

# THEBC PROFESSIONAL ENGINEER

Volume 43 / Number 8

SEPTEMBER 1992

1992 ANNUAL REPORT



Come to the AGM



# Water, Water Everywhere...

## Does British Columbia Really Need A Water Conservation Strategy?

Kim A Stephens PEng, Ted Van der Gulik PEng and Tom Heath PEng

*The following article has been developed from two papers that were presented by BC engineers at the 111th Annual Conference of the American Water Works Association (AWWA) in June 1992. The title of the paper presented by Kim Stephens and Ted Van der Gulik was Demand Side Management: The Okanagan Valley Case Study. Kim Stephens also presented a paper with Tom Heath titled Greater Vancouver's Watersheds: The Need for a Drought Management Strategy in the 1990s. Both papers addressed water conservation issues in the British Columbia context.*

**Background.** The summer of 1992 has once again heightened awareness throughout British Columbia of the limited capabilities of many existing water supply sources. Although there is a perception that BC is *water-rich*, the reality is that we are often seasonally *water-short* (mainly because of storage limitations) during the period when water demand is heaviest due to lawn and garden irrigation.

For the third time in six years, drought conditions have been experienced in the southern part of BC, and in particular the Greater Vancouver region. The 1987 drought is one of the most extreme on record, with a return period rating in the order of 100 years. It followed a relatively benign period of almost half a century.

The extended duration of this benign period may have lulled water supply managers into a false sense of security, especially with respect to the reliable watershed yields of surface water sources during a "dry" summer following a low snowpack winter. The last six years may possibly be reminiscent of conditions in the 1920s.

**Impact of the 1987 Drought.** Half the population of BC lives in the growing Greater Vancouver region. The Okanagan Valley is also experiencing rapid population growth. The 1987 drought resulted in an unprecedented test of the capacities of water supply sources to provide for the existing regional populations, raising concerns regarding the possible consequences of continued growth.

The legacy of the 1987 drought was to trigger two landmark water resource studies:

- By 1988 the Greater Vancouver Water District (GVWD) had initiated a reassessment of watershed yield and population support capacity for each of its three river sources (i.e., Capilano, Seymour and Coquitlam).
- By 1989 the Ministry of Agriculture, Fisheries and Food (MAFF) together with the Association of BC Irrigation Districts (ABCID) had commissioned a comprehensive study that assessed the potential for water conservation in the Okanagan Valley.

These studies have focused attention on the need for a water conservation strategy in British Columbia.

**The Need for a Conservation Strategy.** This need has been further underscored by the severity of conditions in 1992. At the time of preparing this article in mid-July, all the indicators were pointing to 1992 being the driest year on record in the Okanagan Valley, with Okanagan Lake inflows and levels being considerably lower than normal. Similarly, an unseasonably early heat wave combined with extremely low inflows resulted in an unprecedented drawdown of Greater Vancouver's storage lakes in early June.

### THE GREATER VANCOUVER CASE STUDY

**The Sources of Supply.** Figure 1 shows the locations of Greater Vancouver's three river sources. Each has a major dam and lake reservoir.

The Capilano and Seymour systems also include remote mountain lakes which provide a supplementary source of supply during critical low flow periods. These mountain lakes are accessible only by helicopter, when flying conditions are safe. Lake storage is released by manually opening outlet valves.

There are three mountain lakes, of which two are in the Seymour system. The combined reserve storage in these lakes is slightly over half the total useable volume in Capilano Lake and Seymour Lake.

While the GVWD has complete control of the Capilano and Seymour systems, it shares the Coquitlam system with BC Hydro. At present, only a portion of Coquitlam Lake storage is available for domestic water supply, since the primary function of the reservoir is hydroelectric energy production.

**Significance of Watershed Studies.** The 1987 and 1990 droughts have led the GVWD to commission a series of studies in order to assess the water supply capabilities and population support capacities of the three watersheds, as well as provide direction for drought management. The studies have answered these three questions:

- How many people can the existing reservoirs and mountain lakes supply?
- How many people could potentially be supported by the watersheds?
- How can the use of the mountain lakes be optimized?

In summary, these studies have provided the cornerstone for development of a master plan for regional water supply expansion and drought management well into the 21st century. At the same time, they also underscore the necessity for a Water Shortage Response Plan for monitoring water use and implementing demand-side management measures to reduce water use during a dry summer.



‘We have an abundance of water.... Unfortunately, it falls at the wrong time of year.’

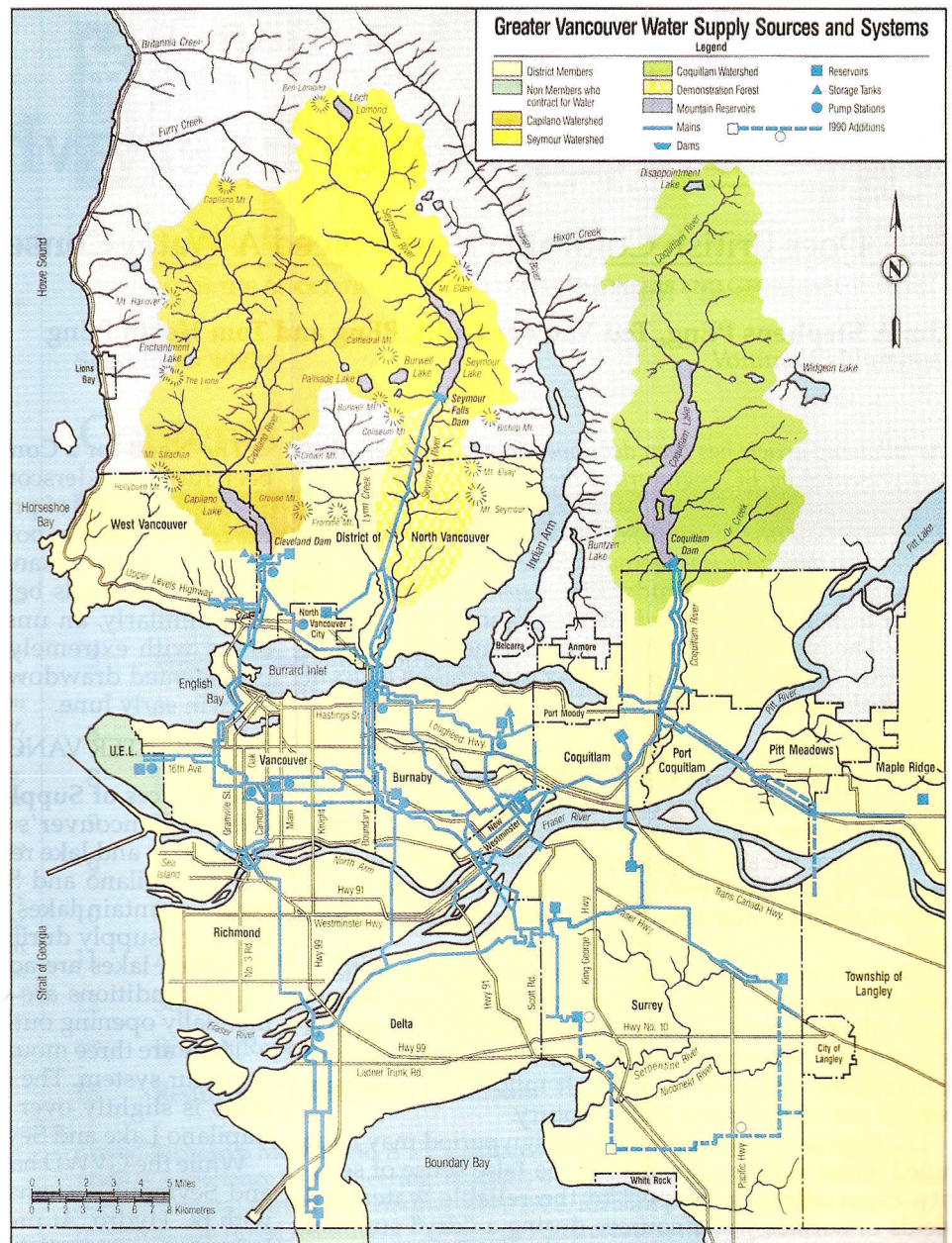


Figure 1. Greater Vancouver water supply source and systems.

**How Many People Can the Watersheds Support?**  
Three scenarios for answering the above question are summarized as follows:

SCENARIO	DESCRIPTION	NO. OF PEOPLE (Millions)
A	Existing operation of three sources, including share use of Coquitlam	2.0
B	Existing operation of Capilano and Seymour, plus single purpose use of Coquitlam for domestic water supply	3.0
C	Ultimate capacity of watersheds through diversions, removal of hydraulic constraints and additional storage dams	5.0

These figures compare with an existing regional population of approximately 1.6 million. The three scenarios do not consider the impact of possible water conservation measures. Significantly, Scenario B is close to the projected population of 2.8 million that provides the basis for the 50-year design horizon adopted by the GVWD for long-term system expansion.

**Vulnerability of the Greater Vancouver Region.** The portion of the regional population presently within the Capilano/Seymour service area is 75%, and virtually matches the combined population support capacity rating for the two sources. (The other 25% is supplied from Coquitlam Lake, which has the surplus capacity.)

On the basis of this finding, the GVWD has developed both short-term and long-term strategies for drought management:

- *short-term strategy:* the Water Shortage Response Plan.
- *long-term strategy:* the Westerly Transfer Project.



The **Westerly Transfer Project** will be completed by 1997, and will enable water to be moved west into the Capilano/Seymour service area. In the meantime, the vulnerability of the Greater Vancouver region is evidenced by the droughts of 1987, 1990 and 1992.

**The Water Shortage Response Plan.** The Water Shortage Response Plan was implemented for the first time in 1992. The plan has three levels of action:

LEVEL	ACTION	DESIRED REDUCTION IN DAILY WATER USE
1	Voluntary conservation	5%
2	Sprinkling regulations	10%
3	Ban on outdoor water use	>10%

Historically, the GVWD's storage lakes have always remained full until early to mid-July. This year the combination of a record mild winter, extremely low snowpack, and heat wave commencing in early May resulted in significant reservoir drawdown starting by the first week of June.

The lowering of Capilano Lake in the winter of 1991-1992 to carry out remedial work on the upstream face

and spillway of Cleveland Dam had only a minor effect on storage reserves which were 93% full heading into the summer.

In 1987, the reservoir drawdown began on July 12th. It was November 4th before the drought broke after a record four-month duration. Faced with the possibility of a five-month drought in 1992, and knowing that the reservoirs could be empty by September, the 16 municipalities comprising the Greater Vancouver Region imposed a ban on lawn sprinkling on June 25th. This was done after it became apparent that voluntary reduction in use would not be enough.

The impact of the ban was dramatic, with consumption dropping by at least 20%. Coupled with timely rainfall in early July (when this article was prepared), imposition of this emergency conservation measure was expected to alleviate concerns for the balance of the summer.

**Water Conservation Initiatives.** The GVWD believes that water conservation will be an important part of its overall planning strategy for the future. Conservation will be necessary to help defer the need for costly capital projects aimed at increasing the source storage and upgrading transmission capacity. The need to minimize operating costs is also a consideration.

Although conservation education has received very little attention to date, the GVWD expects to devote additional resources to this area and to explore other demand management strategies in 1992, and plans to further increase its conservation efforts in 1993.

## **SCHLUMBERGER INDUSTRIES TECHNICAL SERVICE GROUP PROUDLY ANNOUNCES THE OPENING OF THEIR VERNON SERVICE FACILITY, ESTABLISHED TO MEET THE SERVICE NEEDS OF MUNICIPALITIES AND IRRIGATION DISTRICTS IN BRITISH COLUMBIA SPECIALIZING IN THE FOLLOWING SERVICES:**

- **"Turn-Key"** Water Meter Installation Projects
- Automatic Meter Reading Systems
- Water Conservation Products
  - Furnish & Install
- Large Meter Testing and Installations
- Meter Reading and Billing Services
- Meter Leasing and Rental Programs
- Irrigation Meters
- Hydrant Painting
- Hydrant Maintenance
- Hot Tapping
- Valve Testing

### **Schlumberger Industries**

For more information contact:  
Measurement Division  
Technical Service Group  
Unit #2, 2220 - 11th Avenue  
Vernon, BC  
V1T 7X8  
(604) 558-0428

Peter Moxley  
Service Manager  
  
Mike Cooper  
Territory Sales Manager



## The Integrated Strategy

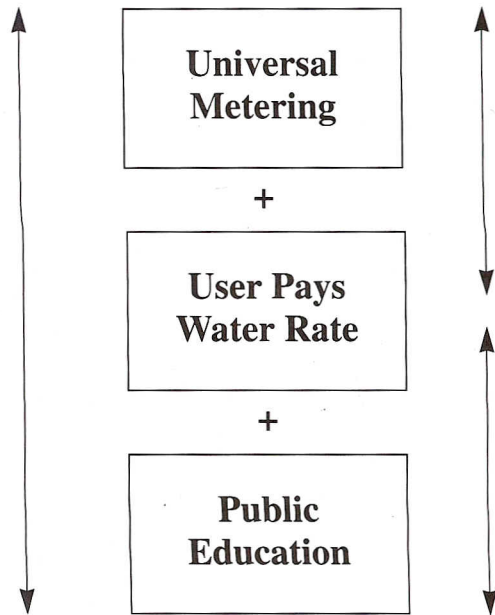


Figure 2

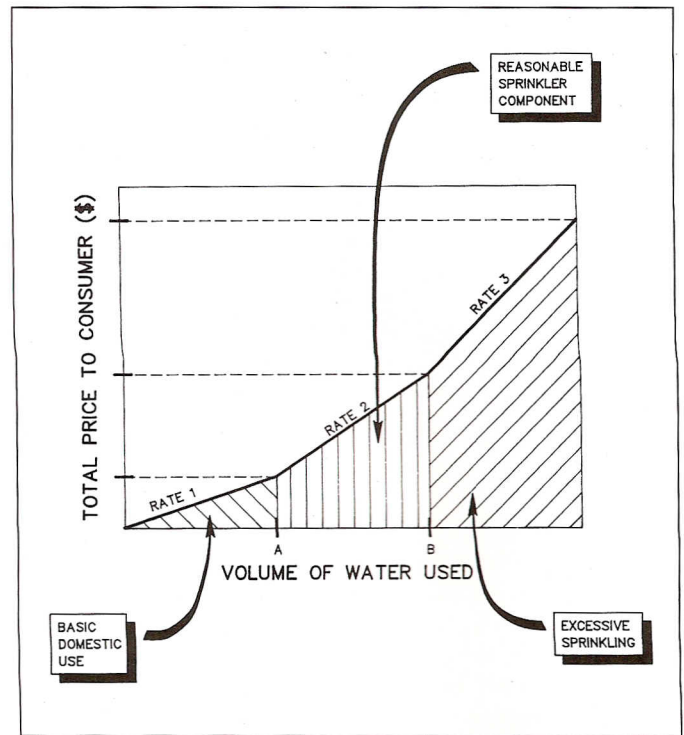


Figure 3. Application of an increasing block rate structure.

## YOUR SOLUTION FOR UNIVERSAL WATER METERING

### WITH NO CASH OUTLAY

- Rental Program For Water Meters
- Leasing Program For Water Meters

### Above Programs Are Available For:

- Neptune Water Meters
- ARB Meter Reading Systems
- Reading And Billing Systems
- Installation Services
- Meter Reading And Maintenance Services

**Schlumberger Industries**

For more information contact:  
Measurement Division  
Technical Service Group  
7275 Weat Credit Avenue  
Mississauga, Ontario  
L5N 5M9

Or Call:  
Joe O'Neill  
(416) 858-4211

## THE OKANAGAN VALLEY CASE STUDY

**The Okanagan Study Area.** The Okanagan Valley is a region in transition; undergoing rapid urbanization, the population now approaches 250,000. Agricultural needs combined with population growth are placing considerable pressures on the Okanagan's water supplies.

Outside the three major urban centres, community water supply is, for the most part, the responsibility of irrigation districts. These are single function governmental organizations that reflect the historical development of the Okanagan. Their original purpose was to serve the agricultural community with irrigation water.

With urbanization, the number of domestic users now far exceeds the number of agricultural users in these irrigation districts. The total population served by these districts is well over 100,000. The water systems are described as combined systems because the same pipe supplies water for both agricultural and domestic (drinking) uses.

**Demand-Side Management.** The goal of the study was to assess the potential for shifting from a supply-side to demand-side management approach in water resource planning and development. The study was comprehensive, identifying mechanisms available for implementation of demand-side management in order to encourage more effective use of existing water supplies.

The traditional approach in supply-side management has been to develop additional source capacity to meet the increasing water demands of a growing population. Often little or no consideration has been given to the reasonableness of those demands.

The objective of demand-side management is to reduce water demand as a way of stretching the capacity of existing sources to support additional growth, and thereby delay having to make major capital investments



in waterworks facilities. (BC Hydro's Power Smart Program is an example of demand-side management.)

To this end, the study analyzed probable impacts of a universal metering program and irrigation system changes. It determined that total annual water use in the Okanagan Study Area (i.e., excluding the cities of Kelowna, Penticton and Vernon) could potentially be reduced by about one-third through demand-side management.

One of the outcomes of the study was the Okanagan Valley Meter Demonstration Program. This has provided an opportunity to obtain data on actual water use. This is the first step leading to a water-saving program.

**Universal Metering in the Okanagan.** Universal metering of water service connections is gaining acceptance as a desirable objective in today's environmentally conscious society. And among water supply managers, the debate no longer revolves around the question: "Should we meter?" Rather, the focus of attention has shifted to the question: "When will it be implemented?"

In the Okanagan Valley, the City of Penticton has had a fully metered system for some time. The City of Vernon is currently implementing a universal metering program, with completion scheduled for November. In addition to these major urban centres, several irrigation districts are in the process of investigating metering options.

**How Do You Reduce Water Use?** Figure 2 illustrates the integrated strategy for reducing water use. It requires:

- universal metering of service connections (i.e., the tool for monitoring the effectiveness of water-saving programs);
- a water rate structure based on a user pays philosophy (i.e., the incentive to reduce/eliminate wasteful uses of water); and
- public education (i.e., the mechanism for instilling an ethic that water conservation is a way of life).

The acronym for this strategy is **TIE** (i.e., tool-incentive-ethic). All three elements are essential to achieve long-term policy objectives in reducing wasteful water use, particularly during the summer months when water is mostly being poured directly onto the land for lawn, garden and crop irrigation.

**Impact of Increasing Block Rate.** Figure 3 illustrates the application of an increasing block rate structure for domestic water use. This has three rates corresponding to three categories of use:

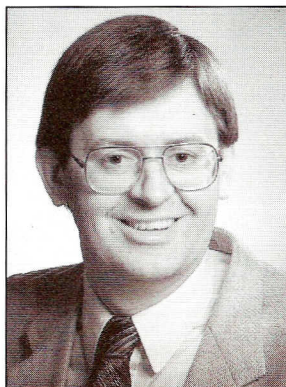
- Rate 1 for basic domestic use
- Rate 2 for reasonable sprinkling of lawns and gardens
- Rate 3 for excessive sprinkling

The first two price levels would be established on the basis of cost recovery, while the third price level would be aimed at eliminating wasteful water use (in order to conserve the water resource).

## CONCLUSION

When people think of British Columbia, they visualize mountains and rain forests. There is a perception that we have an abundance of water . . . and we do. Unfortunately, it falls at the wrong time of year. As a result, we are often short of water in the summer months.

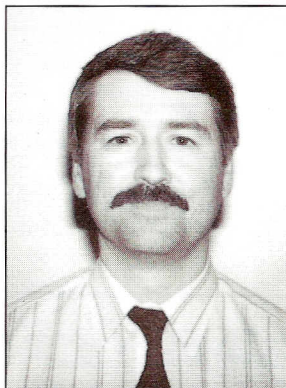
Even in water-rich BC, we are starting to recognize that we must begin to:



Kim A Stephens



Ted Van der Gulik



Tom Heath

*The three co-authors are all graduates of the University of British Columbia, with Kim Stephens and Tom Heath being civil engineers (Classes of '73 and '74, respectively) while Ted Van der Gulik is an agricultural engineer (Class of '77).*

*The three co-authors are also founding members of the Water Conservation Committee recently formed under the aegis of the BC Water and Waste Association.*

*Kim Stephens is an Associate with Kerr Wood Leidal Associates Ltd, a North Vancouver-based firm of consulting engineers that specializes in the municipal and water resource development fields. He was Project Manager for the two case studies that provide the basis for this article.*

*Ted Van der Gulik is the Senior Engineer in the Soils and Engineering Branch of the Ministry of Agriculture, Fisheries and Food, and is based in Abbotsford. He was Chairman of the Technical Steering Committee that oversaw the Okanagan Study.*

*Tom Heath is the Administrator for Water Planning and Operations at the Greater Vancouver Water District. His responsibilities have included development of the current master plan for regional water supply and expansion.*

- reduce wasteful uses of water, both inside and outside the house;
- establish the true value of supplying water to the consumer's tap;
- adopt a user pays philosophy to ensure fairness in cost recovery for water utility operation, renewal and expansion; and
- implement universal metering of water service connections.

This is going to be the theme in the 1990s. The objective is to ensure responsible and effective expenditures of public funds. Fulfilling this objective requires the integrated strategy to **TIE** everything together. 