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WINNIPEG WATER RATE STUDY

by

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BY

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MASTER OF ENGINEERING

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ABSTRACT

At the time of unification of the area municipalities within metropolitan Winnipeg in 1972 many different water rate structures were in effect. In 1972 a task force reviewed all of the rate methods in effect and recommended that the then City of Winnipeg's rate method called the Functional Cost Method be adopted. The recommended rate structure included a three block declining rate schedule and a minimum bill. The new rates were implemented in 1974. Since that time, the minimum bill has been abandoned and rate increases have been applied as a uniform percentage increase to all blocks. In 1979, a committee of the Waterworks, Waste and Disposal Department recommended that an indepth water rate study be undertaken to review the equitability of the present rates, to review the adequacy of generated revenue, to ensure flexibility of the rate method to adapt to future change, to ensure simplicity of use and to ensure that the method to all legal requirements of the utility. The study was undertaken in 1980 as a "cost of service" study.

After a review of alternative rate setting methods, the Functional Cost Method and the Base Extra Capacity Method were chosen to be studied. These two methods were applied to the 1979 water utility's cost data. The allocated costs were then represented in a three block declining rate schedule as a unit cost for water for the utility's customers.

The block rate structure divides customers into classes. Most residential users fall entirely within Block 1. Larger users first pay the Block 1 rate for initial use, then the Block 2 rate and Block 3 rate for subsequent use. It is important to note that large users pay the same rate as residential users for initial use.

The Base Extra Capacity Method is different from the existing method in that it shifts costs from the residential rate to the other blocks. In the Functional Cost Method, the Block 3 rate only includes the cost of transporting water into the City reasoning that the costs of local distribution, etc. have been recovered from all users including industry in the initial blocks. The Base Extra Capacity Method applies some distribution costs in Block 3 reasoning that the system must be in place to supply even the last drop of water.

In the Functional Cost Method customers are classed into blocks according to total usage. In the Base Extra Capacity Method customers are classed according to their demand characteristics, ie. the ratio of their peak usage to their average usage. This is an important refinement since the peak usage in many ways governs the design of pumps and watermains and the costs of building the system. The "blocks" are used to divide customers into low volume/high peak residential users to high volume/low peak industrial users. This recognition of peak usage and having some charges for all components in all blocks are the reasons that the Base Extra Capacity Method is accepted as more equitable than the Functional Cost Method.

The study concludes that the Base-Extra Capacity Method results in more equitable rates than the Functional Cost Method. The study also concludes that further monitoring of peak demand is required before implementation of the new method to better define the demand characteristic patterns for the customer classes.

ACKNOWLEDGMENTS

The author gratefully acknowledges the assistance of the Waterworks, Waste and Disposal Department of the City of Winnipeg, particularly the assistance of the Rate Review Committee.

CONCLUSIONS:

1. That the Base-Extra Capacity cost allocation method is an equitable basis of setting rates in that the costs allocated to each customer class are recovered directly from the respective class and all three block rates recover portions of the total water system costs. While rates under the Functional Cost Method appear equitable when revenues and costs are compared for each customer class, the matching process is forced and equitability is not measureable on this basis. Furthermore, the third block rate under the Functional Cost Method is inequitable in that it recovers no portion of distribution costs which are a substantial portion of the total water system costs.
2. That the Base-Extra Capacity method is flexible in that it is adaptable to the use of demand meters. Technology has improved whereby demand metering will be an economic reality in the very near future.
3. That further study is required in the areas of classifying customers and setting customer class peak factors in order to implement the Base-Extra Capacity Method.
4. That adding a percentage increase across-the-board to the three block rate structure is not valid in terms of the cost allocation method on which the rates are based. However, in the interim period (1982-83) it would be reasonable to utilize this method of setting rates since in the present method, rates are in the middle as far as impact on customers. As an example, large users would pay less than at present if Functional Cost were adopted and will pay more than at present if Base-Extra Capacity is adopted.

RECOMMENDATIONS:

1. That the Base-Extra Capacity cost allocation method be adopted for use in setting water rates for the City of Winnipeg and that water rates based on this method be implemented in April, 1984 in accordance with the program outlined in the report.
2. That the present method of applying an across-the-board percentage increase be continued for 1982 - 83 while studies are ongoing in the areas of customer classification and customer class peak factors.

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1.0 INTRODUCTION

WATER RATE STUDY

1.0 INTRODUCTION

1.1 Background

Prior to the unified City of Winnipeg, there were various rate structures in effect throughout the existing municipalities and cities. The City of Winnipeg, the largest of the municipalities, had a three block rate structure instituted in 1956 except for the period 1969-1974 when a two block rate structure existed.

Amalgamation in 1971 created a need for uniform water rates throughout the new City of Winnipeg. A 1971-2 Rate Study addressed this need and a rate structure based on the study was adopted effective January, 1974. The 1971-2 study was based on a cost allocation method called Functional Cost.

In 1976, an administrative task force was established to monitor the effects of the rate structure and to report annually regarding the requirements of the water and sewer utilities necessary to maintain the utilities as self-supporting operations. Early in 1978, a Rate Review Committee was formed in the Waterworks, Waste and Disposal Department, to establish a program for rate-related reports and studies. This Committee, during 1978 reported on Local Improvement Rates and surveyed water and sewer rate practices in other Canadian Cities. In 1979, the Committee reviewed rate-setting methods recommended by the American Water Works Association (AWWA), and currently in use in other cities, and recommended an in-depth Water Rate Study be undertaken.

1.2 Why a Study?

There are several reasons for undertaking an in-depth rate study.

- i) The current water rate structure was originally based on a allocation method called Functional Cost. This method is now considered subjective in nature and has been replaced by other methods which recognize costs associated with fluctuating usage. Also, since the adoption of rates based on the Functional Cost Method, the rate increases have been in the form of percentages applied across the board to the three block rate structure, rather than reallocating the costs on an annual basis. This method of increasing rates is not consistent with the intent of Functional Cost.

- ii) The recognized need for an accelerated watermain renewal program, the necessity of partial reconstruction of the Wilkes reservoir and requirements for system expansion including the major impact of an aqueduct all accentuate the need for sound financial planning, the foundation of which is a well-defined rate structure.

1.3 Concept of Study

On January 25, 1965, the AWWA adopted the policy:

"...that the interests of the public and of individual customers...can be served best by self-sustained, utility-type enterprises, adequately financed, and with rates to the public and customers based on sound engineering and economic principles..."⁽¹⁾

This policy inherently prescribes the concept of rates based on "cost of service" or the "user pays" principle. The AWWA Water Rates Manual further states:

"To assure equity in charges to the different customers, the basic premise in the establishment of adequate rate schedules is that they should reflect the cost of providing the water service"⁽²⁾

There are many philosophies of rate setting to be found in technical literature, some of which are:

- i) Demand modification - use of rates to increase or decrease the amount and velocity of consumption.
- ii) Social rates - a socialistic philosophy such as life-line which charges a very low rate for water required for minimum health standards.
- iii) Flat rate - customers are charged a set amount regardless of the amount of water used.
- iv) Value of service - what the market will bear.
- v) Cost of service - rates to customers are based on the actual costs of providing the service to the customer classes.

This study is based on the "cost of service" principle. It is considered to be the most equitable overall and if a different philosophy is adopted, it can be done so with full knowledge of the divergence from cost of service.

The moderator, at a 1973 A.W.W.A. seminar on developing water rates, stated:

"There have been attempts in all types of utilities in the country in recent months to require recognition of social problems in rate making. So called 'inverted rates' and concessions to benefit particular classes and types of service are proposals that go beyond rational rate-making. As engineers, or water utility management, we cannot subscribe to rate making practices which, without consideration of cost responsibility, deliberately throw the burden of water costs against any class of customer, whether this be small customers, or large use customers such as industry." (3)

It should be understood that cost allocation methods, while giving the appearance of precision, are an approximation. They are, however, the only tools available to determine whether the rates being used do in fact provide revenues from classes of customers in relative proportion to the cost of providing service to the respective customer classes. There are no formulas, as such, in rate-making, only guidelines which are applied to the conditions and demands of each individual utility. It has in fact been stated that, "To some extent, water rate setting is an art as much as a science." (4)

1.4 OBJECTIVE OF THE STUDY

The objective of the study is to select a rate setting method that will best meet a set of pre-determined criteria. These criteria are:

- i) Cost of service equitability - each customer category should contribute revenue commensurate with its respective cost. This ensures the principle of the "user pays" which is most easily supportable to customers.
- ii) Adequacy of revenue - the rates, for water used, along with other sources of revenue, should generate sufficient funds to cover the total expenditures incurred in providing an adequate level of service.
- iii) Flexibility - the method chosen should be adaptable enough to ensure its suitability in future years. This will give a measure of consistency and continuity to the basis of charging for use of water.
- iv) Simplicity - the final rate structure should have a minimum of different individual rates and rate components. This will reduce billing costs and make the rate structure more easily understood.
- v) Legality - the rate structure adopted should meet all legal requirements to which the water utility is subject.

2.0 METHODOLOGY

2.0 METHODOLOGY

2.1 Introduction

This section will outline the overall methodology of the study. Sub-section 1.3 identified "cost of service" as being the concept of the study. The following sub-sections will give an overview of a cost of service analysis, describe in general terms the selection of alternatives for the study, identify sources of revenue other than charging for water consumed, and outline the development and comparison of the selected alternatives.

2.2 Cost of Service Study - General Description

The development of water rates, based on the concept of "cost of service" involves three major areas of study regardless of the method used.

i) Revenue Requirements

The first area of study is to identify the revenue requirements, which are the costs of maintaining and operating the system. These would, of course, be relative to the level of service being provided. There are two widely used bases for determining revenue requirements - "utility" and "cash". The utility basis is used normally by privately owned water utilities. Usually the cash basis is used for determining revenue requirements of publicly owned utilities. Expense items included in each are:

<u>Utility Basis</u>	<u>Cash Basis</u>
Operating and Maintenance	Operating and Maintenance
Taxes	Taxes (grants in lieu)
Debt Service (interest only)	Debt Service (principal and interest)
Depreciation	Plant replacement, extensions and improvements
Return on rate base (investment)	Optional - appropriations for major improvements or reserves

There are three reasons for using the cash basis for publicly owned utilities:

1. they are financed largely by serial and sinking fund debentures whose retirement must be provided for on an annual basis while they are outstanding whereas investor owned utilities often retire debt by additional borrowing (refinancing),
2. they are not operated for a profit but attempt only to cover total operating costs and to provide for investment in plant facilities,
3. the cash basis is similar to the budget basis used by other City departments in preparing annual estimates.

The cash basis, which has been used in this study, is developed in more detail in Section 3.0 - Identify Costs.

ii) Allocation of Costs

The second area of study involves a two-step allocation of costs. The first step is to take the annual revenue requirements (costs of service) and distribute them to basic cost functions which are related to the operating system. The second step is to take the costs allocated to the basic cost functions

and reallocate them to either block intervals or customer classes in accordance with their requirements for service.

iii) Design of Rates

The third area of study is to design water rates which will recover, from each class of customer, the costs incurred by the respective class. Metered rates normally consist of several rate blocks with decreasing rates for larger consumptions. "Block rates provide a means of recovering costs for general service classes of Residential, Commercial and Industrial users under a single schedule by recognizing the differing water use and associated cost characteristics of each class of service." (5) The block sizes are determined by analysis of the customer consumption history on the billing system data base.

2.3 Allocate Costs - Select Alternatives for Study

The 1979 review of rate-setting practices resulted in identification of only three well-defined "cost of service" allocation methods. These were Functional Cost, Base-Extra Capacity and Commodity Demand.

i) Functional Cost

A modified version of this method was used in the 1971-72 study and hence was the original basis for our current rate structure. This method was selected as one of the alternatives to be studied in order to update the original concept under current cost

conditions. This would then determine the validity or non-validity of our current rate structure in terms of the rate setting method on which it is based. This method is described in detail in Section 4 - Allocate Costs.

ii) Base-Extra Capacity

This method was selected as a second alternative for the study based on its acceptance among water utilities. It has an inherent logic that recognizes costs associated with average usage and with peak rates of use. Different customer classes contribute in varying degrees to these peak rates of use and should be charged accordingly. Another factor in selecting this alternative was the substantial amount of resource material published on it which enabled in-house personnel to do the study. This method is described in more detail in Section 4 - Allocate Costs.

iii) Commodity Demand

This method, while similar to Base-Extra Capacity in that it gives recognition to maximum demands, does not recognize perfect load customers. This type of customer exercises a constant demand 100 per cent of the time and as such does not contribute to the costs associated with diversity of use, that is, varying rates of demand. This method also does

not produce a base cost for water. A base cost gives a rate which is the lowest amount at which water should be sold, even to a perfect load customer. The City of Winnipeg Waterworks System is an established utility and as such has a relatively stable total annual usage. However, it has customers who range from low to high usage and may have diverse peak use requirements. For these reasons the Commodity Demand method was rejected as a study alternative.

The two cost allocation methods selected for study, namely Functional Cost and Base - Extra Capacity are fully developed on an individual basis in Section 4 - Allocate Costs and Design Rates. Section 5 will deal with a recommendation of the more appropriate method.

2.4 Design of Rates

A cost allocation method provides a means of allocating costs. Once costs have been identified and allocated to cost functions, these costs are usually recovered from the customers of the water utility. The recovery of costs are usually accomplished by a charge for a unit of water consumed. This charge is determined through a rate structure. Examples of some rate structures are uniform rates, step rates, demand rates and declining block rates. The current rate structure in use is the declining block rate.

Since this study is primarily a cost of service study, the present rate structure will be retained. The retention of this rate structure will provide a better comparison between the two cost allocation

methods to the present rates. The declining block rate involves a specific unit cost for each block with the specific unit cost declining for successive blocks.

2.5 Consider Sources of Revenue Other Than Rates for Water Used

In most water utilities, rates charged for water used provide the major source of total annual revenue. In the City of Winnipeg water rates produce, on the average, 75% of total revenue.

There are certain costs associated with most water utilities that are logically recovered through means other than charging for water used. An example of this type of cost is the installation of local laterals. These costs are very often recovered through a Local Improvement charge which apportions the costs to the individual property owner who is directly benefiting from the installed lateral.

Other sources of revenue available to water utilities are the mill rate, frontage levies, connection charges, reserve funds, Provincial and Federal grants and subsidies, and miscellaneous charges such as permits and late payment fees.

This area of the study is outside the scope of water rates based on consumption and therefore is not considered in this report.

2.6 Implementation

Upon completion of comparing the two cost allocation methods and recommending one for utilization, an implementation program will be outlined in Section 6.

3.0 IDENTIFY COSTS

3.0 IDENTIFY COSTS

3.1 Introduction

Sub-section 2.2 gave a general description of a cost of service study. The first area of study was to define revenue requirements which are the costs of maintaining and operating the system. Section 3 will analyze the annual costs of a base year, for purposes of cost allocation.

3.2 Total Costs

The year 1979 was selected as a base year, since at the inception of the study, it was the most recent year for which actual costs were available. Given that the "cash" basis (as described in Sub-Section 2.2) is being used to determine revenue requirements, Table 3-1 portrays the 1979 costs of service in this format.

Table 3-1

Revenue Requirements - Total

<u>Revenue Requirement</u>	<u>Amount</u>	<u>%</u>
Operation and maintenance expense	\$12,789,477	59.5
Debt service requirements (principal, interest & related expense)	6,744,709	31.4
Grants in lieu of taxes	1,030,242	4.8
Plant replacement	<u>923,162</u>	<u>4.3</u>
Total revenue requirements - 1979	<u>\$21,487,590</u>	<u>100.0</u>

The total 1979 costs of service of \$21,487,590 were analyzed in detail in order to differentiate between costs to be recovered through the rates and costs to be recovered through other sources of revenue.

3.3 Costs to be Recovered Through Water Rates

Costs recovered through the water rates are directly related to the supply and delivery of potable water to the utility's customers. This includes all costs associated with the operation and maintenance of the water system from the intake at Shoal Lake up to and including the meter on the customer's premises (excluding the pipe connecting the meter to the property line and renewal of local laterals), debt service charges, administration, taxes and general government charges.

A summary of these costs (details are in Appendix 3-1) is shown in Table 3-2 below.

Table 3-2

Revenue Requirements - Rate Supported

<u>Revenue Requirement</u>	<u>Amount</u>
Operation and Maintenance	\$10,540,845
Debt Service Charges	5,619,335
Taxes	<u>876,734</u>
Total	<u>\$17,036,914</u>

3.4 Costs to be Recovered Through Other Sources of Revenue

These costs either are not related to water supply and delivery or it is not logical to recover them through rates for water consumed. They include charges associated with the Sewage Disposal System, the railway gravel hauling operation, fire protection and watermain renewals. Table 3-3 summarizes these costs which are detailed in Appendix 3-1.

Table 3-3

Revenue Requirements - Other Sources

<u>Revenue Requirement</u>	<u>Amount</u>
Operation and Maintenance	\$2,248,632
Debt Service Charges	1,125,374
Taxes	153,508
Plant Replacement	<u>923,162</u>
Total	<u>\$4,450,676</u>

4.0 ALLOCATE COSTS AND DETERMINE RATES

4.0 ALLOCATE COSTS AND DETERMINE RATES

4.1 Introduction

The general description of a cost of service study (subsection 2.2) identified the second area of study as cost allocation and the third area of study as rate development. Section 4 will use the revenue requirements identified in Section 3 (Table 3-2) to allocate the costs of service and develop rates. These two steps of the study - allocate costs and determine rates - will be developed under the two selected cost allocation methods - Functional Cost and Base - Extra Capacity. The results of the two methods will be compared in Section 5 and one of the two methods will be recommended.

4.2 Functional Cost Method

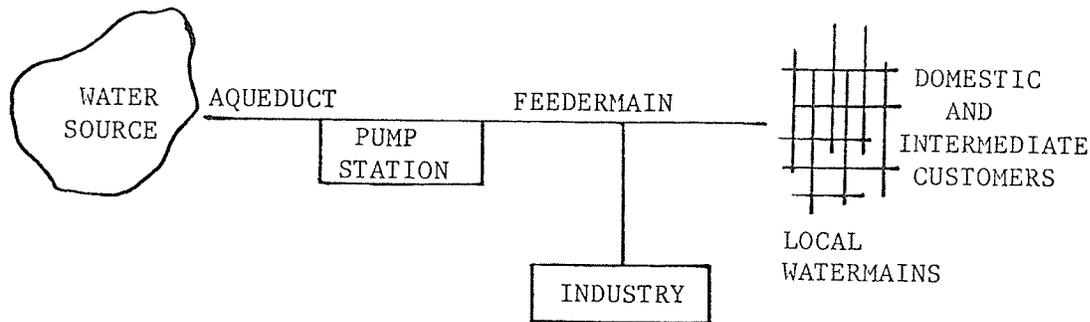
4.2.1 Background of Method

The Functional Cost allocation method was proposed by the New England Water Works Association in 1916 and later adopted by the AWWA in 1923.⁽⁷⁾ The original concept called for a service charge which was a fixed charge and three blocks termed domestic, intermediate and manufacturing or wholesale which had unit rates applied to a quantity of water sold. There were no rules or even guidelines as to how these rates for the blocks or service charge should be calculated. The AWWA Committee on Steps Toward Standardizing Stated Quantities for Slides in Meter Schedules in its report to the Philadelphia Convention in 1922 described the concept and philosophy of a sliding scale (decreasing block rates). The main reason for the sliding scale or block system was "to cover the extra cost of distribution to small takers."⁽⁸⁾ Many miles of pipe are necessary to service the many small users in a system whereas

the large users, being fewer in number and often close to the feeder mains, do not require nearly as much pipe for servicing.

Figure 4-1

Water System Description - Functional Cost Method



Another reason for having lower rates for large users was that "there are frequently limits to the amounts that can be collected for water for manufacturing purposes. If the rate is too high the business is not there." (9) This concept was felt to be particularly valid where a system had capacity in excess of its current needs. Then in 1949⁽¹⁰⁾ and again in 1954⁽¹¹⁾ the AWWA proposed "...a workable pattern or formula by which waterworks personnel may be guided in arriving at the formulation of water rates which are based on sound engineering principles." The rules proposed by AWWA in 1954, which have remained essentially unchanged since that time, were as follows:

METER SERVICE CHARGE

The meter service charge is to include:

1. All commercial expense and a suitable portion of administrative and overhead costs, the total of which is to be divided equally to all accounts.
2. All expense arising out of meters and services, with a share of administrative expense and overhead, the