

THE APPLICATION OF REGIONAL PLANNING TO THE  
CONTROL OF WATER QUALITY: A CASE STUDY  
OF THE PROVINCE OF BRITISH COLUMBIA

by

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## ABSTRACT

The need for conservation of existing water resources in countries which are experiencing rapid urbanization and industrialization becomes quite obvious when one considers the tremendous increase in demand for water as the standard of living rises and as new uses for water evolve. The problems which may arise from lack of recognition of the need for planned utilization of water resources, and the development of means to cope with these problems once they have developed, are exemplified in the case of the highly urbanized and industrialized Ruhr Valley in West Germany. The U.S.A. has reached the stage of recognition of problems which arise out of water pollution and has recently embarked on the development of means to resolve existing and potential problems. Canada will undoubtedly follow this experience very closely.

There is a multiplicity of uses for water for domestic and industrial purposes and the range of these uses is rapidly expanding. This vast and increasing range of beneficial uses often results in conflicts whereby, since the degree of water quality differs for different uses, overuse for one purpose may limit the use for another purpose. To alleviate this situation it is sometimes advantageous or even necessary to determine a hierarchy of use priorities for the various available water supplies.

The hypothesis of this study is that:

Adverse physical conditions resulting from water pollution, which impede satisfactory urban development, can be minimized by implementation of appropriate legislation and policy at the regional level.

The management of water resources, including the control of water quality, since they are so vital to such a large range of uses by man, must be planned on a comprehensive basis. The basis of the planning should be an attempt to attain the goals and objectives established by the planner according to his estimation of the needs and desires of society. These goals and objectives will be most satisfactorily realized by the development of a plan and policy for water quality control, and implementation of that plan through the performance of a logical series of operations within the planning process.

Within the Province of British Columbia there are about thirteen agencies, at the Federal, Provincial, and Municipal levels of Government, which have the legal power to control water quality. This multiplicity of controlling agencies creates overlaps in jurisdictions which may result in inactivity in the imposition of control by these agencies which may unduly rely on each other to exercise their powers. The Pollution-control Board, one of these agencies, was established through the Pollution-control Act in 1956 to resolve these problems of overlapping jurisdictions. The Board has not been successful in becoming a single, competent,

authoritative agency responsible for the control of water pollution within the Province of British Columbia, for the following reasons:

1. It is not fully representative;
2. It has not established water quality and effluent standards criteria;
3. The education program is too limited;
4. It has insufficient budget and staff;
5. The jurisdiction of the Board does not include the whole Province;
6. There are ambiguities in the Act;
7. Insufficient power is given to enforce the Act; and
8. Administration of the Act does not commence at a small enough level of government.

It is suggested that the Board may become the effective unified agency for the control of water pollution in British Columbia if deficiencies under the Act are rectified and if an efficient administrative structure is developed. The proposed administrative structure consists of a Development Board, with representation from the three levels of government, established within each Regional District. Existing and proposed Regional Districts would have to be altered to coincide with river-basin drainage systems or sub-basins in order to make this framework practicable.

It is concluded that with some relatively minor alterations in the existing legal and administrative organization, the desired means of control of water pollution in

the Province of British Columbia can be satisfactorily achieved. This substantiates the hypothesis which formed the basis of this study.

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## CHAPTER I

### THE EFFECT OF WATER POLLUTION ON URBAN AND REGIONAL DEVELOPMENT

Water is one of man's most necessary and useful natural resources. Throughout history, water has been one of the main determinants of urban location. It is a necessary prerequisite for human life. Water is essential for industrial purposes and it has been found to be the best natural agent for transporting and assimilating both domestic and industrial wastes. The harnessing of this resource has made possible the production of vast quantities of electrical power. Agricultural production has been greatly enhanced by the utilization of water for irrigation purposes. The development of water courses into navigable channels improves transportation and thereby supports commercial shipping. Water bodies also provide an intangible service generally referred to as 'amenity' from which man derives pleasure. He likes to live by the water, to use it for recreational purposes, and to utilize its calm atmosphere as an environment for relaxation.

#### I. STATEMENT OF THE PROBLEM

The multiplicity of man's uses for water creates an ever-increasing demand on this resource. As urbanization and industrialization develop, new problems of water supply and

use emerge. Increasing concentrations of urban population place a heavy demand on limited supplies. To accentuate the problem, the major conflicting use, namely the collection and assimilation of domestic and industrial wastes, is also placing increasing demands on this supply. Industrial development is adding to the problem by creating new pollutants.

Urbanization is dependent primarily upon a plentiful supply of potable water for domestic consumption. Many urban areas depend upon industries for their economic base and these may be extensive users of water. An urban area may rely upon hydroelectric power for many of its functions. The potential of a water course as an artery of commerce also favors urban development. The city is dependent upon a river in many cases to carry and assimilate its domestic and industrial wastes. The inhabitants of cities derive pleasure from living beside water, picnicking beside it and using it generally for recreational purposes.

In order to ensure the survival and to encourage the orderly growth of urban areas it is of utmost importance to maximize the available water resources. Maximization of the use of this resource will be possible only through the development of good regional management programs.

The problems which result from poor water quality management became a concern in the latter half of the nineteenth century as a result of recognition of the dangers

presented to public health by water-borne disease germs. These dangers increased with growing urbanization and industrialization because of the concentrations of domestic and industrial wastes disposed of in waters which were being used for domestic water supplies. Pasteur's discovery of disease germs, and the recognition that the presence of these germs in public water supplies may be the cause of public health problems, enabled action to be taken to control the severity of the problems. Purification methods such as the use of disinfectants like chlorine also contributed extensively to the solution of the problems.

Prior to the nineteenth century in Europe, and the twentieth century in North America, potable water was available in undiminishing supplies. Since that time developing urbanization and industrialization are producing problems for which solutions must be found.

As increasing populations create greater demand for pure water, the supplies are being decreased by the additional wastes being deposited into these supplies. As fast as new chemical disinfectants are developed, industry creates other new wastes which require new methods of treatment.

These problems are created primarily from man's need, and it may be said his demand, to subject water to a multiplicity of uses, many of which are conflicting because of the varying degrees of purity required. The necessity for effective water quality management is becoming more manifest,

particularly in the United States now, as supplies of water are being depleted from overuse. The problem, particularly in Western Canada, has not yet reached critical proportions but it is considered that preventive measures should be taken before the water quality deteriorates to a degree where extensive and expensive remedial action would be required.

## II. OBJECTIVES OF THE STUDY

The quantity and quality of available water supplies affect the viability of urban areas. The effects which can result are considered in this thesis in the light of community and regional planning objectives.

The control of water quality in the Province of British Columbia, which is the particular area of study, is generally effectuated through the action of a multitude of organizations at the federal, provincial, and municipal levels of government. The variety of legislation at the federal level, through which these agencies exercise direct or indirect control, are The Fisheries Act, The Navigable Waters Protection Act, The Canada Shipping Act, The Criminal Code, and The National Housing Act.

In the Province of British Columbia the controlling legislation includes The Pollution-control Act, The Health Act, and The Water Act. Although the legislative jurisdiction over all fisheries in Canada is vested in the federal government, the Provincial Department of Recreation and

Conservation, by agreement with the federal government, administers the non-tidal sport and commercial fisheries.<sup>1</sup>

At the municipal level of government there are specific organizations within each municipality, which receive their powers of administration through the B.C. Municipal Act and the Municipal Council, to control water quality within their jurisdiction.

Basic to the successful application of planning at the community or regional level is the ability to control water quality because of the ill-effects which poor quality water can have on community or regional development.

The objective of this thesis is to evaluate the existing system of water quality control within the Province of B.C. with the intention of devising a more operable framework through which more effective control of water pollution may be imposed.

### III. DEFINITIONS OF WATER POLLUTION

The disposal of human wastes and other organic refuse in water has been the cause of many serious pollution

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<sup>1</sup>R.G. McMynn, Report to the Special Committee on Fisheries Concerning the Jurisdictional and Administrative Management of the Commercial Fisheries of B.C. and the Major Problems Associated With the Management of the Resource (Victoria, B.C.: Commercial Fisheries Branch, Department of Recreation and Conservation, Province of B.C., March, 1965), pp. 21-32.

problems since time immemorial. The extensive growth of population in itself has caused the problem to become a serious one. To make the situation even more critical these growing populations are concentrating in urban areas, which generally depend upon a system of water courses to absorb their wastes. The predicament becomes increasingly more crucial as industrial development expands and the demands on the water supply system to assimilate these added wastes are increased. These are essentially the main causes of water pollution.

Dr. R.H. Wright, a physical chemist of the B.C. Research Council defines 'pollution' simply as "dirt, and dirt is matter in the wrong place."<sup>2</sup>

The Oxford English Dictionary defines 'pollute' and 'pollution' as follows:

Pollute: to make physically impure, foul, or filthy; to dirty, stain, taint, befoul.

Pollution: the act of polluting or condition of being polluted; uncleanness or impurity caused by contamination.

Coulson and Forbes define water 'pollution' as it applies particularly in common law as:

The addition of something to water which changes its natural qualities so that the riparian proprietor does

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<sup>2</sup>Dr. R.H. Wright, "What is Water Pollution?" (paper presented at the Conference on Water Pollution, Burnaby, B.C., December 2, 1965).

not get the natural water of the stream transmitted to him.<sup>3</sup>

This definition gives the widest and broadest significance because it dates back to a time when it was possible to conceive of natural water. Increasing urbanization and industrialization have forced man to accept the fact that he must forego 'natural water' supply. In view of this, narrower meanings have been ascribed to 'pollution'.

In the particular area which is studied in detail here, namely the Province of British Columbia, the Pollution-control Board defines 'pollution' in the Pollution-control Act as follows:

In this Act, unless the context otherwise requires, . . . "pollution" means anything done, or any result or condition existing, created, or likely to be created, affecting land or water which, in the opinion of the Board (i.e. the Pollution-control Board established under this act), is detrimental to health, sanitation, or the public interest.<sup>4</sup>

Although this definition is applicable to the pollution of land as well as water, the subject area of this thesis is limited to water pollution control and its implications for urban development.

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<sup>3</sup>Coulson and Forbes, The Law of Waters, as quoted from Louis Klein, Aspects of River Pollution, (London: Butterworths Scientific Publications, 1957), p. 18.

<sup>4</sup>Province of British Columbia, Pollution-control Act (R.S.B.C. 1960, Chapter 289; 1963, Chapter 42; 1965, Chapter 37. 1965), p. 3645.

#### IV. ORGANIZATION OF THE THESIS

A summary of the problem to be studied, a brief history of the problem, and the reasons for the study of the problem introduce the thesis. The subject matter is made more comprehensible by the inclusion of definitions of water pollution, an indication of the scope of the study and a statement of limitations which exist. The stage is finally set by a statement of the hypothesis of the thesis.

The need for conservation of existing water resources is described in Chapter II by a review of the situation as it developed and how it was handled in the extremely complex case of the Ruhr Valley in West Germany. To bring the picture a little closer to the particular case of study, namely the Province of British Columbia, the situation in the United States, an area of lesser urbanization and industrialization, is considered in the light of the availability of sources of good water supply and the need for increased control of the uses of their water resources. The rate of population growth in Canada and the status of the water resources of Canada are viewed comparatively with that of the United States. It becomes evident from this general overview and comparison that the demand for water is increasing very rapidly and that control must be imposed in order to protect the limited supplies of good water which are available. Control must be imposed primarily at the regional level with lesser degrees of control at the local and federal levels.

Having established the increasing need for conservation of available water resources, it becomes necessary to examine the ways in which the water resources can be used and how these various uses affect one another. The multiplicity of beneficial uses of water are outlined in detail in Chapter III. It is evident that, although these uses are all beneficial in one way or another for urban development, many of the uses conflict with each other because of the varying degrees of purity required. It often becomes necessary to determine a hierarchy of uses in order that the highest priority uses will not be endangered by lower priority conflicting uses. Attempts have been made by using benefit-cost analyses, with much difficulty, to objectively determine what uses should be permitted and at what scale.

The objectives of community and regional planning are related to those of the various users of a water resource in Chapter IV. The differences and similarities in these objectives are indicated and problem areas are identified.

The history of water quality control in B.C. is summarized in Chapter V in order to lead to an explanation of the organization of the existing framework which imposes the control. The existing water quality problems in the Province of B.C. are discussed. The existing legislation and policy, which is applicable in B.C. at the federal, provincial and municipal levels of government, are critically reviewed and other means of controlling water quality are indicated.

The critical analysis of the existing legislation and policy leads to the formulation of recommendations and conclusions as to the validity of the thesis hypothesis. These are documented in Chapter VI.

## V. SCOPE AND LIMITATIONS

Although this study uses the organization structure in water quality management in the Ruhr Valley, the United States, and Canada, for illustrative purposes, the scope of the study is confined primarily to the situation in the Province of British Columbia. The study scope has been restricted to this scale of consideration because of the limited amount of time and resources available. Only a small amount of information on the Ruhr Valley water quality controlling organizations has been written in English. Resources did not permit translation of the German manuscripts.

The extent of consideration of the situation in the Province of British Columbia consisted of a relatively detailed study of the aspects of legislation and policy which are applicable within the Province of British Columbia. There was neither sufficient time nor adequate personal qualifications to deal with the fine details of the pieces of legislation.

The sources of information utilized in this study include a broad spectrum of library material; personal interviews were conducted with newspaper personnel. Extensive

personal, informal, interviews were entertained by Provincial Government people on the Pollution-control Board, in the Health Department, in the Department of Recreation and Conservation dealing with fisheries, and in the Department of Municipal Affairs dealing with Regional Planning. Federal Government employees of the Department of Fisheries in Vancouver and of the Biological Research Station at Nanaimo, B.C., contributed information. A considerable amount of information was obtained by attending three conferences on water pollution held in Vancouver. Interviews were conducted with researchers within the B.C. Research Council and with employees of the B.C. Regional Office of the Central Mortgage and Housing Corporation in Vancouver. Some general information was obtained from mailed questionnaires which were conducted by Mr. Arnie Myers of the Vancouver Sun newspaper.

The organization and analysis of this extensive pool of information assisted the writer in obtaining a thorough knowledge of the strengths and weaknesses of the existing pollution-control organizations in the province as well as the physical problems which exist as a result of water pollution.

It was observed that many of the deficiencies existing as a result of overlap of the excessive number of controlling organizations could be eliminated by unifying the control of water quality management.

## VI. STUDY HYPOTHESIS

The hypothesis of this thesis is that adverse physical conditions resulting from water pollution, which impede satisfactory urban development, can be minimized by implementation of appropriate legislation and policy at the regional level.

Urban development is not feasible without an adequate supply of water which is suitable for human consumption. Urban areas which are dependent upon water-oriented industries or industries which use large amounts of water, as their economic base, cannot be expected to survive under a shortage of usable water. Urban inhabitants, particularly in the United States and Canada, utilize water resources extensively for recreational purposes. These and many other uses of water, upon which an urban area depends for satisfactory development, are greatly restricted by water pollution.

Polluted water, besides being unusable or permitting only limited use for domestic and industrial consumption, may be visually undesirable or create undesirable odours. There is no question that these factors would impede satisfactory urban development.

Water quality management programs must be exercised on a regional basis to ensure a maximization of beneficial uses of available water resources. The problem in planning such a program is to strike a reasonable balance in permitting conflicting uses without endangering those uses of higher priority. This can be accomplished only by implementation of

adequate legislation and policy.

## VII. SUMMARY

WATER QUALITY MANAGEMENT is coming to dominate the problem of planning for development and use of water resources in many parts of the United States. Moreover, it has become widely recognized that water quality is a problem which in most respects, can be best analyzed and dealt with on a regional basis.<sup>5</sup>

This problem is becoming prevalent in Canada as well, as levels of urbanization and industrialization approach those in the United States. The multiplicity of man's uses for water creates an ever-increasing demand on water resources. As demands for pure water increase the supplies are depleted by conflicting uses, such as the use for sewage waste assimilation.

The objectives of the study, definitions of water pollution and the general organization of the thesis are outlined in this Chapter.

The writer documents the need for conservation of the existing water resources in Chapter II by considering the cases of the Ruhr Valley, the United States and then Canada.

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<sup>5</sup>Allen V. Kneese, "Water Quality Management by Regional Authorities in the Ruhr Area," Papers and Proceedings of the Regional Science Association, Volume 11, 1963, pp. 229-230.

## CHAPTER II

### WATER RESOURCES: THE NEED FOR CONSERVATION

MAN AND HIS WORKS have created a pollution problem since time immemorial. The more gregarious he became, the more the problem pressed upon him. Until perhaps the last century, at least in the United States, the situation was not sufficiently acute to call forth concerted attack.<sup>1</sup>

It is evident from the findings of extensive research conducted, particularly in the United States, by such organizations as Resources for the Future, Incorporated, the United States Public Health Service and the American Water Works Association, that existing water resources are rapidly diminishing in utility for human consumption. The quantity of water, which is existing in the water resources of the world, is generally considered to be inexhaustible.<sup>2</sup> Thomas R. Camp, a consulting engineer who has done a considerable amount of work for the U.S. Public Health Service in the study of water quality, points out that the value of water is not realized because the supply is so plentiful.<sup>3</sup> The result

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<sup>1</sup>Abel Wolman, "Water Pollution Abatement: The Nature of the U.S. Problem," In Comparisons In Resource Management (Baltimore: The Johns Hopkins University Press for Resources for the Future, Inc., 1961), p. 137.

<sup>2</sup>Samuel S. Baxter, "Determination of Stream Use," Journal of the American Water Works Association, 56:10, October, 1964, p. 1285.

<sup>3</sup>Thomas R. Camp, Water and Its Impurities (New York: Reinhold Publishing Corporation, 1963), p. 1.

is that this basic resource has been increasingly abused by its utilization for waste disposal purposes.

Accompanied by increasing population growth and urbanization is an increasing rate of growth in industrial development. Both population growth and industrial development have placed a greater demand on existing water resources by the fact that there are increasing numbers of users. To add to this problem, domestic consumption has increased recently because of modern industrial society's higher standard of living, more bathing, dishwashers, and automatic washers. There is greater lawn area per user as a result of the trend to have larger lots and more grassed areas for each single-family dwelling.<sup>4</sup> For example, as is indicated in Figure 1<sup>5</sup>, page 16, average daily single-family dwelling residential water consumption in Wichita, Kansas, has increased considerably over the past three decades. Some of the various reasons given for this increased consumption are that as family incomes rise increased water usage can better be afforded, improved systems have brought about better quality and increased pressure, which leads to an increase in quantity used.

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<sup>4</sup>F.P. Linaweaver Jr., J.C. Geyer, and J.B. Wolff, "Progress Report on the Residential Water Use Research Project," Journal of the American Water Works Association, 56:9, September, 1964, p. 1121.

<sup>5</sup>Task Group, "Study of Domestic Water Use," Journal of the American Water Works Association, 50:11, November, 1958, p. 1411.

## IN WICHITA, KAN., 1924-55

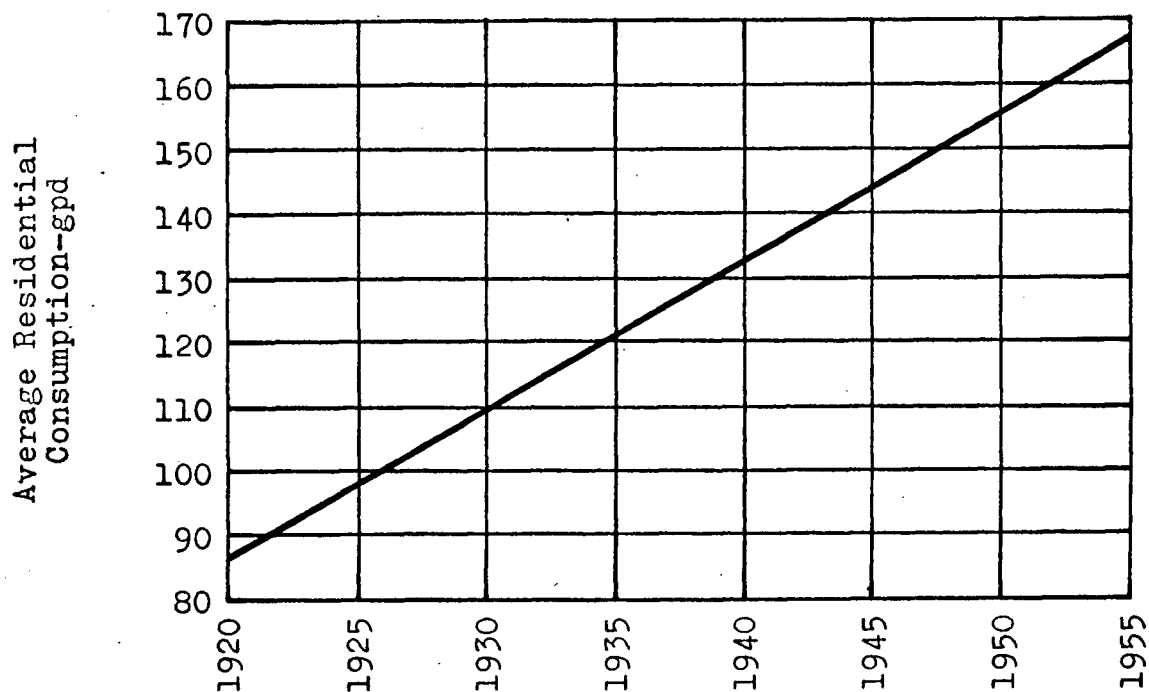


FIGURE 1

(SOURCE OF THESE TWO CURVES: Task Group Report, "Study of Domestic Water Use," Journal of the American Water Works Association, 50:11, November, 1958, pp. 1411-1412.)

## TRENDS IN RESIDENTIAL WATER SALES, 1939-56

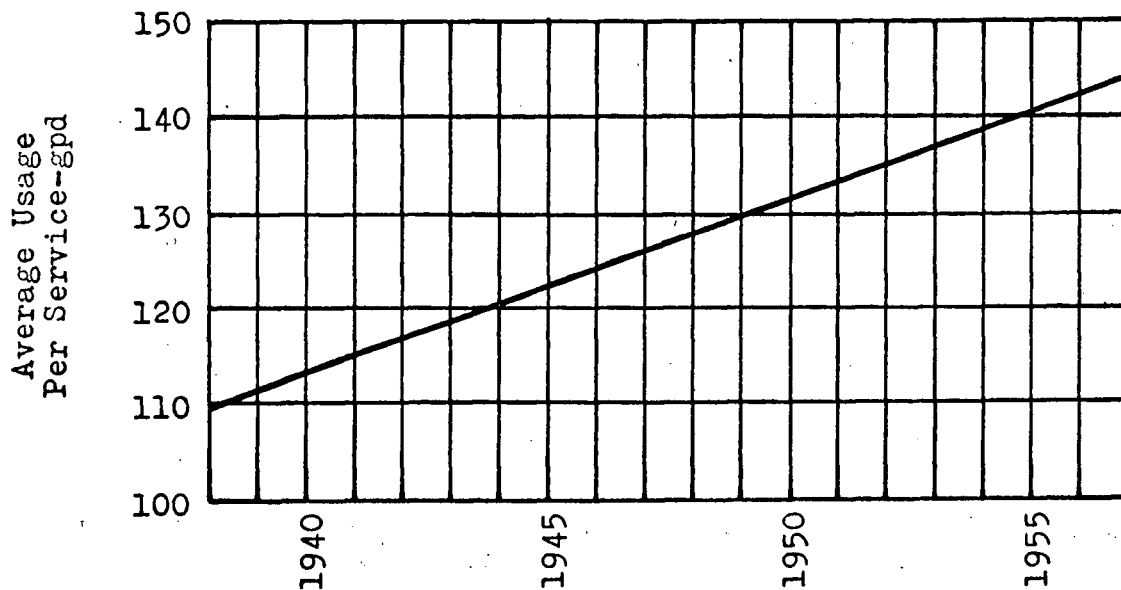


FIGURE 2

Figure 2<sup>6</sup>, page 16, portrays average single-family dwelling daily water consumption in the United States, based on data collected from 58 systems.

Industrial usage is increased because of the increased scale of operation and the greater demand for water in new processes. Water, besides being required legitimately in greater amounts, is being used wastefully particularly in regions of supposedly plentiful supply in the United States.<sup>7</sup>

### I. PROBLEM RECOGNITION: THE RUHR VALLEY

An historic example of recognition of the need for water quality management is the Ruhr Valley in West Germany. In this highly industrialized and heavily populated area seven large cooperative water resources associations called 'Genossenschaften' have been organized by special legislation in the period from 1904 to 1958.<sup>8</sup> These Associations, as indicated by Kneese:

. . . were given almost complete multipurpose authority over water quantity and quality in entire watersheds by their special laws . . . . They have for up to 50 years made comprehensive plans for waste disposal, water supply,

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<sup>6</sup>Ibid., p. 1412.

<sup>7</sup>Ibid., p. 128.

<sup>8</sup>Allen V. Kneese, "Water Quality Management By Regional Authorities in the Ruhr Area With Special Emphasis on the Role of Cost Assessment," Papers and Proceedings of the Regional Science Association, Vol. 11, 1963, pp. 234-236.

flood control, and land drainage (a problem of great significance in the coal mining areas).<sup>9</sup>

The area of the 'Genossenschaften' contains five important cities comprising a total population of some eight million people. It is one of the most concentrated industrial areas in the entire world and, to accentuate the problem, is contained on a land area of only 4,300 square miles.<sup>10</sup> This provided an average population density in 1960 of about 1,700 persons per square mile in the whole Ruhr area, as compared with an average of about 800 persons per square mile in Rhode Island and New Jersey.<sup>11</sup> This extensive population and industrial growth has placed an extreme demand on the limited water resources available in the Ruhr area. It has brought about the necessity for concerted effort in management of water resources to ensure survival and growth of the area.

Flowing through West Germany's most concentrated industrial region, the river remains clean enough for swimming and boating within the shadows of industrial smokestacks. This is all possible because of the efforts of a cooperative

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<sup>9</sup>Ibid.

<sup>10</sup>Ibid., pp. 236-237.

<sup>11</sup>Gordon M. Fair, "Pollution Abatement in the Ruhr District," Comparisons In Resource Management (Baltimore: The Johns Hopkins University Press for Resources for the Future, Inc., 1961), p. 144.

society of 250 municipalities with 2,200 industries along the river. The association operates on the principle that the costs of purification must be borne by the polluter. This has promoted the building of over 100 purification plants since 1948, and encourages members to clean up their own wastes.

Since the area is dependent upon a very low total volume of water flow, the efficiency of the operation must be very high. In this regard, far-reaching collective abatement measures and stream specialization are employed. Whereas the Ruhr and Lippe Rivers are generally used for recreation and municipal-industrial water supply, the Emscher is used exclusively for waste dilution, degradation, and transport. Despite these low priority uses there is a quality objective of avoidance of aesthetic nuisance.

## II. UNITED STATES WATER CONSERVATION STATUS

The problems arising from water pollution in the United States are becoming increasingly critical. It is estimated by Resources for the Future that the U.S. population, using medium rates of growth, will reach 244 million by 1980 and 329 million by the year 2000.<sup>12</sup> Wolman goes on to point out that "the pace of expenditures (for water quality control) must be stepped up, if the country is to

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<sup>12</sup> Wolman, op. cit., p. 138.

remove the backlog of the past 20 years and keep ahead of the urbanization and industrialization needs of the future decades."<sup>13</sup>

The United States Government is slowly beginning to recognize the long range significance of the inter-related problems which are inevitable unless positive action is taken to achieve effective water quality control. This is indicated by Kneese's reference to a report of the Senate Select Committee on National Water Resources, which he suggests "helps give perspective to the possible magnitude of the water quality management task in the various water resources regions."<sup>14</sup> The report points out that most areas in the United States have a sufficiently adequate supply of water for various projected uses. It goes on to point out that "presently dependable supplies are generally far from adequate to provide dilutions of projected future municipal and industrial waste discharge."<sup>15</sup> The Committee contends that to maintain comparatively clean streams might involve a national expenditure of an additional \$100 billion dollars by the year 2000. The increasing severity of the problem is acknowledged and there is recognition of the need for large

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<sup>13</sup> Ibid., p. 139.

<sup>14</sup> Kneese, op. cit., p. 230.

<sup>15</sup> Ibid.

scale programs in water resource management.

The U.S. federal government passed the "water Resources Planning Act of 1965" in an effort to coordinate the policies and programs of the various agencies of the three levels of government in the field of water resources. The three basic objectives of the Act are:

1. To facilitate coordination of federal policy at the Washington level,
2. To foster coordination of governmental activities bearing upon water resources management within individual river basins, and
3. To strengthen the planning activities at the state level of government.

The "Water Quality Act of 1965" was enacted to strengthen water quality management programs by providing major federal participation in water pollution abatement. Its basic provisions, as indicated by Professor R.O. Sylvester, are:

to establish a national policy regarding water pollution; to give major stature to the administration of water pollution control by the establishment of a Federal Water Pollution Control Administration; to increase grants for research, development and construction related to water pollution control; and to require the establishment of water quality standards in each state, either by state or federal action.<sup>16</sup>

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<sup>16</sup> University of British Columbia, 1965 Conference On Water Pollution Proceedings (University of British Columbia, Department of University Extensions, 1966), p. 7.

The enactment of these Acts is a major step forward in the protection of water resources in the United States.

### III. WATER QUALITY PROBLEMS IN CANADA

The extent to which problems arise due to water pollution in Canada, and more particularly British Columbia, is far less critical than in the United States because of the lag in population growth, urbanization and industrialization. Although this is the situation at present, it is evident that the experiences of other countries should be utilized so that action can be taken now to prevent the problems from occurring in the future.

Canada is developing very quickly and in the near future the levels of urbanization and industrialization may approximate those of the United States. A Report of the Rowell-Sirois Commission, published in 1940, described Canada as "one of the least self-sufficient countries in the world" because the country is not developed adequately to produce goods and services to provide for her own requirements.<sup>17</sup> Seventeen years later the Royal Commission on Canada's Economic Prospects recognized that this is no longer "an accurate description of the Canadian economy as it exists today."<sup>18</sup>

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<sup>17</sup>Government of Canada, Royal Commission on Canada's Economic Prospects - Final Report (Ottawa: Queen's Printer and Controller of Stationery, 1957), pp. 94-95.

<sup>18</sup>Ibid.

The post-war period brought an economic boom which has resulted in the necessary industrialization to make Canada relatively more industrialized. Along with this boom came tremendous growth in population and urbanization. The rapid rate of population growth and urbanization in Canada is indicated in Table 1<sup>19</sup>, with data taken from the Dominion Bureau of Statistics Census data. A graphical representation of comparative growth rates in Canada and British Columbia is presented in Figure 3, page 24.

URBAN GROWTH TRENDS IN CANADA & B.C.  
(Population in thousands.)

Year	Total		% Increase		Rural		Urban*		% Urban	
	Canada	B.C.	Can.	B.C.	Canada	B.C.	Canada	B.C.	Can.	B.C.
1901	5,371	178	34	121	3,350	88	2,022	90	38	50
11	7,207	393	22	34	3,934	189	3,273	204	45	52
21	8,788	525	18	32	4,436	277	4,352	248	50	47
31	10,377	695	11	18	4,805	300	5,572	395	54	57
41	11,507	817	22	43	5,254	374	6,252	443	54	54
51	14,009	1,165	30	40	5,381	372	8,628	793	62	68
61	18,238	1,629			5,538	447	12,700	1,182	69	73

\*Settlements of 1,000 or more population.

SOURCE: Dominion Bureau of Statistics, Canada Year Book (Ottawa: Queen's Printer and Controller of Stationery) 1916-p. 83; 1946-p. 111; 1956-p. 153; 1961-p. 1197.

TABLE 1

<sup>19</sup>Dominion Bureau of Statistics, Canada Year Book (Ottawa: Queen's Printer and Controller of Stationery) 1916-p. 83; 1946-p. 111; 1956-p. 153; 1961-p. 1197.

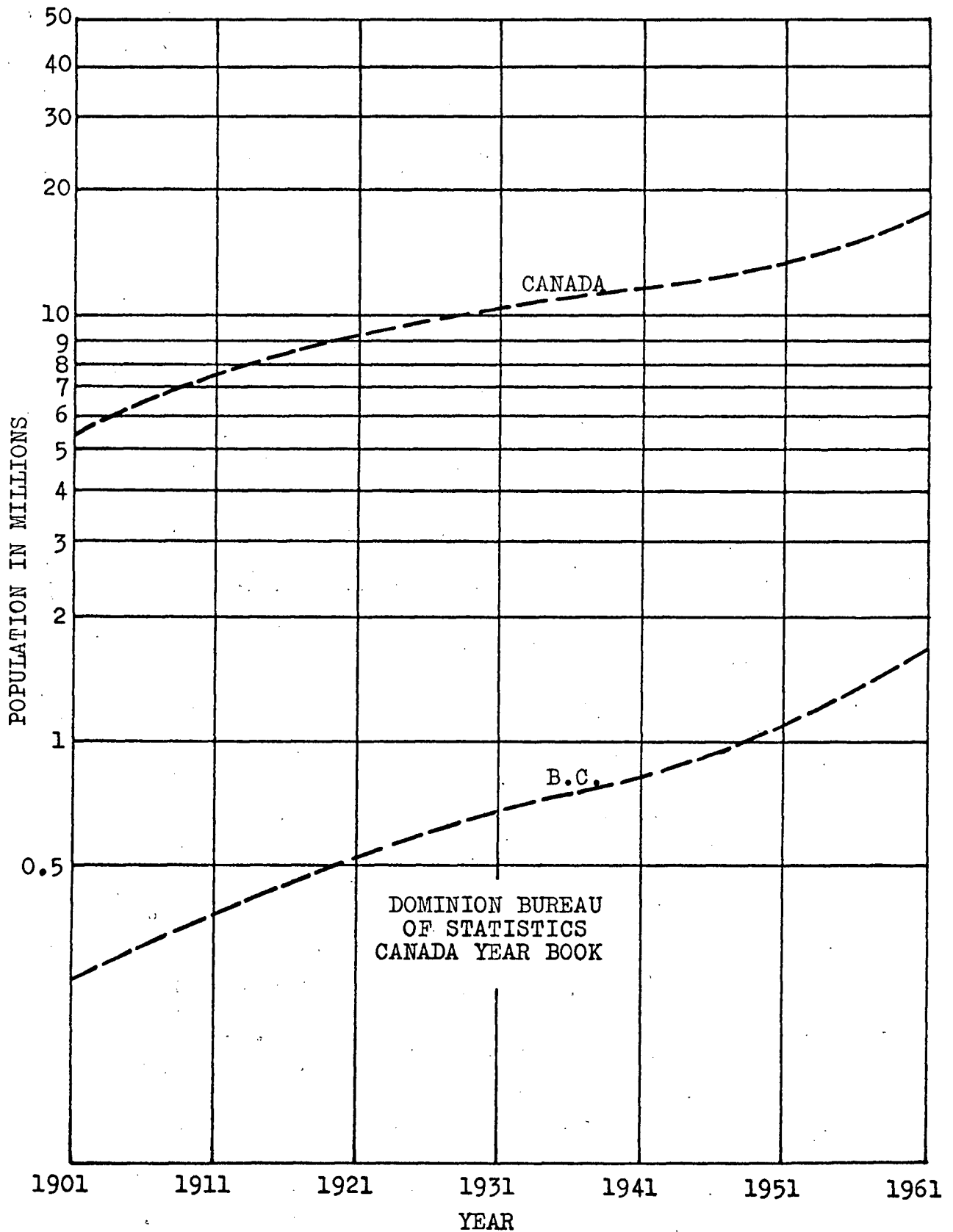
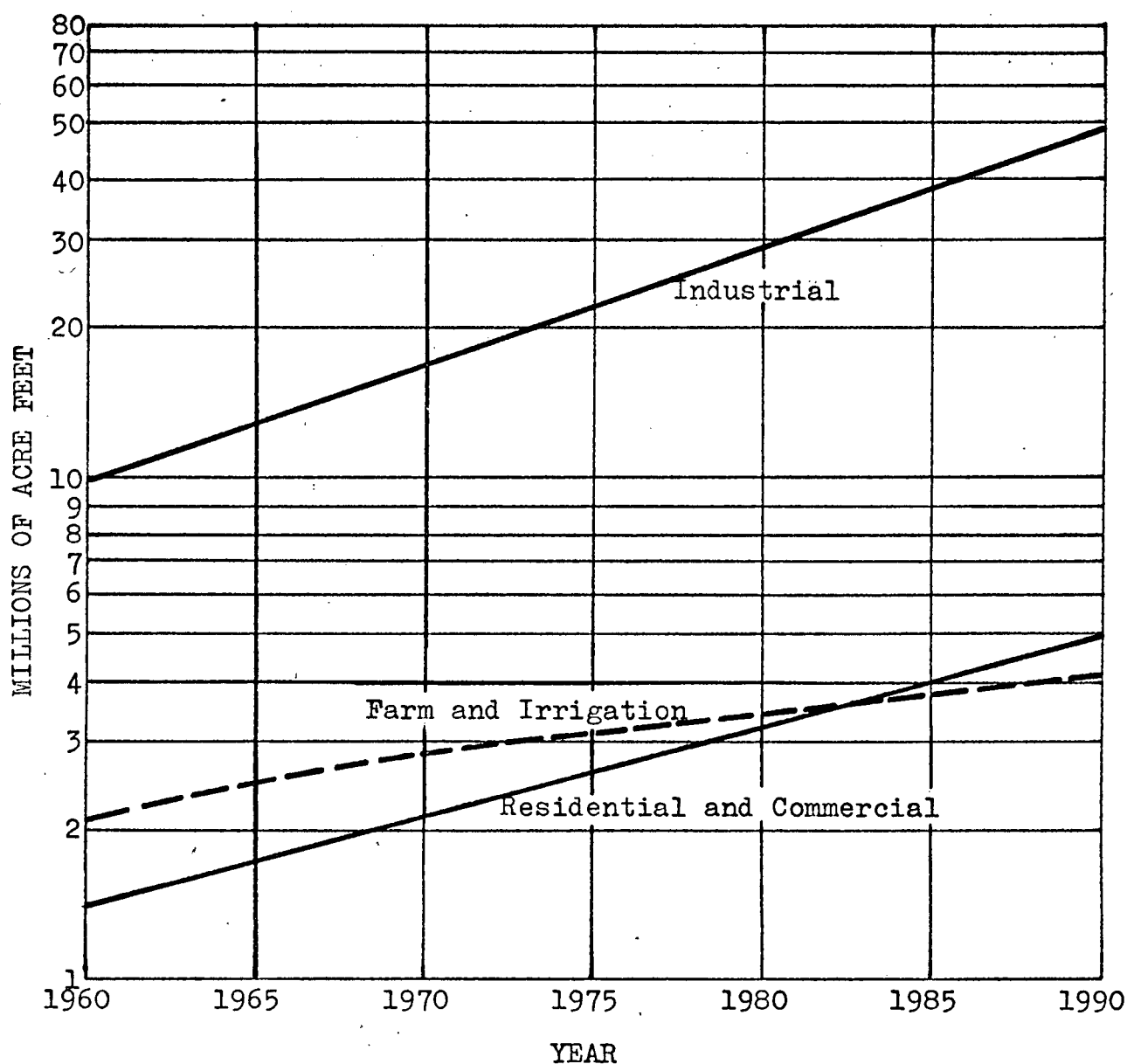


FIGURE 3

PROJECTION OF PRINCIPAL USES  
FOR WATER IN CANADA, 1960-1990



SOURCE: Ralph R. Kruegar, et. al. (ed.), Regional Resource Planning in Canada (Toronto: Holt, Rinehart and Winston of Canada, Limited, 1963), p.164

FIGURE 4

By means of population projections and a prediction of changes in the usage of water, future demands on the water resources can be determined. A projection of the principal uses for water in Canada has been made to the year 1990. It is reproduced in graphical form in Figure 4, page 25.

Canada is experiencing a growing economy, increasing population, urbanization and industrialization. "Resources for the Future" points out that:

THE CHIEF PRESENT-DAY PROBLEMS of water resources result from heavy demand and from conflicts in demand stimulated by a vigorous economy, expanding population, and widespread industrialization.<sup>20</sup>

The growing problems in Canada are evident from the experience of others, but the means of coping with the problems have been devised for remedial action. It should not be an insurmountable task for Canada to use these experiences to formulate preventive legislation and policy to bring about conservation of her vast water resources.

#### IV. SUMMARY

The rapidly expanding population and industrial growth, resulting in extensive urbanization, creates increasing demands on existing water resources. The problem of inadequate water resources is accentuated by the increased demand per capita because of a higher standard of living,

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<sup>20</sup>Water Resources (Washington, D.C.: Resources for the Future, Annual Report, 1964), p. 42.

automatic washers, dish washers, and increased lawn sprinkling, and the fact that so many new types of effluents are being created by modern industrial production.

These problems have been recognized in the Ruhr Valley, where water supply is very limited, and appropriate action has been taken. In the United States the problems are less critical but action is being taken in the forms of legislation of the "Water Resources Planning Act of 1965" and the "Water Quality Act of 1965" to insure against a critical condition.

As the rates of urbanization and industrialization increase in Canada, the possibilities of attaining a critical condition in our water resources increase unless appropriate action is taken now. Canada should utilize the experiences of other countries to formulate preventive legislation and policy to bring about conservation of her vast water resources.

The subjects of water uses, conflicts which occur among these uses, and the utility of the establishment of a priority of uses, will be dealt with in detail in Chapter III.

### CHAPTER III

#### THE RELATIONSHIPS BETWEEN WATER USAGE AND URBAN AND REGIONAL PLANNING

Water, one of the basic requirements of all forms of life, shares with air, the position of being the most important natural resource in the life of man, animals and plants. Thomas R. Camp points out that water is not only necessary for life, but is in fact a part of life itself, since the protoplasm of most living cells contains about 80 percent water, and he indicates that "Every activity of man involves some use of water."<sup>1</sup>

Since the beginning of time man has experienced increasing urbanization, and water has always been a major factor in the location and development of urbanized areas. Craine points out that since the beginning of time water has provided a multiplicity of services or amenities for urban existence and that the "recognition of these is fundamental to an understanding of the relationships between water management and urban planning."<sup>2</sup>

Within the great number of alternative uses of water by man, there are many areas of conflict. This situation

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<sup>1</sup>Thomas R. Camp, Water and Its Impurities (New York: Reinhold Publishing Corporation, 1963), p. 1.

<sup>2</sup>Lyle E. Craine, "Water Management And Urban Planning," American Journal of Public Health, Vol. 51, No. 3, p. 428.

results in the necessity for man to eliminate these conflicts by determining a hierarchy of uses of water and by permitting only specific uses for certain bodies of water, or by removing the conflicts by the use of some physical or chemical process by which the physical quality of the water is returned to its previous state.

### I. THE RANGE OF USES FOR WATER

Man's dependence upon water is best expressed by an indication of the multiplicity of services he obtains from this resource. He is dependent upon it primarily because, as Camp puts it, "the biochemical reactions that occur in the metabolism and growth of living cells involve water, and all of them take place in water, which has often been referred to as the universal solvent."<sup>3</sup> He requires water for domestic purposes principally for drinking and culinary needs. Other requirements within the category of domestic usage are for bathing, washing, laundering, heating and air conditioning, lawn sprinkling, and for the disposal of domestic sewage.

Man's chief concern has always been to obtain an adequate supply of clean water, for where there was water food could be grown. As the population grows in any area however, the need for food rises and as urbanization occurs, the area of food producing land decreases. This means that there is

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<sup>3</sup>Camp, op. cit., p. 1.

a requirement for a substantial increase in farm production or an increase in food imports to the area. Notwithstanding the possibility of importing food, the solution to this problem, at least for the time being, may be to increase the local production by the conversion of traditional dry farming methods to modern methods of irrigation.<sup>4</sup> This means of increasing production places great demands on the water resources. It is indicated in a report on Water Resources and Requirements of Western Canada that "Although the development of irrigation in our country has been hampered by the small market for specialized agricultural products, approximately three million acre feet (one acre foot of water is the volume of one foot of water over the area of one acre) of water is now being used annually (in Western Canada) for irrigation."<sup>5</sup> Another use of water in agricultural production is for livestock raising.

Industry places a considerable demand on the available water resources for processing and cooling. Some commonly accepted facts are that it takes 5 gallons of water to produce 1 gallon of milk, 10 gallons to produce a gallon of

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<sup>4</sup>The Ralph M. Parsons Company, North American Water And Power Alliance (Los Angeles: The Ralph M. Parsons Company, 1964), NEWS & VIEWS, pp. 2-3.

<sup>5</sup>J.W. McCaig and F.W. Patterson, "Water Resources and Requirements of Western Canada" (paper presented to The Canadian Institute of Mining & Metallurgy, Calgary, Alberta, October 26, 1965), p. 2.

gasoline, 65,000 gallons to produce 1 ton of steel, 70,000 gallons to make 1 ton of wood pulp and 600,000 gallons to manufacture 1 ton of synthetic rubber.<sup>6</sup> A conservation program including more careful control and the re-use of some of the water in these processes would result in a considerable reduction in this exceedingly large volume of usage.

The principal use of water in all provinces of Canada, with the exception of Prince Edward Island, is for the generation of hydro-electric power.<sup>7</sup> This is not to imply that this usage should receive first priority. The use of water in the production of electricity is applicable to the production of steam power as well as to the production of hydro-electric power.

Water constitutes the natural environment for the survival of vast populations of fish and thereby an adequate supply is necessary for the vitality of a large fishing industry. Besides supporting the commercial fishing industry water bodies also harbour fish for sport fishing.

Water navigation, one of the first modes of transportation, is an economical means of transportation at specific scales, and is dependent upon water for its function. As other means of transportation approach capacity, which is not

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<sup>6</sup>Ibid., p. 3.

<sup>7</sup>Ibid., p. 2.

outside the realm of possibility with the economic progress of the world today, this could become an important function. Since this use often involves the dumping of solid or liquid wastes, intentionally or unintentionally, it constitutes a threat to good water quality.

In addition to these areas of increasing water demand, the change in the societal structure of North America, with increased urbanization and industrialization bringing about a shorter work-week and higher per capita incomes, has created an even greater demand on water resources for recreational purposes. Wolman indicates that "Water resources play a tremendously important role in the recreational life of a nation."<sup>8</sup> Such recreational activities as swimming, sport fishing, water-skiing, sailing and motorboating have become an accepted part of the American way of life. Water is necessary for the propagation of wildlife, which in turn provides another means of recreation in the form of hunting. To some the propagation of wildlife may add to the pleasure of bird-watching.

Many people utilize bodies of water in a more abstract manner by deriving satisfaction from their aesthetic value as exemplified by Craine's description, "We would rather picnic by the water; and we view with envy the house (or cottage) on

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<sup>8</sup>Abel Wolman, Water Resources (Washington, D.C.: National Academy of Sciences-National Research Council, 1962), p. 8.

the banks of a stream . . .".<sup>9</sup> This is evidenced by the fact that properties having water frontage are always considerably higher in value than other properties of similar characteristics, but lacking that unique quality.

Abel Wolman sums up these last few points very aptly as follows:

Major interest in our society now turns to the protection of recreation, wildlife, and aesthetic values of streams, lakes and estuaries. Here the man in the street, uncluttered by scientific doubts and delayed research, clamors for visible cleanliness rather than invisible risk.<sup>10</sup>

With the absolute growth of population, with increased urbanization and with changing patterns of industrialization, the volume of man's domestic and industrial wastes has drastically increased. The safe disposal of these wastes has created a critical problem. Rivers, being the best natural agent for carrying and digesting these wastes, are used extensively for this purpose. The problem lies in the fact that after dilution of wastes reaches a certain point the water becomes unable to absorb further wastes by its natural self-purification process and this results in the formation of sulphur compounds, a diminishing of the dissolved oxygen,

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<sup>9</sup>Craine, op. cit., p. 428.

<sup>10</sup>Abel Wolman, "Water Pollution Abatement: The Nature of the U.S. Problem," Comparisons In Resource Management (Baltimore: The Johns Hopkins University Press for Resources for the Future, Inc., 1961), p. 139.

and the formation of ammonia, carbon dioxide and methane or marsh gas.

Man subjects water to a great variety of uses for his immediate convenience. This multiplicity of uses is summarized by Thomas R. Camp as follows:

Man uses water not only for drinking and culinary purposes but also for bathing, washing, laundering, heating and air-conditioning, for agriculture, stock, raising gardens, for industrial processes and cooling, for water power and steam power, for fire protection, for disposal of wastes, for swimming, boating and other recreational purposes, for fish and wildlife propagation, and for navigation.<sup>11</sup>

Since man has chosen to subject the water resources to such a range of varying uses, he has come to recognize that these uses are often conflicting.

## II. CONFLICTS WHICH EXIST AMONG POTENTIAL USES FOR WATER

Many of the uses for which man needs water are incompatible in that excessive use for one purpose may limit its use for another. Until recently, in most parts of the United States and Canada, the problem of incompatibility has been overlooked because of the availability of vast quantities of clean water.

Urban development is occurring at an ever-increasing rate. As urbanization increases, the demand for domestic

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<sup>11</sup>Camp, op. cit., p. 1.

water supply increases at a faster rate. With these realized increases there is an intensification of the domestic sewage disposal problem. The source of water supply is, in many cases, the receptacle of the sewage which is discharged. Uncontrolled discharge can result in a critical debasement in the water resource. Both of the uses are recognized as important and perhaps necessary for overall efficiency of operation. The incompatibility of these two uses is particularly recognized when one use becomes so intensive that the other use is not reasonably practical.

The need for increased farm production has involved the use of water in the adaptation of dry farming to irrigation methods. Also involved in the process of increased food production has been the adoption of the use of pesticides, weed-killer chemicals and fertilizers. These substances may find their way into the irrigation waters and back to the source of supply. Contamination of a water supply by these ingredients can be critical to the life of fish and perhaps even to human and animal life if the concentrations get too high. Besides this problem, the diversion of water for irrigation purposes can affect navigation by lowering the navigable depth, it may lower power potentials, it reduces the capacity of that water body for waste disposal dilution purposes, it may decrease recreational values, aesthetic values and result in a destruction of the fish and

wildlife environment.<sup>12</sup> Problems may also occur from resultant changes in ground water levels.

Industrial processes develop industrial wastes which are often highly toxic. The discharge of these wastes is generally into an active body of water such as a river or the tidewaters. The result may be debasement of that water course to the point where it may not be useful for such other uses as domestic supply, recreation, and fish propagation.

The production of hydro-electric and steam power results in temperature increases thus impairing the quality for alternative uses.

Water, which is to be used for the production of hydro-electric power must be relatively free of dissolved oxygen, because it is corrosive to metals. This freedom of dissolved oxygen is not conducive to aquatic life.<sup>13</sup>

It is evident from this review that, although each use of water, when considered on its own merits, appears to be justifiable, it may not be so legitimate from a comprehensive viewpoint.

Since man has decided to subject individual water bodies to a multiplicity of uses, each demanding a different

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<sup>12</sup>E.F. Renshaw, "Value of an Acre-foot of Water," Journal of the American Water Works Association, 50:3, March, 1958, p. 303.

<sup>13</sup>Camp, op. cit., p. 2.

degree of cleanliness, it would appear that he must cope with the problem of determining use priorities. On the other hand, he may prohibit those users, who debase the water, from lowering the quality below that required by the higher priority users.

### III. HIERARCHY OF PRIORITIES FOR WATER USAGE

The determination of priorities in the allocation of uses of water resources is an extremely complex process. The complexity arises primarily in the definition of the objectives of the system. The main difficulties originate in an attempt to evaluate such objectives as recreational uses or the more abstract use of pleasure derivation from the scenic view, which may be presented by the water resources. Since people are willing to pay to receive recreational or scenic view benefits, these services can perhaps be evaluated.<sup>14</sup> In order to obtain an accurate appraisal of the relative advantages and disadvantages of the alternative uses of water being considered, it is necessary to consider these and other social implications as well as the purely monetary values.

Water uses in order of decreasing water quality have been itemized as follows:<sup>15</sup>

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<sup>14</sup>Otto Eckstein, Water Resource Development: The Economics of Project Evaluation (Cambridge: Harvard University Press, 1958), p. 41.

<sup>15</sup>T.A.J. Leach, "Practical Problems of Water Pollution," Sixth B.C. Natural Resources Conference, 1953, p. 178.

1. Public water supply
2. Fish propagation
3. Recreation and bathing
4. Industrial water supply
5. Agricultural use
6. Water power
7. Navigation
8. Disposal of sewage and industrial wastes.

Leach points out that the required water quality is determined by the higher use, where more than one use is permitted. The problem becomes one of defining water quality, because it is possible that the quality of water required by the highest use listed may not be adequate for a lower use. For example, the highest priority use, namely public water supply, can tolerate a total salt content of up to 500 parts per million, whereas in a much lower usage, namely the production of steam power, a total salt content of not more than one part per million is permissible.<sup>16</sup> It may be stated that, according to the criterion that highest quality requirements should receive highest priority, usage for the production of steam power should be a higher use than that of domestic consumption. In an area where there are alternative sources or where import is feasible for public water supply, and where it is advantageous to produce steam power, this criterion

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<sup>16</sup>Camp, op. cit., p. 2.

may be applicable.

A means of determining the probable value of the various uses for the water resource is to consider the price which people are willing to pay for it. A priority ordering can be obtained by this means. This particular means of evaluation was undertaken by E.F. Renshaw in a consideration of the mean and maximum prices people would pay for the use of water in seven categories of uses. The data, which were extracted from a survey of 416 cities with populations of 10,000 and over in the United States,<sup>17</sup> are presented in Table 2, page 40.<sup>18</sup>

The list of use categories is not exhaustive in that there was no attempt made to assign monetary value to recreational and aesthetic attributes of water. The highest priority use, as can be observed from the classification in Table 2, is that of domestic usage. This is the only usage listed which it would be virtually impossible to live without, so it should naturally receive the highest priority.

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<sup>17</sup>H.F. Seidel, A.S. Johnson, and D.O. Decker, "A Statistical Analysis of Water Works Data for 1950," Journal of the American Water Works Association, 45:12, December, 1953, p. 1309.

<sup>18</sup>Renshaw, op. cit., p. 304.

VALUES OF WATER  
(Water Value in \$/acre foot<sup>\*</sup>)

CATEGORY	MEAN	MAXIMUM
Domestic	\$100.19	\$235.66
Industrial	40.73	163.35
Irrigation	1.67	27.04
Hydropower	0.71	5.90
Waste disposal	0.63	2.56
Inland navigation	0.05	1.17
Commercial fisheries	0.025	1.06

<sup>\*</sup>1 acre foot = 0.326 million gallons

SOURCE: E.F. Renshaw, "Value of an Acre-foot of Water,"  
Journal of the American Water Works Association,  
50:3, March, 1958, p. 304.

TABLE 2

This general classification, although it may be acceptable as a means of determining national priorities, is not necessarily applicable to every body of water or every locality. In a locality where there are several different sources of water, the most efficient allocation of uses may be to permit only certain uses in specific reaches of streams. Classification of priorities in this particular case may be according to a desirable degree of cleanliness by the highest priority user in that stream. This can only be treated as a general rule, because a specific aspect of water quality which may not be detrimental to the highest

priority user may be harmful to a lower priority user. The prime example in this regard is that of domestic usage versus usage for the production of steam power which was cited earlier. Another example is that, although the toxic effluents of industrial wastes may not be harmful to human consumption they may result in damage to the gills of fish.

A very sophisticated and relatively objective means of determining use priorities is by conducting a benefit-cost analysis of all uses of water within the study area. It should be pointed out that complete objectivity is impossible because of the necessity for placing a real value on such aspects as benefits received from recreation, fish, and wildlife. Hammond points out that "Their very intangibility, it might be argued, precludes them from being regarded as a return on investment."<sup>19</sup>

Problems arise in the application of this method of analysis in that the costs of treating a water supply, a process which is inevitable for all surface water, are not reduced in proportion to the costs of treatment upstream. This should not be taken to mean that the dumping of untreated sewage into a stream should be acceptable, because of the possible existence of water-borne disease germs such as

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<sup>19</sup>R.J. Hammond, Benefit Cost Analysis and Water-pollution Control (Stanford, California: Food Research Institute, Stanford University, 1960), p. 3.

typhoid fever, which is extremely difficult to eliminate from a water supply by treatment. The evaluator becomes extensively involved in estimation and speculation in determining the real value and the true costs of the tangible and intangible factors, and in consideration of the direct and secondary benefits. As R.J. Hammond so appropriately states ". . . defenders of the scheme must fall back on noneconomic justification, and say that it is good for its own sake . . . ." <sup>20</sup>

The U.S. federal government is moving in the direction of justifying water projects on the basis of benefits that are particularly difficult to evaluate, such as uses of water for recreation, municipal and industrial water supply. For example, as I.K. Fox and O.C. Herfindahl indicate, "benefits attributed to recreation, water supply, and pollution abatement were 27 percent of the total benefits of flood control projects authorized in 1962 (gross investment, \$2.6 billion) as compared with 3 percent for those authorized in 1950."<sup>21</sup> They go on to point out that more advanced procedures will have to be developed before monetary values can be assigned

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<sup>20</sup> Ibid., p. 59.

<sup>21</sup> I.K. Fox and O.C. Herfindahl, "Attainment of Efficiency in Satisfying Demands for Water Resources," American Economic Review, May, 1964, p. 204.

to some of these benefits with any assurance. Their general evaluation of the benefit-cost method of analysis is indicated by the following:

Benefit-cost evaluation practices could be improved in several respects. The change that would have the most significant effect would be the adoption of a more realistic interest rate. (The interest rate is indicated earlier in the article as being a low  $2 \frac{5}{8}$  percent.<sup>22</sup>) In addition, federal policy might more directly require evaluation of nonstructural alternatives to flood control and non-reservoir alternatives to quality improvement. If this were done and the evaluations reviewed by an independent audit unit, there would be greater assurance that proposed projects tended to maximize net benefits.<sup>23</sup>

The determination of use priorities is an essential part of water resource usage programing. It is necessary in order to determine the degree of cleanliness which will be maintained or strived for in the water body. The preservation of the desired water quality generally involves the minimizing of debasement from pollution.

#### IV. SUMMARY

Water is one of the basic requirements of all forms of life and as such the usage of the existing water resources must be planned in order that its use may be optimized. The diversity of domestic usage which man has for water ranges from use for drinking and culinary purposes, bathing, washing,

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<sup>22</sup> Ibid., p. 202.

<sup>23</sup> Ibid., p. 206.

laundrying, heating, air-conditioning, raising gardens, lawn sprinkling, to use for fire protection, and domestic sewage disposal. Industry uses water in its processes, for cooling, for the production of water and steam power, for navigation, and for industrial sewage disposal. Agricultural usage includes irrigation and water for livestock. Water is necessary for the propagation of fish and wildlife, and is widely used, particularly in western societies, for such recreational purposes as swimming and boating.

This wide variety of usage creates conflicts among the uses because an excessive use for one purpose may limit its use for another.

Increased rates of urbanization and industrial development have placed a great demand on the planning of water resources. Control of water quality may be imposed by setting effluent standards which users would be compelled to meet. The solution to the problem of water quality in the Ruhr Valley was resolved by the determination of use priorities and allocating specific uses to specific streams.

The objectives of society which are strived for in planning and water quality control are considered in Chapter IV.

## CHAPTER IV

### THE PLANNING OBJECTIVES OF WATER QUALITY CONTROL

The utilization of the human and physical resources which are available to man must be organized in order that their potential can be maximized. The verification as to whether or not the potentials of resources are being put to the best uses can be determined only by a comprehensive study of the objectives and value systems of the users of those resources.

#### I. THE PLANNING PROCESS

##### Planning Defined.

As long as human species has been in possession of a faculty for reasoning, man has sought to influence the course of events. Early he learned that foresight in the exercise of this power provided a means for achieving certain predetermined objectives. When man utilizes such a means-end mechanism, he is engaged in "planning."<sup>1</sup>

Planning may be undertaken at different levels of government in the performance of city planning, regional planning, resource planning, or national planning. Although planning has never been defined scientifically to form the basis of uniformity of practice, the concepts used in the

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<sup>1</sup>F. Stuart Chapin, Jr., "Foundations of Urban Planning," Urban Life and Form, Werner Z. Hirsch, editor (New York: Holt, Rinehart and Winston, Inc., 1963), p. 217.

definitions which are presented here are quite comparable.

Chapin has defined city planning as follows:

. . . city planning may be regarded as a means for systematically anticipating and achieving adjustment in the physical environment of a city consistent with social and economic trends and sound principles of civic design . . . . It is designed to fulfill local objectives of social, economic, and physical well-being, considering both immediate needs and those of the foreseeable future.<sup>2</sup>

The very general and all-inclusive objectives which can be extracted from these definitions are to provide social, economic, and physical well-being in the present and the foreseeable future. These general objectives are either stated directly or implied in all good definitions of planning.

John Friedmann, a regional scientist, considers the process at a larger scale, but defines it very similarly. He points out that, although a general theory of planning has not been established, there are commonly accepted elements which describe the nature of the planning process. The following quotation describes his concept of the planning process.

Primarily a way of thinking about social and economic problems, planning is oriented predominantly toward the future, is deeply concerned with the relation of goals to collective decisions, and strives for comprehensiveness in policy and program.<sup>3</sup>

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<sup>2</sup>F. Stuart Chapin, Jr., Urban Land Use Planning (Urbana: University of Illinois Press, 1965), Foreword, p. vi.

<sup>3</sup>J. Friedmann, "Regional Planning as a Field of Study," Regional Development and Planning - A Reader, J. Friedmann and W. Alonso, Editors, (Cambridge: The M.I.T. Press, 1965), p. 61.

A sincere effort toward comprehensiveness in a planning program, a concept which is advocated in this definition, is required to ensure that all vital interests are considered.

Davidoff and Reiner in "A Choice Theory of Planning" refer to planning as a set of procedures and define it as "the process for determining appropriate future action through a sequence of choices."<sup>4</sup> They point out that the use of the word 'determining' implies 'finding out' and 'assuring'. In other words, it is not considered sufficient to outline appropriate future action; the planner must be able to convince those for whom the planning is being done that the proposed action is in fact appropriate. The use of the word 'appropriate' implies that criteria are used in the selection between alternative programs of action. The selection process therefore involves the establishment of goals or general objectives for the planning unit. It is explained that 'action' suggests an "eventual outcome of planning efforts" which would entail the implementation of specific means to attain the desired ends.<sup>5</sup> A theory of planning must, therefore, be directed to problems of

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<sup>4</sup>P. Davidoff and T.A. Reiner, "A Choice Theory of Planning," Journal of the American Institute of Planners, Volume XXVIII, May, 1962, p. 103.

<sup>5</sup>Ibid.

effectuation.

Planning may be defined as the organization of activities and action programs, with specific objectives in mind, from a comprehensive viewpoint, to enhance the possibility of realizing desired goals. The process provides protection against uncoordinated efforts.

Planning is a specialized science dealing with the economic, social, and physical aspects of a planning unit, with particular concern for the effects of the environment on its inhabitants. Although the planner may not have the specialized skills of an economist, a political scientist, or a sociologist, he must be able to recognize the potential contribution of these professions in facilitating the planning process. The planning process becomes the planner's means and spatial organization his ends in the attainment of specified objectives. Chapin points out that there are differences as well as similarities between planning and the other fields mentioned. Three of the differentiating features are:

1. its multidisciplinary ties,
2. its innovational bias, and
3. its joint identification with the sciences and the arts.<sup>6</sup>

These features are necessary to maintain comprehensiveness in planning.

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<sup>6</sup>Chapin, "Foundations of Urban Planning," op. cit., pp. 218-223.

The Planning Process. Planning, which may be very broadly defined as systematization, can function adequately only within an organized administrative framework. This organized framework, which is referred to as the planning process, consists of the performance of a logical series of operations in the development and implementation of a plan.

In the development of a plan it is essential to become knowledgeable about the goals or objectives of the society for which the planning is being done. Another basic requirement is a knowledge of the existing social, economic, and physical conditions within the planning area. These factors can be determined through a well-executed program of research. Chapin refers to this part of the process as the "goal specification stage."<sup>7</sup> This component of the planning process is somewhat similarly titled "value formulation" by Davidoff and Reiner.<sup>8</sup> Within this component the planner will find himself dealing with facts as well as values, which, as Davidoff and Reiner point out, are closely related. The association is demonstrated by the following statements made by these authors:

1. Factual statements and their analysis invariably reflect the values of their markets; . . . .

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<sup>7</sup>Ibid., p. 224.

<sup>8</sup>Davidoff and Reiner, op. cit., p. 106.

2. Our personal experiences show that our values are colored by our understanding of facts.
3. We can make factual statements about values:  
    . . . . . Conversely,<sup>9</sup> one can make value assertions  
    about facts, . . . . .<sup>9</sup>

The planner must deal with both facts and values in his assessment of the present situation and purely with values in planning the environment for the future.

With a basic realization that the ultimate intention is the accomplishment of specified ends, the data which are collected must be analyzed in the light of alternative means of attaining these ends. Also inherent in the analysis of collected data is the establishment, through probability analysis, of the most desirable of value-oriented objectives. The investigation will inevitably include an analysis of existing social, economic, and physical conditions. Observations and/or conclusions of analysis should acquaint the planner with existing conditions within the planning area and should be an indicator of the wants, needs, and aspirations of the society comprised within that area.

The identification and measurement of existing conditions in the area, and a depiction of the wants, needs, and aspirations of the people is inadequate for the formation of the basis of a planning program. This wealth of information must be synthesized to arrive at the design of systems for

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<sup>9</sup>Ibid., p. 107.

the satisfaction of the selected goals and objectives. These three constituents of the planning process, namely analysis, synthesis, and design, are unified under the heading of "means identification" by Davidoff and Reiner.<sup>10</sup> They describe this as the conversion of ends into means. The conversion involves the identification of all possible alternatives to determine which means best satisfy the selected objectives. The relative title as ascribed by Chapin for this component of the process is the "decision-making stage."<sup>11</sup> Chapin describes this part as "the stage in which alternative courses of action for the fulfillment of goals are considered and evaluated, and a selection is made."<sup>12</sup> He goes on to indicate that this stage of the planning process involves:

1. consideration of all action alternatives within the framework of conditions that prevail and goals sought;
2. evaluation of the consequences following from the pursuit of each action alternative, including the change of conditions predicted and the extent of goal achievement anticipated; and
3. selection of the alternative that in the light of consequences and in consideration of goals is the most preferable course of action.<sup>13</sup>

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<sup>10</sup>Ibid., p. 111.

<sup>11</sup>Chapin, "Foundations of Urban Planning," op. cit., p. 224.

<sup>12</sup>Ibid., p. 229.

<sup>13</sup>Ibid., p. 230.

Having made the necessary decisions based on a selection from available alternatives and completing the design, that design must be implemented before goals and objectives can be realized. Since initial implementation may not produce the desired results, as may be the case where false assumptions have been made, a feedback and revaluation stage becomes necessary. Chapin refers to this component of the continuing process as "the post-decision making stages consisting of what we have termed the execution, evaluation, and reorientation stages of planning."<sup>14</sup>

These latter stages of the planning process, namely implementation, evaluation, and feedback, are collectively discussed under the heading of "effectuation" by Davidoff and Reiner.<sup>15</sup> They define this as the step in which the planner utilizes previously selected means in the attainment of goals adopted in the first stage. They present the question as to whether concern with effectuation of policy belongs in a theory of planning or whether planning should terminate with the identification of means leaving the administrators to carry out the programs. Contemporary administrative thought favours integration of policy and administration. Davidoff and Reiner pose for the planner "the role of an overseer, one

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<sup>14</sup>Ibid., p. 232.

<sup>15</sup>Davidoff and Reiner, op. cit., p. 113.

who aids policy makers by observing the direction programs are given and by suggesting means for redirecting these toward their intended goals.

This procedure, for the performance of a planning task, is a continuing process in the development of the planning area. The steps of this process may be summarized as follows:

1. Goal formulation,
2. Research and analysis,
3. Synthesis or programming,
4. Design,
5. Implementation,
6. Evaluation, and
7. Feedback.

Planning Purposes. Davidoff and Reiner break down the ultimate objectives of the planning operation into three classes, namely efficiency and rational action, market aid or replacement, and change or widening of choice.<sup>16</sup> Planning, because of its comprehensive nature, ensures an efficient allocation of resources. Rationality, too, may be said to be the result of the comprehensiveness of the planning process. As described by Davidoff and Reiner, efficiency and rationality are essential characteristics of planning in the selection

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<sup>16</sup> Ibid., pp. 105-106.

of the best of all alternatives considered.

Although the concept of a perfect market does not exist, the planner should consider the perfect allocation of goods and services, which would result from such a market system, in his evaluation of goals. Where an imperfect market system is accepted as a basic premise for planning, the planner's task, as indicated by these authors, may be to devise an appropriate system of pricing and distribution.

Where change is desired, the planning process has come to be recognized as the tool, within a democratic society, which can be used most efficiently to effectuate that change. It is the planner's role to utilize the planning process to determine and describe the range of choices which are available and to suggest the implications of these choices. This information is vital to the decision-maker.

Planning Objectives. The broad goals of planning, as stated in the previously documented definitions, are to attain social, economic, and physical well-being for the residents of the planning area. These goals may be refined to a variety of very specific objectives to satisfy particular needs and desires. These objectives will vary considerably from time to time and from place to place due to changing circumstances. A short term objective may be functionally quite different from a long term objective. The objectives of a metropolitan area would be of a different

scale from those of a region of which the metropolitan area is just a part.

Dahl and Lindblom define the "important prime goals of human beings in Western societies" as follows:

. . . existence or survival, physiological gratifications (through food, sex, sleep, and comfort), love and affection, respect, self-respect, power or control, skill, enlightenment, prestige, aesthetic satisfaction, excitement, novelty, and many others.

. . .

. . . seven instrumental goals are freedom, rationality, democracy, subjective equality, security, progress, and appropriate inclusion.<sup>17</sup>

These goals may be considered to be very basic and general but they constitute the framework for the goals of society. The planner must begin with these goals.

These objectives have been consolidated by the San Francisco Planning Agency in their Master Plan and condensed as follows by J. Delafons:

1. Improvement of the city as a place for living, by aiding in making it more healthful, safe, pleasant, and satisfying, . . . and by providing adequate open spaces and appropriate community facilities.
2. Improvement of the city as a place for commerce and industry by making it more efficient, orderly, and satisfactory for the production, exchange and distribution of goods and services, . . . .
3. Organization of the two principal functional parts of the city - the working areas and the community areas - . . . and so that the economic, social and cultural development of the city may be furthered.

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<sup>17</sup> R.A. Dahl and C.E. Lindblom, Politics, Economics, and Welfare (New York: Harper and Row Publishers, 1953), p. 28.

4. Protection, preservation, and enhancement of the economic, social, cultural and esthetic values that establish the desirable quality and unique character of the city.<sup>18</sup>

These goals and objectives are applicable at the regional level as well as at the community level with the difference being only in scale. Since a region is generally a much larger unit than even a metropolitan area, and in fact may even include metropolitan areas, the treatment of goals at the regional level is usually on a broader and more general basis. The ultimate goals in any case are the attainment of social, economic, and physical well-being.

## II. WATER QUALITY CONTROL

The Objectives of Water Quality Control. In the development of programs utilizing water resources it is essential that the regional planner consider the ultimate goals of society. One of the main factors which can defeat the planning purposes in a regional water resource program is the presence of water pollution. This is not to suggest that there should be an attempt to eliminate water pollution completely because that is not practical or even theoretically possible. It is, however, essential that it be controlled in

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<sup>18</sup>J. Delafons, Land-Use Controls in the United States (Cambridge: Joint Centre for Urban Studies of the Massachusetts Institute of Technology and Harvard University, 1962), Appendix p. i.

order that the goals and objectives of society, which must be employed in the establishment of a water quality management program, can be attained.

The following reiteration of water uses as quoted from Thomas R. Camp, in Chapter II, will establish a framework within which specific objectives can be discussed:

Man uses water not only for drinking and culinary purposes but also for bathing, washing, laundering, heating and air-conditioning, for agriculture, stock, raising gardens, for industrial processes and cooling, for water power and steam power, for fire protection, for disposal of wastes, for swimming, boating and other recreational purposes, for fish and wildlife propagation, and for navigation.<sup>19</sup>

A review of the multiplicity of uses presented will re-emphasize the conflicting uses which occur, and accentuate the problems which exist for the agency in charge of determining the goals and objectives of the society to be planned for.

When the usage of the water directly or indirectly involves domestic consumption such as in drinking, culinary usage, bathing, swimming, boating and other recreational purposes, the prime goal is to have water which will not endanger the public health. Dr. C.J.G. MacKenzie of the Department of Preventive Medicine at the University of British Columbia points out that "the most dreaded threats to health presented by water have been the water-borne

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<sup>19</sup>Thomas R. Camp, Water and Its Impurities (New York: Reinhold Publishing Corporation, 1963), p. 1.

diseases."<sup>20</sup> The most serious of these have been cholera and typhoid fever; there are as many as a dozen others. He indicates that water might also affect the health of the people because of the presence of dissolved chemicals or constituents. The health of people may also be affected by the lack of certain constituents such as iodine and fluoride. Objectives in this category of usage are that the water should exist in sufficient quantities and should not be objectionable to the senses of taste or smell, nor should it be discoloured. It should present, as Craine puts it, "living amenities",<sup>21</sup> by which he implies that it should provide a pleasant and attractive view.

In order that water can sustain fish and wildlife, it must be relatively free of pollution. The presence of toxic compounds in the water is harmful to the gill-system of fish and may result in destruction of the fish and wildlife population. The existence of a high concentration of compounds which result in depletion of the oxygen content of water can also destroy fish life. These factors have both economic and

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<sup>20</sup>Dr. C.J.G. MacKenzie, "Pollution Problems in British Columbia and the People's Health" 1965 Conference on Water Pollution Proceedings (University of British Columbia, Department of University Extension, February, 1966), p. 27.

<sup>21</sup>L.E. Craine, "Water Management and Urban Planning," American Journal of Public Health, Vol. 51, No. 3, March, 1961, p. 429.

social ramifications. The major economic factor could be that the fishing industry, which constitutes the economic base of certain areas, may be destroyed. The social ramification will be that recreation activities in the form of fishing and hunting will be reduced. The objectives in this application of the usage of water would be to have sufficient quantity of adequate quality to enhance the life of fish and wildlife in the interest of improved economic and social conditions.

A large quantity of comparatively clean water is required in the production of hydro-power. In the production of steam power the quality, particularly in respect to salt content, must be very high. The salt content must be less than one part per million. Since a considerable amount of power is required in industrial operations, in operating our trolley buses and in lighting our homes, it should be an objective to manage the quality of water resources to enhance the economic and social status of man.

The pollution of water generally originates from its users. These users consider that the use of water as a carrier and digester of their domestic and industrial wastes is a legitimate use. In the opinion of the writer this use is rightly considered a legitimate one as long as it does not unreasonably interfere with other beneficial uses. Unjustifiable interference exists when water for the highest priority use, namely domestic consumption, is rendered undrinkable.

Domestic wastes, when disposed of in large quantities in a body of water where the dilution factor is too low, deplete the oxygen content of the water which may result in the formation of ammonia, carbon dioxide, and methane or marsh gas. The shortage of oxygen and the gaseous formations will tend to kill fish or drive them away. Fish life may also be destroyed by the discharge of highly toxic effluents by industry.

The use of water for irrigation purposes often results in toxic pollution because spray pesticides find their way into the channels and eventually back to a main water course. Similarly the use of water for navigational purposes may result in pollution from oil losses or discharges. This results in a film of oil spreading over the water surface and preventing the replenishment of the needed oxygen, as well as creating an undesirable appearance.

It is evident that all of these uses are beneficial, but since they are also conflicting, management of the water resources at the regional level of government is of the utmost importance. The management program may consist of an attempt to arrive at an equitable use for all users concerned. This may be accomplished by assigning costs to all activities related to waste disposal with the intention of designing a program of pollution control to minimize these costs. Kneese points out that one of the difficulties in designing and operating such a system is that "certain values diminished or

destroyed by water pollution are exceedingly difficult to measure. Prominent among these are the value of aesthetic and recreational amenities."<sup>22</sup>

Stephen A. Marglin, in a general statement of objectives of water-resource development said: "The prime objective of public water-resource development is often stated as the maximization of national welfare."<sup>23</sup> Accepting this statement and recognizing the relationship between water quality management and water resource development, the prime objective of water quality management may also be stated as the maximization of national welfare.

. . . planning, if it is to fulfill its role, must be prepared to express and document . . . water service needs and priorities in terms of long-range goals. Water managers, if they are to perform with the vision our times demand of them, must participate in the planning process and be guided by the planning product in selecting the mixture of multiple services which the river can render.<sup>24</sup>

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<sup>22</sup> A.V. Kneese, "Water Quality Management by Regional Authorities in the Ruhr Area With Special Emphasis on the Role of Cost Assessment," Papers and Proceedings of the Regional Science Association, Vol. II, 1963, p. 233.

<sup>23</sup> Arthur Maass et al., Design of Water-Resource Systems (Cambridge: Harvard University Press, 1962), p. 17.

<sup>24</sup> Craine, op. cit., pp. 429-430.

### III. SUMMARY

Regional planning may be an effective means by which the problems resulting from water pollution to the public health, industry, and recreation can be controlled. Ideally the application of the regional or community planning process, depending upon the scale of the operation, in a comprehensive manner will enable the determination of a complete range of societal objectives, will lead to the analysis of existing conditions in the light of these objectives, and will permit the selection of the most desirable program for the attainment of the desired ends.

The ultimate goals or objectives of the public sector of society, as determined by a planning study, and as applied to water quality management, are the attainment of social, economic and physical well-being for that sector of society which is being planned for. As has been documented, these are also the general goals, as expressed by public interest, of society.

## CHAPTER V

### THE MEANS OF ACHIEVING WATER QUALITY CONTROL: A CASE STUDY OF THE PROVINCE OF BRITISH COLUMBIA

An extremely elaborate administrative framework for the control of water pollution has developed in the Province of British Columbia since its establishment as a Colony. This elaborate framework, in many cases, results in overlaps of jurisdiction among the agencies which have the power to control water pollution. This overlap may result in inactivity in the imposition of control by these agencies which may unduly rely on each other to exercise their powers.

#### I. OBJECTIVES OF THE CASE STUDY

The objective of the Case Study is to test the Study Hypothesis of this thesis, which is that:

Adverse physical conditions resulting from water pollution, which impede satisfactory urban development, can be minimized by implementation of appropriate legislation and policy at the regional level.

This is accomplished by reviewing the historical development of water quality control in British Columbia to establish the sources of existing legislation which are applicable, in this regard, today. A review of the water pollution problems which exist in British Columbia provides an indication of the relative effectiveness of existing legislation and policy for the control of water pollution in the Province.

A detailed analysis of the legislation and policy for the control of water quality, applicable in British Columbia, reveals deficiencies in the legal, administrative, and financial aspects of that legislation. An analysis of these deficiencies enables the writer to make recommendations to achieve a more effective means of controlling water quality.

As E.P. Partridge quoted from a primary source at an "Edgar Marburg Lecture," in 1957:

The most difficult problem of water resources development is the balancing of the interests, demands, and responsibilities of individuals, local groups, states, and the Federal Government.<sup>1</sup>

It is this balance which the writer seeks to create by the recommended legislative, administrative, and financial framework through which water quality may be more effectively controlled than is currently the case in British Columbia.

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<sup>1</sup> E.P. Partridge, Your Most Important Raw Material (Philadelphia: The American Society for Testing Materials, 1957), p. 11.

## II. HISTORICAL DEVELOPMENT OF WATER QUALITY

CONTROL IN BRITISH COLUMBIA<sup>2</sup>

Regulations for the control of water pollution in the Province of British Columbia date back to long before the area became a Colony. In British Columbia it is on record that among the Haida Indians the penalty for polluting a stream was death.<sup>3</sup> At the time of English occupation of the land, the English Common Law as it applied to the rights relating to the use of water, sometimes known as the law of riparian rights, was the law in force in the Colony.

H. Alan MacLean, Q.C., relates that:

Under the riparian law, every owner of real property bordering a stream has as an incident to his property in the riparian land, a proprietary right to have the water flow to him in its natural state in flow, quantity and quality, neither increased nor diminished, whether he has made use of it or not. He is entitled to make certain uses of the water while it is on his property.<sup>4</sup>

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<sup>2</sup>See M.J. Shelley, "A Critical Analysis Of The Water Legislation Of British Columbia" (unpublished Master's Thesis, in Business Administration, The University of British Columbia, Vancouver, 1957), Chapter IX, pp. 83-94. The basic organization of Shelley's Chapter IX was adopted for this study.

<sup>3</sup>P.R. Purcell, "Progress and Pollution," Transactions of the Sixth British Columbia Natural Resources Conference (Victoria: The British Columbia Natural Resources Conference, 1953), p. 163.

<sup>4</sup>H. Alan MacLean, Q.C., "Historical Development of Water Legislation in British Columbia," Transactions of the Eighth British Columbia Natural Resources Conference (Victoria: The British Columbia Natural Resources Conference, 1953), p. 243.

Within the year following the formal establishment of the Colony of British Columbia, regulations were being made providing for the orderly appropriation of water. These regulations partially replaced the law of riparian rights but no provisions were set out for the control of water quality.

In 1869 the first legislation respecting Public Health in the Colony of British Columbia was enacted. It was entitled "An Ordinance for Promoting the Public Health in the Colony of British Columbia."<sup>5</sup> Through the legislature, this Ordinance became "An Act for Promoting the Public Health" or the "Health Act." The powers bestowed upon the Lieutenant Governor in Council are outlined in the following quotations from the Act.

2. It shall be lawful for the Lieutenant Governor in Council, by any order duly made and passed, from time to time, and at any time, to mark out, define, and vary certain portions of the Province to be Health Districts, and to make and alter such rules, regulations, and by-laws as such Lieutenant Governor in Council may deem expedient, in respect to the following matters, that is to say:-

. . .

(b.) The duties and jurisdictions of the local Boards of Health, in all matters whatsoever in anywise relating to . . . epidemic, endemic, or contagious diseases or disorders, and for the summary abatement of any nuisance or injury to public health likely to arise therefrom:<sup>6</sup>

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<sup>5</sup>Health Ordinance, 1869, B.C. Ordinances 1868-1869.

<sup>6</sup>Health Act, Statutes of British Columbia, Consolidated Acts, 1888, Chapter 55.

The penalty, which may be imposed on anyone who wilfully obstructs any Health Officer or in any way commits any breach of any provision of the Act, shall consist of a fine not exceeding one hundred dollars for the first offence and not exceeding two hundred dollars for the second offence.<sup>7</sup>

Although these penalties are not comparable to those imposed by the Haida Indians they were quite substantial for that period of time.

The "Sanitary Regulations, 1892"<sup>8</sup> were established following threatened invasion of infectious and contagious diseases. The regulations provide means to enforce the enacted sanitary laws. These regulations were applicable to all areas within the Province with the exception of City Municipalities. Under these regulations it became mandatory for all wells which were in use to be cleaned out on or before the 15th of March and October of each year. Further, it was established that no 'privy-vault, cesspool, or reservoir' into which a 'privy, water-closet, stable, or sink' was drained could be constructed without prior approval of a duly qualified doctor. These and other related measures were enforceable by the Board of Health under the threat of a

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<sup>7</sup> Ibid., Section 8.

<sup>8</sup> Sanitary Regulations, 1892, Sessional Papers of the Province of British Columbia, 1893, pp. 265-268.

penalty not to exceed one hundred dollars for an offence.<sup>9</sup>

The "Health Act, 1893" instituted the "Provincial Board of Health," which was to consist of not more than five members, one of whom was to be the Secretary of the Board. The duties of the Board were to:

9. . . . take cognizance of the interests of health and life among people of the Province; . . . they shall make sanitary investigations and inquiries respecting causes of disease, and especially of epidemics; . . . they shall make such suggestions as to the prevention and interception of contagious and infectious diseases, . . .

12. . . . Provincial Board of Health may . . . issue such regulations as the Board deems necessary for the prevention, treatment, mitigation and suppression of disease . . . .<sup>10</sup>

This Act gave the Board the responsibility of inspecting and approving any plans relating to proposed public water supplies or sewerage systems.<sup>11</sup> The Board was also given the right to force municipal councils to appoint a Medical Health Officer.<sup>12</sup> The "Health Act, 1893," was very elaborate and comprehensive and hence has been adopted as the basis of British Columbia's present Health Act.

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<sup>9</sup> Ibid., Section 3(8).

<sup>10</sup> Health Act, 1893, Statutes of British Columbia, 1893, Chapter 15.

<sup>11</sup> Ibid., Section 27.

<sup>12</sup> Ibid., Section 28.

In 1896 the "Sanitary Regulations, 1892," were repealed by the "Sanitary Regulations, 1896"<sup>13</sup> upon recommendation by the Provincial Board of Health. Through the provisions of the "Health Act" and the "Health Act, 1893" the administrative details of the Local Boards of Health, the Health Officers, and the Sanitary Inspectors were specified.

These regulations were in force in all parts of British Columbia, except in City Municipalities, under the Local Board of Health. Clauses 4 to 8 and 41 to 51, all inclusive, were applicable with the imposition of further control being left to the discretion of the Provincial Board of Health. Since City Municipalities had a Local Board of Health, a Medical Officer and a Sanitary Inspector to impose the necessary control the general clauses of the 'Regulations' were not necessarily applicable.

The first legislation in British Columbia specifically designated for the control of pollution of streams was defined under these regulations. This legislation stated that:

45. No solid refuse or waste matter of any kind shall be deposited in any stream so as to obstruct its flow, or put into any stream or lake so as to pollute its waters, and no solid or liquid sewage matter from either public or private sewers shall be discharged into any stream or lake, but if it can be proved that the best means have been adopted to purify the sewage, etc., before it enters the stream or lake, no offence is committed, that is

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<sup>13</sup> Sanitary Regulations, 1896, Sessional Papers of the Province of British Columbia, 1898, pp. 1221-1233.

unless the Local Board has notified the offending parties that the means adopted are insufficient; nor shall any poisonous, noxious, or polluting liquid proceeding from any other source be passed into any stream or lake unless the best means have been first adopted to purify the same.<sup>14</sup>

Upon approval of the Provincial Board of Health or Medical Health Officer, sewage may be discharged in the sea. The provision for dumping of other material is outlined in the following quotation.

46. Any kind of waste material may be taken to sea and dumped not less than one mile from shore, and at such time and place that it will be carried out by the tide.<sup>15</sup>

Violation of any provisions of these regulations was punishable by a fine of one hundred dollars for each offence, with or without costs, or by imprisonment, with or without hard labour, for a term not exceeding six months, or by both fine and imprisonment, in the discretion of the convicting Court.<sup>16</sup>

In 1904 "An Act Respecting Sanitary Drainage Companies"<sup>17</sup> was passed providing the Provincial Board of Health

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<sup>14</sup> Ibid., Section 45.

<sup>15</sup> Ibid., Section 46.

<sup>16</sup> Ibid., Section 49.

<sup>17</sup> Sanitary Drainage Companies Act, 1904, Statutes of British Columbia, February 10, 1904, Chapter 16.

with the power to control the construction of sewerage systems as developed by sanitary drainage companies, by making Board of Health approval of such systems mandatory.

An attempt to control stream pollution in district municipalities was made by the enactment of the "Sewerage Act, 1910."<sup>18</sup> Under this Act, the Lieutenant Governor in Council was given the authority to establish Sewerage Districts upon petition from a representative number of property owners in the district. The Act enabled Commissioners of the District to insist upon proper plumbing and sewer connections.

This legislation, enabling the establishment of Sewerage Districts, led to the enactment of legislation in 1914<sup>19</sup> through which the Vancouver and Districts Joint Sewerage and Drainage Board was established. This Act provided the Board with Powers to construct, maintain, and operate sewers and drains within and without the sewerage district. By this provision, control of water pollution by sanitary sewage could be exercised within the immediate confines of the District; the District was dependent upon the control imposed by the "Sanitary Regulations, 1896" for the prevention of pollution of their waters from sources outside the

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<sup>18</sup>Sewerage Act, 1910, Statutes of British Columbia, March 10, 1910, Chapter 43.

<sup>19</sup>Vancouver and Districts Joint Sewerage and Drainage Act, Statutes of British Columbia, March, 1914, Chapter 79.

District.

In 1915 the "Health Act Amendment Act, 1915"<sup>20</sup> was enacted. The Provincial Board of Health obtained the power to control the quality of water in any water system by forcing any municipality, any person or corporate body to rectify any situation which created a menace to the public health. The regulation imposed to control the disposal of sewage was that:

25. No common sewer or system of sewerage shall be established or continued unless there is maintained in connection therewith a system of sewage purification and disposal which removes and avoids any menace to the public health . . . .<sup>21</sup>

The "Water Act, 1948"<sup>22</sup>, which has undergone many revisions since the original "Water Act, 1909," enables the control of water pollution by providing the Comptroller of Water Rights with the power to issue a stop order to a water licensee where the licensee is responsible for pollution which is detrimental to the use of the water by other licensees, or where it is detrimental to the public interest.<sup>23</sup>

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<sup>20</sup>Health Act Amendment Act, 1915, Statutes of British Columbia, 1915, Chapter 30.

<sup>21</sup>Ibid.

<sup>22</sup>Water Act, 1948, Statutes of British Columbia, 1948, Chapter 361.

<sup>23</sup>R. Bowering, "Pollution Control In British Columbia Today," Sixth B.C. Natural Resources Conference Proceedings (Victoria: The British Columbia Natural Resources Conference, 1953), p. 188.

The "Greater Vancouver Water District Act, 1924,"<sup>24</sup> has expanded its membership from three small areas in 1924 to its present membership of the City of Vancouver, the District of Burnaby, the City of New Westminster, the District of North Vancouver, the Township of Richmond, the District of West Vancouver, the District of Pitt Meadows, the District of Maple Ridge, the District of Coquitlam, the City of Port Coquitlam, the City of Port Moody, the District of Fraser Mills, the District of Surrey, and the District of Delta. The desired membership is one which includes all the municipalities within the Greater Vancouver area. (See Map 1, page 73A.)

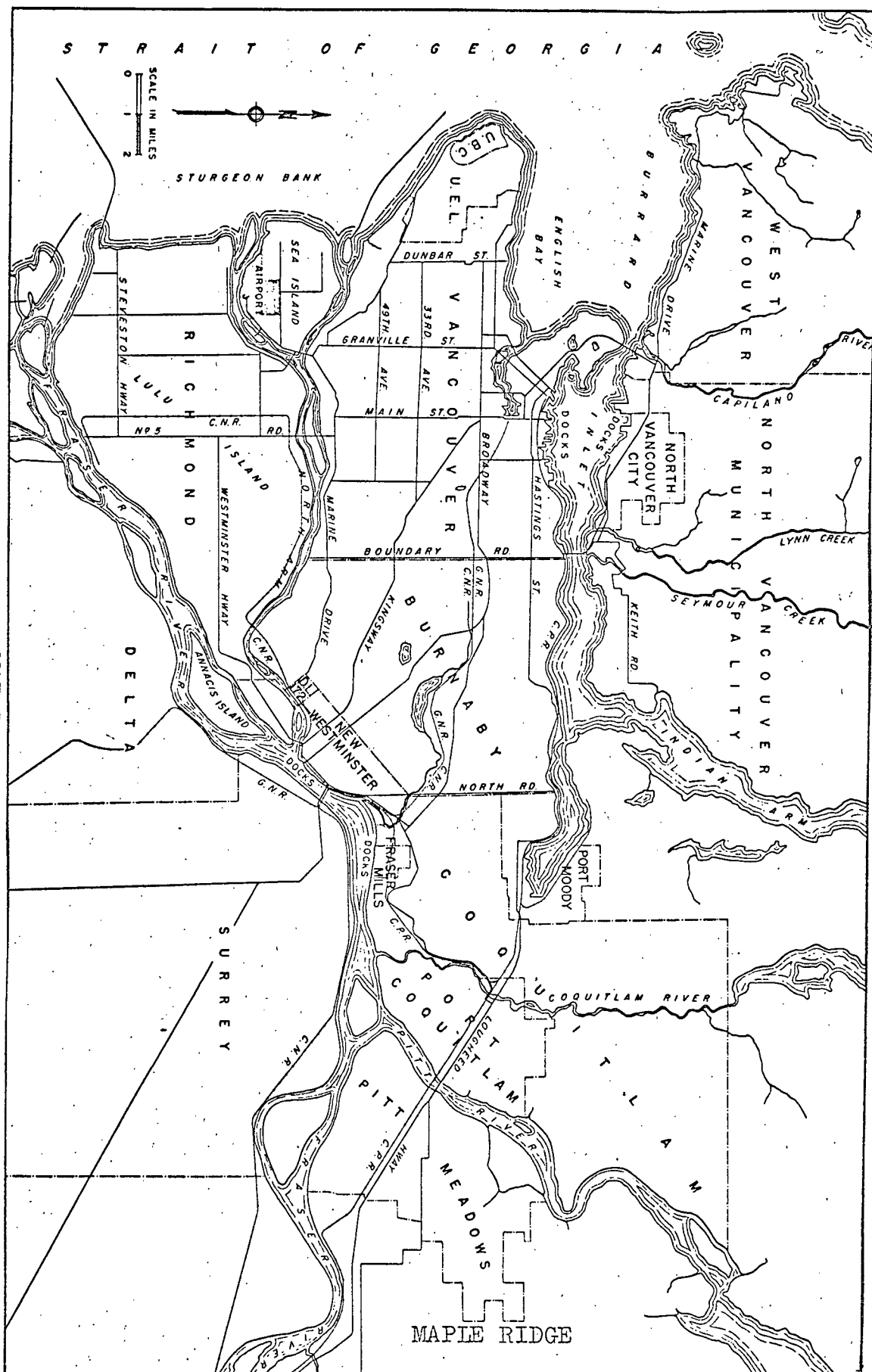
The section through which water quality is controlled states that:

88. If any person shall bathe the person, or wash or cleanse any cloth, wool, leather, skin of animals, or place any nuisance or offensive thing within or near the source of supply of such waterworks in any lake, river, pond source or fountain, or reservoir from which the water of said waterworks is obtained, or shall convey or cast, cause or throw, or put filth, dirt, dead carcasses, or other offensive or objectionable, injurious, or deleterious thing or things therein, or within the distance therefrom as above set out, or cause, permit, or suffer the water of any sink, sewer, or drain to run or be conveyed into the same or into any part of the system, or cause any other thing to be done whereby the water therein may be in anywise tainted or fouled or become contaminated, he shall be liable, on summary conviction, to a fine not exceeding fifty dollars, or to imprisonment for a period not

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<sup>24</sup>Greater Vancouver Water District Act, 1924, Statutes of British Columbia, 1924, Chapter 22.

# GREATER VANCOUVER AREA



MAP 1

exceeding thirty days, with or without hard labour, or to both fine and imprisonment.<sup>25</sup>

This legislation provides a very comprehensive means of control within the area of jurisdiction of the Act. This area is dependent upon other legislation for the control of pollution of water, which may flow from outside the area into water bodies within the area. One of the agencies which imposes such control is the Provincial Department of Health.

The "Vancouver and Districts Joint Sewerage and Drainage Act" was amended several times, with little change in legislation concerning water pollution, from its enactment in 1914 to 1956 when it was repealed by the "Greater Vancouver Sewerage and Drainage District Act."<sup>26</sup> This Act provides an indirect control of water pollution by enabling the Corporation to expropriate any land within or outside its area for the purpose of the construction and operation of sewerage and drainage facilities.

Membership in the Sewerage and Drainage District, at the time of incorporation, consisted of only the City of Vancouver, the District of Burnaby, and the University Endowment Lands. The membership has since increased to include the District of West Vancouver, the City and District of

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<sup>25</sup>Ibid., Section 88.

<sup>26</sup>Greater Vancouver Sewerage and Drainage District Act, 1956, Statutes of British Columbia, 1956, Chapter 59.

North Vancouver, the District of Coquitlam, the City of Port Moody, the Township of Richmond, and the District of Surrey. As in the case of the Greater Vancouver Water District, membership of all municipalities within the area would enable optimum water-pollution control in that area.

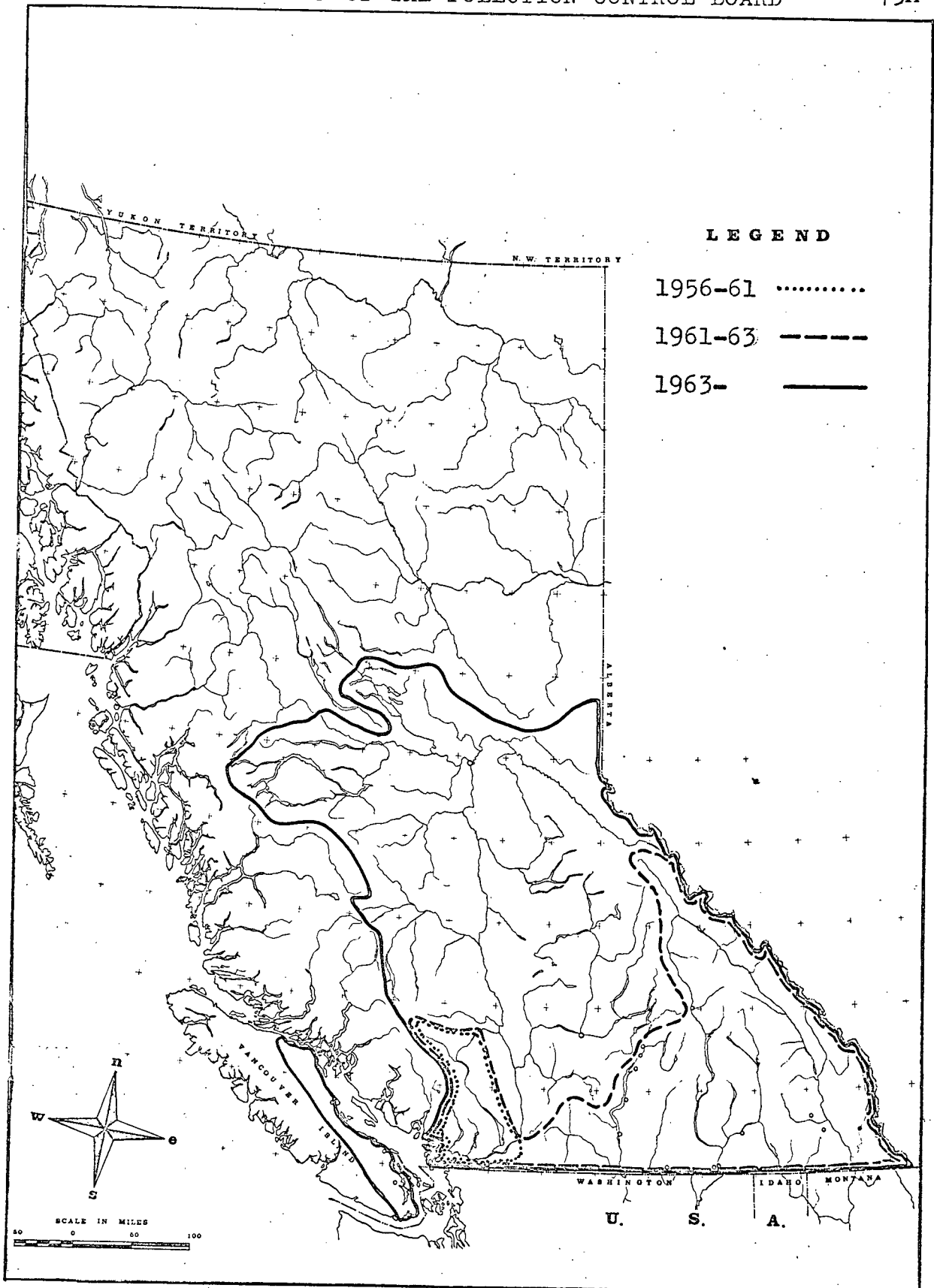
The most recent legislation in an attempt to control pollution of land as well as water, in the Province of British Columbia, is the "Pollution-control Act, 1956."<sup>27</sup> From the Pollution-control Board's formation in 1956 until 1961, the area of its jurisdiction was confined to the Lower Fraser Valley downstream of Hope, including all of the Greater Vancouver and Boundary Bay areas. In 1961, the territorial area under the authority of the Board was extended to include all of the Columbia River drainage basin which lies within the Province of British Columbia. Effective January 1, 1963, the jurisdiction of the Board was enlarged to include the entire Fraser River basin and most of the populated area of the East Coast of Vancouver Island. (See Map 2, page 75A).

The specific legislation by which water-pollution control is imposed through this Act is dealt with in detail in a later section of this chapter.

Other legislation which has been directly or indirectly

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<sup>27</sup>Pollution-control Act, 1956, Statutes of British Columbia, 1956, Chapter 36. The consolidation of this Act and related Regulations, amended to 1965, are reproduced in Appendix I.



MAP 2

instrumental in the control of some aspects of water pollution include the "Federal Fisheries Act" which originated in the latter quarter of the nineteenth century and is effective today, the "Migratory Birds Regulations Act," the National Harbours Board Bylaws, the "Navigable Waters Protection Act," the "Canada Shipping Act," the "National Housing Act - 1954, as Amended to 1960-61" and the "Municipal Act of the Province of British Columbia."<sup>28</sup> These statutes are considered in detail as they apply today, in a later section of this chapter.

Despite this vast range of means available to control water pollution, many problems still exist in British Columbia today.

### III. THE WATER QUALITY CONTROL PROBLEM IN B.C.

Most people in the Province of British Columbia are of the opinion, if they have an opinion, that there is no water pollution problem in this province. In an effort to verify this opinion or prove it false, Mr. T.A. Myers, Medical Reporter for the Vancouver Sun Daily Newspaper, conducted a mailed questionnaire survey in April, 1965, of every municipality in the Province. Of the 132 municipalities contacted, 93, or seventy percent, replied. Seventeen percent of the

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<sup>28</sup> R. Bowering, op. cit., p. 184.

municipalities which replied indicated that they feel they have a water pollution problem. Thirty-one percent of the respondents who indicate that they have a water pollution problem reported that the problem is created by both industrial and domestic wastes, thirty-eight percent attribute the problem to industrial effluents alone, and the remaining thirty-one percent indicate that the problem is caused by insufficiently treated domestic sewage.

Although the questionnaires served the purpose for which they were intended, they nevertheless contained subjective evaluations which tend to distort the meaning of the statistics. This problem cannot be avoided without the utilization of comparative standards and extensive physical and chemical analyses of water samples in the evaluation of the extent of pollution. These means of maintaining objectivity in evaluating the questionnaire results, could not be conducted within the scope of this study.

Examples of the subjectivity of some of the answers received are that, although there may not be any industrial or domestic waste treatment, the evaluator may indicate that there is no water pollution problem. Particular examples of this are that all of the municipalities except Vancouver within the Vancouver Metropolitan Area, Victoria, Comox, Port Alice, Ladysmith, Prince George, and Trail indicate that there is no water pollution problem, whereas, according to other sources such as the Departments of Public Health and

Fisheries, a water pollution problem actually does exist. There are undoubtedly other examples with which the writer is not familiar, but these few examples indicate where and how errors may have been introduced as a result of the inability of the author to use objective means of determining the degree of water pollution which may exist.

Water pollution problems which have resulted from untreated domestic sewage disposal are gradually being brought under closer control by the construction of more elaborate sewage treatment facilities. Table 3, page 79, indicates the trend, in this regard, for the period from 1953 to 1965.

Most B.C. municipalities do not employ secondary<sup>29</sup> treatment because their effluent is ultimately discharged into volumes of water which provide a large enough dilution factor to remove possibilities of pollution dangers to downstream users. Many of the improvements in treatment facilities are attributable to the adoption of legislation in 1960-61, through the National Housing Act, 1954, amended to 1960-61, under Part VI B, whereby loans are made available for municipal sewage treatment works.<sup>30</sup> The Central Mortgage

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<sup>29</sup>Primary treatment consists basically of the removal of gross solids from sewage whereas secondary treatment reduces the biochemical oxygen demand (B.O.D.) and the dissolved solids content of the sewage.

<sup>30</sup>Government of Canada, National Housing Act-1954, amended to 1964 (Ottawa: Queen's Printer and Controller of Stationery, 1964), Office Consolidation, pp. 41-43.

and Housing Corporation, which administers the National Housing Act, has a policy whereby all newly constructed houses must be connected to piped sewers, with certain exceptions being permitted to utilize septic tanks, in order to be eligible for NHA loan insurance.<sup>31</sup>

DEGREE OF DOMESTIC SEWAGE TREATMENT  
FOR B.C. MUNICIPALITIES

Degree of Treatment	% of B.C. Municipalities		% Change Based on 1953
	1953 <sup>*</sup>	1965 <sup>**</sup>	
None	74	28	Reduced 62
Primary	14	41	Increased 194
Secondary	12	31	Increased 156

SOURCES: <sup>\*</sup> Sixth British Columbia Natural Resources Conference (Victoria: The British Columbia Natural Resources Conference, 1953), p. 191.

<sup>\*\*</sup> C.J. Keenan, "Pollution Problems in British Columbia," Proceedings of 1965 Conference on Water Pollution (University of British Columbia, Department of University Extension, December 2 and 3, 1965), pp. 22-23.

TABLE 3

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<sup>31</sup>Information obtained by telephone conversation with A. Nauss, B.C. Regional Office of the Central Mortgage and Housing Corporation.

Increasing industrialization presents the problem of increased volumes of wastes which must be disposed of, and also the problem of dealing with new types of pollutants which are continually resulting from the adoption of new types of industrial processes. Most of the industrial organizations within the province are attempting to minimize water pollution problems by the utilization of modern treatment facilities.

Water pollution problems which may be detrimental to public health have always received prime consideration. Solutions to these problems have minimized the effects of water pollution. The incidence of typhoid and paratyphoid fever have been almost completely eliminated by the development and use of such bactericidal agents as chlorine. Table 4, page 81, indicates the incidence of diseases which have been reported in the Province of B.C. in the last half decade as a result of water contamination.

The Department of Public Health of the Province of B.C. is engaged in a continuing program of research with the objectives of locating the origin of water-borne diseases and attempting to eliminate the causes of water pollution through control measures.

The Pollution-control Act<sup>32</sup> was enacted in 1956 to set

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<sup>32</sup>Government of British Columbia, Pollution-control Act R.S.B.C. 1960, Chapter 289; 1963, Chapter 42; 1965, Chapter 37. (Victoria: Queen's Printer and Controller of Stationery, 1956).

up an agency whose purpose is to determine what constitutes a polluted condition of land, or water and to take the steps within its power to alleviate that problem. This agency, in conjunction with other agencies which have powers to control water pollution, has been successful in securing a reasonably low level of water pollution and minimizing its effects on public health, the fishing industry, on other industries using water, on recreation, and on aesthetic amenities created by the use of water in the Province of British Columbia.

SELECTED REPORTED DISEASES - BRITISH COLUMBIA  
(Number of Cases Reported 1961-1965)

Disease	1961	1962	1963	1964	1965 <sup>*</sup>
Infectious Hepatitis	1,677	1,889	1,736	1,030	916
Typhoid and Paratyphoid Fever	28	10	6	11	10
Streptococcus Infections	2,068	1,254	1,099	965	1,461
Venereal Disease (Syphilis and gonorrhea)	3,600	4,276	5,434	6,301	4,972

\* January 1 to October 29.

SOURCE: 1965 Conference on Water Pollution Proceedings  
(Department of University Extension, University of  
British Columbia, February, 1966), p. 34.

TABLE 4

#### IV. LEGISLATION AND POLICY FOR THE CONTROL OF WATER QUALITY IN B.C. TODAY

There is considerable existing legislation and policy at the federal, provincial, and local levels of government for the control of water pollution in British Columbia. Although the objectives of all the agencies which may impose control are generally similar, differences nevertheless do occur, such as between the "Health Act," the "Fisheries Act," and the "Migratory Birds Regulations Act." Whereas the "Health Act" has the prime objective of the prevention of nuisances and the protection of the public health, the "Fisheries Act" strives to prevent pollution that would harm commercial and sport fisheries resources, and the "Migratory Birds Regulations Act" provides for the protection particularly of migratory water-fowl.

##### Legislation and Policy at the Federal Level of Government

1. "Fisheries Act." The provisions which are applicable for the control of water pollution under this legislation states that:

33. (1) No one shall throw overboard ballast, coal ashes, stones, or other prejudicial or deleterious substances in any river harbour or roadstead, or in any water where fishing is carried on, or leave or deposit or cause to be thrown, left or deposited, upon the shore, beach or bank of any water or upon the beach between high and low water mark, remains or offal of fish, or of marine animals, or leave decayed or decaying fish in any net or other fishing apparatus; such remains or offal may be buried ashore, above high water mark.

(2) No person shall cause or knowingly permit to pass into, or put or knowingly permit to be put, lime, chemical substances or drugs, poisonous matter, dead or decaying fish, or remnants thereof, mill rubbish or sawdust or any other deleterious substance or thing, whether the same is of a like character to the substances named in this section or not, in any water frequented by fish, or that flows into such water, nor on ice over either such waters.

(3) No person engaged in logging, lumbering, land clearing or other operations, shall put or knowingly permit to be put, any slash, stumps or other debris into any water frequented by fish or that flows into such water, or on the ice over either such water, or at a place from which it is likely to be carried into either such water. 1932, c.42, s.33.<sup>33</sup>

The Governor in Council may make regulations to prevent or remedy the obstruction and pollution of streams and to forbid the destruction of fish or eggs of fish.<sup>34</sup> Control means which may be imposed for offences which are committed against section 33.(1) as documented above consist of, for each offence:

. . . a penalty not less than twenty dollars and costs and not more than one hundred dollars and costs, or to imprisonment for a term not exceeding two months; and every one so offending, whether master or servant, and the master or owner of any vessel or boat from which such ballast or offal, or other prejudicial substance is thrown, is liable to penalty and imprisonment as aforesaid for each offence. 1932, c.42, s.60.<sup>35</sup>

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<sup>33</sup> Fisheries Act, Revised Statutes of Canada, 1952, Chapter 119, Section 33.

<sup>34</sup> Ibid., Section 34.

<sup>35</sup> Ibid., Section 60.

Anyone who commits an offence against section 33.(2) as documented above:

. . . is liable, for the first offence, to a penalty of twenty dollars and costs, for the second offence, to a penalty of not less than forty dollars and costs, and not more than eighty dollars and costs, and also in addition thereto a further penalty of not less than ten dollars and not more than twenty dollars for every day during which such offence is continued; and for the third or any subsequent offence, to a penalty of not less than one hundred dollars and costs, and not more than two hundred dollars and costs, and also in addition thereto a further penalty not exceeding twenty dollars for every day during which such offence is continued. 1932, c.42, s.61.<sup>36</sup>

Consistent with the objective of the "Fisheries Act," water pollution that would harm commercial or sport fisheries resources could be effectively prevented by the strict enforcement of means of control which are available through this legislation.

As the jurisdictional management of fisheries in all waters in Canada is a Federal responsibility, as allocated by the B.N.A. Act of 1867, the administration and enforcement of regulations is also its responsibility unless officially transferred or agreed to by both governments. In British Columbia, the Federal Government administers and enforces regulations for all marine species and those which spawn in fresh water but live the majority of their lives in the sea. The Province has administrative responsibility only for

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<sup>36</sup> Ibid., Section 61.

non-tidal or fresh water fisheries. British Columbia also issues and administers oyster leases. In all instances the regulations under which management is carried out are Federally enacted.<sup>37</sup>

2. "Navigable Waters Protection Act." This Act prohibits the throwing of any sawdust, edgings, slabs, bark or rubbish of any description whatsoever into any river, stream or other water, any part of which is navigable or which flows into any navigable water.<sup>38</sup> Any person convicted of such an offence is liable, for a first offence, to:

. . . a penalty of not less than twenty dollars, and for each subsequent offence, to a penalty of not less than fifty dollars. R.S., c.140, s.28.<sup>39</sup>

Fishery officers are given the right to administer these sections of the act. These officers have the right to exercise all the powers conferred upon them for like purposes by the "Fisheries Act" in the enforcement of these provisions.<sup>40</sup>

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<sup>37</sup>R.G. McMynn, Report to the Special Committee on Fisheries Concerning the Jurisdictional Management of the Commercial Fisheries of British Columbia and the Major Problems Associated with the Management of the Resource (Victoria: Commercial Fisheries Branch, Department of Recreation and Conservation, March, 1965), pp. 21-33.

<sup>38</sup>Navigable Waters Protection Act, Revised Statutes of Canada, 1952, Chapter 193, Section 18.

<sup>39</sup>Ibid., Section 27.

<sup>40</sup>Ibid., Section 21.

3. "Canada Shipping Act." This Act, under the general administration of the Governor in Council provides for the making of regulations (a) to carry out and give effect to the provisions of The International Convention for the Prevention of Pollution of the Sea by Oil, 1954, (b) for regulating and preventing the pollution by oil from ships of any inland, minor or other waters of Canada; and (c) prescribing a fine not exceeding five hundred dollars or imprisonment not exceeding six months or both fine and imprisonment to be imposed upon summary conviction as a penalty for violation of a regulation made under this section.<sup>41</sup>

4. "National Harbours Board Bylaw." The Regulations governing the harbour of Vancouver were made under Bylaw by the National Harbours Board. Through the Bylaw control of water pollution is established by providing that:

Nothing shall be thrown, drained or discharged into the water, allowed to come in contact with the water, or deposited in the water within the limits of the harbour which may in any manner

. . .

(b) cause any nuisance or danger to health or endanger life or health;

Provided, however, that ballast or rubbish may be placed, left or disposed of at such places in the harbour as may be assigned by the Board.<sup>42</sup>

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<sup>41</sup>Canada Shipping Act, Statutes of Canada, 1956, Chapter 34, Section 25.

<sup>42</sup>R. Bowering, op. cit., p. 194.

The penalty for the violation of this bylaw consists of a fine not exceeding five hundred dollars or imprisonment for a period not exceeding sixty days or, in default of payment of a pecuniary penalty and of the costs of conviction, to imprisonment for a period not exceeding thirty days.<sup>43</sup>

5. "Migratory Birds Regulations Act." By this Act, it is made unlawful to place, cause to be placed or in any manner permit the flow or entrance of oil, oil wastes or substances harmful to migratory water-fowl into or upon water frequented by migratory water-fowl or waters flowing into such waters or on the ice covering either of such waters.<sup>44</sup>

Persons found guilty of committing an offence against this Act are liable to a fine of not more than three hundred dollars and not less than ten dollars or to imprisonment for a term not exceeding six months or to both fine and imprisonment.<sup>45</sup>

6. "Criminal Code." The "Criminal Code" makes a criminal offence of a "common nuisance" which causes physical injury to any person, or which endangers the lives, safety,

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<sup>43</sup>Ibid.

<sup>44</sup>Ibid., p. 193.

<sup>45</sup>Ibid., pp. 193-194.

or health of the public.<sup>46</sup>

7. "National Housing Act-1954, Amended to 1964." By the enactment of legislation under Part VI B of the "National Housing Act, 1954"<sup>47</sup> in 1960-61, loans are made available for the construction of municipal sewage treatment projects. The specific legislation indicating the purpose of this addition to the Act is documented below.

36F. (1) In order to assist in the elimination or prevention of water and soil pollution (Central Mortgage and Housing) Corporation may, with the approval of the Governor in Council, make a loan to any province, municipality or municipal sewerage corporation for the purpose of assisting in the construction or expansion of a sewage treatment project.<sup>48</sup>

Reference to a "sewage treatment project," for the purposes of this Act, means a project consisting of a trunk sewage collector system, a central treatment plant or both for the collection and treatment of sewage from one or more municipalities.<sup>49</sup> A loan may be made under this Act only if

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<sup>46</sup>N.E. Cooke, et. al. (ed.), Water Pollution Control - A Digest Of Legislation and Regulations in Force in Canada (Montreal: Canadian Industries Limited, May, 1965), p. F-2.

<sup>47</sup>National Housing Act-1954, Amended to 1964 Statutes of Canada, 1964-65, Chapter 15.

<sup>48</sup>Ibid., Section 13, 36F. (1).

<sup>49</sup>National Housing Act-1954, Amended to 1961, Office Consolidation, Chapter 23, Part VI B, Section 36E(b).

satisfactory evidence of the need for a sewage treatment project to eliminate or prevent water or soil pollution is presented to the Corporation.

This Act is administered by the Central Mortgage and Housing Corporation which is an agency of the Federal Government of Canada. Since the matters being dealt with are of a local nature they fall under the jurisdiction of the Provincial Government so action by the Corporation is taken only upon consent of the Provincial Government at the request of the municipality.

Financing of sewage treatment projects under this Act is assisted through loans made available out of the Consolidated Revenue Fund by the Minister.<sup>50</sup> A loan made under this Section may not exceed two-thirds of the cost of the project. It will bear an interest rate as prescribed by the Governor in Council and have maximum amortization period of the useful life of the project or fifty years whichever is the least.<sup>51</sup> The loans must be secured by debentures issued by the borrower or by other security which is acceptable to the Corporation and be repaid including principal and interest as established by the Corporation in payments not less frequent than

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<sup>50</sup>Ibid., Section 36H.

<sup>51</sup>Ibid., Section 36F (2) (a), (b) and (c).

annually.<sup>52</sup> Reductions in indebtedness are applicable if the project is completed prior to specified dates. The present legislation permits a forgiveness of 25% of the principal plus 25% of the accrued interest if the project is completed before March 31, 1967. Where a project is not completed by that date the borrower is eligible for 25% of the principal received and interest accrued as of March 31, 1967.

Provincial Legislation for the Control of Water Pollution  
in British Columbia

1. "Health Act." The legislation by which water pollution may be controlled through this Act gives the Lieutenant-Governor in Council the right to:

. . . make and issue such general rules, orders, and regulations as he deems necessary for the prevention, treatment, mitigation, and suppression of disease . . . and the Lieutenant-Governor in Council may by the rules, orders, and regulations provide for and regulate

. . .

(r) the prevention of the pollution, defilement, discoloration, or fouling of all lakes, streams, pools, springs, and waters;<sup>53</sup>

. . .

113. A person who violates . . . provision of this Act is, unless it is otherwise specifically provided, liable for every such offence to a penalty not exceeding one hundred dollars, or to imprisonment, with or without hard

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<sup>52</sup>National Housing Act, op. cit., Section 14.

<sup>53</sup>Health Act, Revised Statutes of British Columbia, 1960, Chapter 170, Section 6.

labour, for a term not exceeding six months, or to both fine and imprisonment, in the discretion of the convicting Justice. R.S. 1948, c.141, s.114.<sup>54</sup>

This Act is administered under the Provincial Department of Health Services and Hospital Insurance by the Provincial Health Officer with the assistance of Local Boards of Health, and Health Officers within the Province.<sup>55</sup>

2. "Water Act." It is an offence under this Act to put into any stream any sawdust, timber, tailings, gravel, refuse, carcass, or other thing or substance after having been ordered by the Engineer or Water Recorder not to do so. The penalty for such an offence is a fine not to exceed two hundred and fifty dollars and, in default of payment, to imprisonment not exceeding twelve months.<sup>56</sup>

This Act is administered by the Comptroller of Water Rights in the Department of Lands, Forests, and Water Resources.

3. "Pollution-control Act."<sup>57</sup> This Act was assented

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<sup>54</sup>Ibid., Section 113.

<sup>55</sup>Ibid., Section 4.

<sup>56</sup>Water Act, Revised Statutes of British Columbia, 1960, Chapter 405, Section 41(k).

<sup>57</sup>Pollution-control Act, Revised Statutes of British Columbia, 1960, Chapter 289; 1963, Chapter 42; 1965, Chapter 37. See Appendix 1.

to originally on March 2, 1956 and was revised in 1960, 1963 and 1965. The purpose of the Act is given in the preamble of this Act which states that:

Whereas it is deemed in the public interest to maintain and ensure the purity of all waters of the Province consistent with public health and the public enjoyment thereof, the propagation and protection of wildlife, birds, game and other aquatic life, and the industrial development of the Province:

And where it is deemed expedient to require the use of all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the Province:

Now, therefore, Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of British Columbia, enacts as follows:<sup>58</sup>

Under the Act, 'pollution' is defined as:

. . . anything done, or any result or condition existing, created, or likely to be created, affecting land or water which, in the opinion of the Board, is detrimental to health, sanitation, or the public interest;<sup>59</sup>

The discharge of sewage or other waste materials into the waters of the area or areas within the jurisdiction of the Board is prohibited unless a permit for such an operation has been obtained from the Board.<sup>60</sup>

The jurisdiction of the Board includes all of the Columbia River basin which lies within the Province of

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<sup>58</sup>Pollution-control Act, Statutes of British Columbia, 1956, Chapter 36.

<sup>59</sup>Pollution-control Act, op. cit., Section 2.

<sup>60</sup>Ibid., Section 7.(1).

British Columbia, the entire Fraser River basin, and most of the populated area of the East Coast of Vancouver Island. Although this includes only about 40 percent of the area within the Province it does contain about 95 percent of the population in the Province.

The Board may:

. . . classify operations according to the type of sewage or waste materials being discharged or proposed to be discharged, or by the type of treatment proposed or undertaken, or by the volume of the discharge or proposed discharge, or any combination of these, and may, with the approval of the Lieutenant-Governor in Council, exempt any class or classes of operation so defined from the provisions of this Act, and may make such exemptions applicable to a specific area or areas under the jurisdiction of the Board. 1963, c.42, s.17.<sup>61</sup>

The Pollution-control Board operates under terms of reference which should be more specifically defined by the Provincial Cabinet. Their prime function to date is the issuance of permits for the effluent of waste materials into water courses within their jurisdiction. Membership on the Board consists of the Deputy Minister of Lands, Forests, and Water Resources, who is the Chairman representing Water Resources, the Executive Engineer, representing the Health Department, a representative of Commercial Fisheries, and representation from Forest Services. It is hoped that the membership can soon be increased to include the Mines Department and the Department of Agriculture to get general

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<sup>61</sup>Ibid., Section 7A.

representation on the Board. Until representation is broadened it will be very difficult for the Board to function in the capacity for which it was intended.

The policy of the Board has been to consider each application for a permit to discharge wastes on its own merits rather than having rigid stream standards or established effluent standards to which users should conform. It will be necessary to adopt stricter policy as the Board functions and as the Province grows.

The administration of this Act is the responsibility of the Minister of Lands, Forests, and Water Resources.<sup>62</sup> Under the Minister, the Pollution-control Board, whose members are appointed by the Lieutenant-Governor in Council, effectuates the legislation and policy. The Board has the following powers and duties:

- (a) To determine what qualities and properties of water shall constitute a polluted condition:
- (b) To prescribe standards regarding the quality and character of the effluent which may be discharged into any of the waters within the area or areas under the jurisdiction of the Board:
- (c) To conduct tests and surveys to determine the extent of pollution of any waters within the area or areas under the jurisdiction of the Board:
- (d) To examine into all existing or proposed means for the disposal of sewage or other waste materials, or both, and to approve the plans and specifications for such works as are deemed necessary to

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<sup>62</sup>Ibid., Section 11.

prevent pollution of the waters of the area or areas:

- (e) To notify all persons who discharge effluent into the said waters when the effluent fails to meet the prescribed standards:
- (f) To order any person to increase the degree of treatment of the effluent or to alter the manner or point of discharge of the effluent being discharged by such person to bring the effluent up to the prescribed standards:
- (g) To order any person who fails to comply with an order issued under clause (f) to cease discharging effluent into any waters in the area as and from a day and time specified in the order:
- (h) To appoint such advisory or technical committees from time to time as may be deemed necessary to inform the Board with regard to whatever matters may be referred by the Board. 1956, c.36, s.4; 1965, c.37, s.3.<sup>63</sup>

The Lieutenant-Governor in Council may make regulations which are deemed necessary and advisable.<sup>64</sup> To date these regulations deal only with matters concerning the acquisition of permits under the Act, and specify waste effluent classifications.

The penalty for an offence against any provisions of this Act consists of a fine not exceeding two hundred and fifty dollars and, in default of payment, to imprisonment for a term not exceeding twelve months.<sup>65</sup>

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<sup>63</sup>Ibid., Section 4.

<sup>64</sup>Ibid., Section 20.

<sup>65</sup>Ibid., Section 5.

Expenses which may be incurred in the administration of this Act or for the carrying-out of the provisions of this Act shall, in the absence of any vote of the Legislative Assembly, be paid out of the Consolidated Revenue Fund.<sup>66</sup>

### Means of Control at the Municipal Level

Municipalities may ensure that water pollution is controlled by the application of legislation which is available to them through the Federal and Provincial Governments. An example of this external means of control is the application of legislation available under the "Health Act" through the local Medical Health Officer. There are internal means of control as well.

1. "Municipal Act."<sup>67</sup> Indirect means of control are available under section 525 of this Act. It is an offence to obstruct or fill up any ditch, drain, creek, or watercourse. The penalty for commitment of such an offence is a fine not exceeding two hundred dollars.

Under section 714(b) the Council may, for the health, safety, and protection of persons and property, regulate the installation, alteration, or repair of plumbing (including

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<sup>66</sup>Ibid., Section 10.

<sup>67</sup>Municipal Act, Revised Statutes of British Columbia, 1960, Chapter 255; 1961, Chapter 43; 1962, Chapters 36, 41; 1963, Chapter 42; 1964, Chapter 33.

septic tanks and sewer connections).

Section 870(g) makes provision for the Council, by by-law, to prohibit persons from causing or permitting water, rubbish, or noxious, offensive, or unwholesome matter or substance to collect or accumulate around their premises, which in this case may be construed to be the municipality. The Council may also, according to subsection (j), by by-law, require manufacturers and processors to dispose of the waste from their plants in a manner directed by the by-law. Provision is made in section (o) to control bathing in any public waters in or near any municipality.

All types of drainage systems within a municipality are classified as property of that municipality. As such the municipalities may impose control on anyone who uses these facilities.

A particular case exists in the Vancouver area, in which there is an attempt to establish Water Districts, and Sewerage and Drainage Districts so that various aspects of water and sewerage works may be controlled. These Districts are formed through legislation of which parts are applicable to the control of water quality.

2. "Greater Vancouver Water District Act, 1924."

The legislation represented by this Act, by which water quality can be controlled states that:

88. If any person shall bathe the person, or wash or

cleanse any clothe, wool, leather, skin of animals, or place any nuisance or offensive thing within or near the source of supply of such waterworks in any lake, river, pond source or fountain, or reservoir from which the water of said waterworks is obtained, or shall convey or cast, cause of throw, or put filth, dirt, dead carcasses, or other offensive or objectionable, injurious, or deleterious thing or things therein, or within the distance therefrom as above set out, or cause, permit, or suffer the water of any sink, sewer, or drain to run or be conveyed into the same or into any part of the system, or cause any other thing to be done whereby the water therein may be in anywise tainted or fouled or become contaminated, he shall be liable, on summary conviction, to a fine not exceeding fifty dollars, or to imprisonment for a period not exceeding thirty days, with or without hard labour, or to both fine and imprisonment.<sup>68</sup>

This Act is administered by the Greater Vancouver Water District Board, which was established under the Act.

3. "Greater Vancouver Sewerage and Drainage Districts Act, 1956."<sup>69</sup> This Act provides an indirect means to control water pollution by enabling the expropriation of any land within or outside its area for the purpose of the construction and operation of sewerage and drainage facilities.

The powers and functions are controlled by an Administrative Board, consisting of representatives appointed annually by the respective Councils of the member municipalities and by a member appointed by the Minister of Lands,

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<sup>68</sup> Greater Vancouver Water District Act, 1924, Statutes of British Columbia, 1924, Chapter 22.

<sup>69</sup> Greater Vancouver Sewerage and Drainage Districts Act, 1956, Statutes of British Columbia, 1956, Chapter 59.

Forests, and Water Resources to represent the University Endowment Lands. The Chairman is appointed annually by the Board from among its members. Subject to the control of the Board, the affairs and business of the Corporation are under the management of a Commissioner appointed by the Board.

#### V. EVALUATION OF EXISTING MEANS OF CONTROL

There are a great number of agencies with legislative power to control water pollution in the Province of British Columbia. This multiplicity of agencies often results in a duplication of legislation which is available for use. Where legislation is duplicated between agencies each agency may rely on the other for enforcement of that legislation with the result being that it does not get enforced and the pollution problem persists.

The Pollution-control Act<sup>70</sup> was enacted in 1956 in an attempt to resolve this problem. It has been amended on several occasions to improve specific sections of the Act and to extend the area of jurisdiction of the Act. The Act is still not effective in regards to legislation, policy and enforcement; the reasons for this are considered in detail in the following pages.

It is the writer's contention that with minor

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<sup>70</sup>  
Pollution-control Act, op. cit.

improvements in the legislation, with the establishment of carefully formulated policy, and with the development of a more effective administrative framework, the Pollution-control Act would constitute adequate legislation for the effective control of water pollution. Rather than deal with specific details of the legislation, policy, administration, and financing of all the agencies which have powers to control water pollution, an attempt is made here to evaluate the Pollution-control Act and its effectuation in more detail.

Membership on the Pollution-control Board at present does not provide a broad enough representation of functions which are directly concerned with water pollution to permit comprehensive effectuation. The present membership consists of the Deputy Minister of Lands, Forests, and Water Resources as Chairman and also as representative of Water Resources; the Executive Engineer represents the Department of Health; and there are representatives from Commercial Fisheries and Forest Services. This membership, which is determined by the Lieutenant-Governor in Council,<sup>71</sup> should be enlarged to include such functional departments as Mines and Agriculture. Until the membership is increased to include representation of these other agencies, it is not practical to consider that the Pollution-control Board could be the unified water

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<sup>71</sup>Ibid., Section 3.

pollution control agency within the Province.

Several sections of the legislation, as presented in the Act, are presently subjected to criticism and should be amended. Whereas the Board has the power and duty:

. . . to determine what qualities and properties of water shall constitute a polluted condition:

. . . to prescribe standards regarding the quality and character of the effluent which may be discharged into any of the waters within the area or areas under the jurisdiction of the Board:

. . . to conduct tests and surveys to determine the extent of pollution of any waters within the area or areas under the jurisdiction of the Board:<sup>72</sup>

the operation of the Board has not yet reached that level of sophistication. The Board has not adopted specific means by which the extent of water pollution can be objectively and consistently determined. Standards to which the quality and character of effluents could be compared have not been officially adopted by the Board. The Board, in the absence of these criteria, considers each case on its own merit and makes its decisions accordingly.

Whereas the Act provides that:

No person shall discharge sewage or other waste materials into the waters of the area or areas under the jurisdiction of the Board without a permit from the Board.<sup>73</sup>

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<sup>72</sup> Ibid., Section 4(a), (b), and (c).

<sup>73</sup> Ibid., Section 7.(1).

the Regulations which are set up under the Act by Order in Council do not require that a permit be obtained from the Board for the discharge of domestic sewage where such discharge is not in excess of 5,000 gallons per day.<sup>74</sup> This ambiguity should be cleared up by an amendment to this section of the Act.

The administration of the Act is dependent on the services of employees of the Health Branch of the Department of Health Services and Hospital Insurance for its operation.<sup>75</sup> In order that the administration of this Act can become more efficient and workable, it will be necessary to provide sufficient staff, strictly for the effectuation of the legislation under the Pollution-control Act, in the employ of the Pollution-control organization.

Financing of costs for the administration of this Act or for the carrying out of the provisions of this Act shall:

. . . in the absence of any vote of the Legislative Assembly available therefor, be paid out of the Consolidated Revenue Fund. 1956, c.36, s.10.<sup>76</sup>

The administration of this Act has been extremely confined by the extremely limited amount of funds which were budgeted for

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<sup>74</sup>Regulations by Orders in Council Numbers 719 in 1957, 1452 in 1958, and 1033 in 1963, Section 11.

<sup>75</sup>Pollution-control Act, op. cit., Section 8(1).

<sup>76</sup>Ibid., Section 10.

that purpose. Prior to last year the budgeted amount was limited to \$2,500. Last year that amount was raised to \$25,000. Even this latter apportionment of funds is minimal in consideration of the extensive task which is expected to be performed.

The jurisdiction of the Board presently extends to include all of the area of the Columbia River basin which lies within the Province of British Columbia, the entire Fraser River basin and most of the populated area of the East Coast of Vancouver Island.<sup>77</sup> Although this includes only 40 percent of the total area of the Province, it includes about 95 percent of the population in the Province. The area of jurisdiction will have to be expanded to include the total area within the Province before comprehensive water pollution control can be effectuated.

The Act provides that:

. . . Any person whose rights would be affected by the granting of a permit may, within such time as may be prescribed in the regulations, file an objection thereto.<sup>78</sup>

Whereas the Pollution-control Board considered that the City of Nelson should provide treatment of their domestic sewage prior to disposal into public waters, the City defeated the by-law for the construction of sewage treatment facilities.

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<sup>77</sup>Ibid., Section 12 and Orders in Council Numbers 643 in 1961, 2995 in 1962, and 3049 in 1962.

<sup>78</sup>Ibid., Section 17(1).

Provincial legislation controlling municipalities should be amended to permit an order from the Board to override a municipal decision to subject such a by-law to a vote; this would assist in enabling enforcement of the Act.

The Act is administered from Victoria; there is a very large area to be administered from one office with an extremely limited staff and a limited amount of operating funds. To accentuate the problem, there are weaknesses in the legislation and policy. Until these deficiencies are eliminated, the Act cannot function effectively.

## VI. OTHER MEANS OF CONTROL

The enforcement of legislation is a direct and relatively effective means by which water quality can be controlled. By the enactment of such legislation the pollution of water, within the area of jurisdiction of the governing agency, is made illegal and the polluter is liable to legal prosecution for such actions.

A law which has not yet been enacted in Canada but which has been successfully enforced in Germany is the law prohibiting the sale of "hard", non-biodegradable<sup>79</sup> detergents after October, 1964.

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<sup>79</sup> Non-biodegradable detergents cannot be decomposed by conventional treatment plants. Consequently the effluent from these plants creates a foaming condition which may be detrimental to fish life and is unsightly.

The means adopted by the 'Genossenschaften' for the control of water pollution in the Ruhr region of West Germany is to apportion the costs of constructing and operating waste treatment systems in proportion to the extent of pollution created by those members whose activities make it necessary and to the benefits received from these treatment systems. The procedures adopted for fulfilling this directive have been accepted as rational and equitable and have played an important role in the efficient operation of the system.<sup>80</sup> The tax is made large enough to provide the polluter with an economic incentive to correct his waste discharge so that the water quality objectives can be realized.

An indirect incentive for problem correction is to encourage industrial cooperation by allowing a rapid tax amortization on waste treatment facilities or to make outright grants from public funds to match a percentage of the treatment costs.<sup>81</sup>

A further indirect means of controlling water pollution is by instituting an educational program whereby water

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<sup>80</sup>A.V. Kneese, "Water Quality Management by Regional Authorities in the Ruhr Area," Regional Science Association Papers and Proceedings, Volume 11, 1963, p. 236.

<sup>81</sup>R.O. Sylvester, "Objectives of Water Quality Management," 1965 Conference On Water Pollution Proceeding (University of British Columbia, Department of University Extension, December 2 and 3, 1965), p. 9.

users can be educated: to comprehend the causes of water pollution; to understand the ways by which water pollution can be abated, regarding new and existing types of waste treatment equipment which are available; and as to the use and effectiveness of such equipment.

## VII. RECOMMENDED ADMINISTRATIVE STRUCTURE

Basic pre-requisites to the effective control of water pollution in British Columbia are the adoption of the improvements which are suggested, in a previous section, for the Pollution-control Act, the establishment of the Pollution-control Board as the unified body responsible for the effectuation of means to control water pollution, which should include the repealing of legislation, within other Provincial agencies, for the specific purpose of controlling water pollution, and the development of an administrative structure which would be capable of effectively and efficiently administering the means of control.

Recommendations for improving the effectiveness of administration of the Pollution-control Act are that:

1. the membership of the Pollution-control Board should be expanded to provide representation of all groups with direct interest;
2. regular and comprehensive measurement of pollutants and of water quality should be established;
3. standards acceptable to stated uses should be developed;

4. a program of education of all sectors of society should be accelerated for the purpose of acquainting the public with the causes of water pollution and ways of abating it;
5. the budget and staffing for the administration of the Act must be considerably increased;
6. the jurisdiction of the Board must ultimately extend to include the whole Province;
7. certain ambiguities must be eliminated from the Act;
8. municipal powers, under the Municipal Act, respecting water pollution, should be reduced to permit enforcement of the Pollution-control Act; and that
9. administration of the Act should commence at the regional level.

The multiplicity of agencies which have specific powers through legislation for the control of water pollution does not engender harmony. One of the inherent problems in the resolution of this inefficient means of imposing control is that there are controlling agencies at the federal, provincial, and municipal levels of government. Whereas the provisions of provincial and municipal levels of government can be resolved at the Provincial level there is no means of attaining the relinquishment of the federal jurisdictions without changes in the Federal Constitution, except by agreement as exemplified by the Federal Fisheries Act which is administered through the Commercial Fisheries Branch of the Provincial Government Department of Recreation and Conservation. To date there has been no conflict between Provincial

pollution legislation and provisions of the Federal Fisheries Act regarding protection of fish.<sup>82</sup>

The Provincial Government should, by legislation to amend existing Acts, repeal those sections of Provincial and Municipal Acts, other than the Pollution-control Act, which specifically deal with water pollution control. By adopting the recommended improvements under the Pollution-control Act, the Province will establish the single, competent, authoritative Board required for the effective administration of water pollution control policy.

The administrative structure by which this policy can be efficiently implemented should develop around the smallest level of government which has the means to cope with the problem.<sup>83</sup> J.D. Chapman states that "It is a cardinal rule of water management that the operating unit shall be the river basin or at least the sub-basin . . . ."<sup>84</sup> The application of this rule to the situation in British Columbia would necessitate the acceptance of the sub-basin as the

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<sup>82</sup>R.G. McMynn, op. cit., p. 37.

<sup>83</sup>Clean Air and Water in a Complex Society (Wilmington, Delaware: E.I. DuPont De Nemours and Company, 1965), Publication no. 28, p. 13.

<sup>84</sup>J.D. Chapman, "Water Pollution -- A Threat To The Quality Of The British Columbian Environment," 1965 Conference On Water Pollution Proceedings (University of British Columbia, Department of University Extension, December 2 and 3, 1965), p. 63.

operating unit in order to retain a workable size of unit. This would necessitate interregional cooperation to control upstream pollution.

H.P. Oberlander, in considering practical problems of Federalism, makes the following recommendation to overcome some of the problems of federalism

. . . instead of worrying who will do what or spending further time in dividing . . . developmental responsibilities between two or three levels of Government let us assume that the present allocation is merely one of administrative convenience and that emphasis must be placed on joint action instead of individual or separate actions by the Provinces or Ottawa. Let us create more opportunities and vehicles for joint action, both political and administrative ones to achieve a common purpose and thereby overcome the conservative nature of Federalism

To be specific we must wed the power to make plans with the fiscal and administrative strength necessary to carry them out. Therefore it ought to be possible to allow all three levels of Government in a given area to resolve . . . development problems jointly. Perhaps we could create . . . Development Boards . . . . These . . . Development Boards would have clearly defined geographic jurisdictions which would coincide with groups of either presently established or reorganized local municipalities.<sup>85</sup>

There is provision for the establishment of regional districts and Development Boards, referred to as 'Regional Boards,' within the Municipal Act.<sup>86</sup> Regional districts may

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<sup>85</sup> Peter Oberlander, "Urban Planning And Federalism," Proceedings of the 1964 Annual Conference of the American Institute of Planners (Washington, D.C.: American Institute of Planners, 1964), p. 68.

<sup>86</sup> Municipal Act Amendment Act, 1965, Chapter 28, Sections 765-769.

be incorporated, on the recommendation of the Minister of Municipal Affairs, by the Lieutenant-Governor in Council, subject to special provisions within the Act.<sup>87</sup> Membership on the Regional Board shall consist of the requisite number of Directors appointed by the Council or Trustees of each municipality from among its members and the requisite number of Directors elected from the electoral areas.<sup>88</sup>

The powers, duties, and obligations of the regional district, in addition to those specified in this Act, are as specified in the Letters Patent.<sup>89</sup> One of the additional duties is that the Regional Board shall prepare regional plans applicable to the regional district and revise them as necessary.<sup>90</sup>

The Regional Board shall provide for the establishment of a Technical Planning Committee consisting of:

- (a) a Planning Director;
- (b) a Medical Health Officer;
- (c) one officer at the option of each member municipality;

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<sup>87</sup>Ibid., Section 766-767.

<sup>88</sup>Ibid., Section 769.

<sup>89</sup>Ibid., Section 767(k).

<sup>90</sup>Ibid., Section 795(1).

- (d) a Provincial planning officer; and
- (e) one representative at the option of each of:
  - (i) the Lands Service, Department of Lands, Forests, and Water Resources;
  - (ii) the Water Resources Service, Department of Lands, Forests, and Water Resources;
  - (iii) the Department of Agriculture; and
  - (iv) the Department of Highways.<sup>91</sup>

For the effective administration of the Pollution-control Act membership on the Committee should be expanded to include representation from the Federal Government. Such representation would ensure that federal interests are considered and the representative would act as an interprovincial coordinator when necessary. Membership on the Committee may have to expand further as the administration of more functions are made the responsibility of the Board.

Where problems arise out of the administration of the Act at the regional level, there should be recourse through the Pollution-control Board, which would be retained as the general administrative agency at the Provincial level. It should undertake, with the Federal Government, programs of research and education among other Provincial level duties.

There is, therefore, provision for the creation of

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<sup>91</sup>  
Ibid., Section 798.B(1).

regional districts on the basis of river basins and sub-basins within which the proposed Development Boards may function to achieve optimum water quality control within the Province of British Columbia. Since the boundaries of regional districts, some of which have been established and others of which are proposed by the Department of Municipal Affairs, do not coincide with those boundaries which would delineate river basin districts, the former districts would not be operable for water pollution control. If, as is proposed, one of the functions of regional districts is to control water pollution, it would be desirable to establish regional districts related to boundaries of river basins. Since river basins generally create more contiguous units than do agglomerations of school districts, functions, such as water pollution control, and water and sewerage systems, would more naturally coexist and could more practically be coordinated within river basins.

According to D. Campbell, the Minister of the Department of Municipal Affairs, the Regional District legislation was set up with the following objectives in mind:

To create an adaptable type of organization capable of handling any intermunicipal service, with the affected municipalities helping in the design of the organization.

To preserve both the identity of existing municipalities and a sense of community, even if this involves extra cost.

To broaden the borrowing base of the Municipalities without removing their taxing powers.

To provide a local decision-making body for the Unorganized Areas of the Province.<sup>92</sup>

With these objectives in mind, the writer suggests that regional districts would be better established on the basis of river basins. This would also enhance the attainment of the objective of better water quality control.

#### VIII. SUMMARY

The objective of conducting the case study is to consider the historical development of water quality control and the means of controlling water quality which are available within the Province of British Columbia with the intention of proposing a more effective means of controlling water pollution.

Despite the vast range of means available for the effectuation of water quality control in the Province of British Columbia many problems exist.

Legislation for the control of water pollution has been enacted at the federal, provincial, and municipal levels of government. The various pieces of legislation under which control is available are as follows:

- |                 |                                     |
|-----------------|-------------------------------------|
| <u>Federal.</u> | 1. Fisheries Act;                   |
|                 | 2. Navigable Waters Protection Act; |
|                 | 3. Canada Shipping Act;             |
|                 | 4. National Harbours Board Bylaw;   |

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<sup>92</sup>"B.C.'s New Regional Districts," Community Planning in B.C., Volume VI, Number 1, February, 1966.

5. Migratory Birds Regulations Act;
6. Criminal Code; and
7. National Housing Act.

- Provincial.
1. Health Act;
  2. Water Act; and
  3. Pollution-control Act.

- Municipal.
1. Municipal Act;
  2. Greater Vancouver Water Districts Act; and
  3. Greater Vancouver Sewerage and Drainage Districts Act.

The existing means of control of water pollution in British Columbia involves a multiplicity of agencies which does not engender efficient functioning. Improvements which would have to be made under the Pollution-control Act to make it an effective single agency responsible for the control of water pollution include:

1. the expansion of the Pollution-control Board representation;
2. the establishment of suitable water-quality criteria;
3. an expansion of the education program;
4. an increase in budget and staff;
5. an extension of the jurisdiction of the Board;
6. the elimination of ambiguities from the Act;
7. an increase in the powers under the Act; and
8. commencement of administration of the Act at the regional level.

Coordination of water pollution controlling agencies at the Federal, Provincial, and Municipal levels of government can be best accomplished by the establishment of a

Development Board, with representation from each level of government, within each incorporated regional district. The regional districts proposed for the purpose of effectuating water pollution control, should be based on river basins and sub-basins.

The proposed improvements under the Pollution-control Act and the establishment of the proposed regional districts would provide an effective and efficient means of water pollution control within the Province of British Columbia.

## CHAPTER VI

### WATER POLLUTION CONTROL AT THE REGIONAL LEVEL

#### I. SUMMARY

The need for conservation of existing water resources in countries which are experiencing rapid urbanization and industrialization becomes quite obvious when one considers the tremendous increase in demand for water as the standard of living rises and as new uses for water evolve. The problems which may arise from lack of recognition of the need for planned utilization of water resources, and the development of means to cope with these problems once they have developed, are exemplified in the case of the highly urbanized and industrialized Ruhr Valley in West Germany. The U.S.A. has reached the stage of recognition of problems which arise out of water pollution and has recently embarked on the development of means to resolve these existing and potential problems. Canada will undoubtedly follow this experience very closely.

There is a multiplicity of uses for water for domestic and industrial purposes and the range of these uses is rapidly expanding. This vast and increasing range of beneficial uses often results in conflicts whereby, since the degree of water quality differs for different uses, overuse

for one purpose may limit the use for another purpose. To alleviate this situation it is sometimes advantageous or even necessary to determine a hierarchy of use priorities for the various available water supplies.

The management of water resources, including the control of water quality, since they are so vital to such a large range of uses by man, must be planned on a comprehensive basis. The basis of the planning should be an attempt to attain the goals and objectives established by the planner according to his estimation of the needs and desires of society. These goals and objectives will be most satisfactorily realized by the development of a plan and policy for water quality control, and implementation of that plan through the performance of a logical series of operations within the planning process.

Within the Province of British Columbia there are about thirteen agencies, at the Federal, Provincial, and Municipal levels of Government, which have the legal power to control water quality. This multiplicity of controlling agencies creates overlaps in jurisdictions which may result in inactivity in the imposition of control by these agencies which may unduly rely on each other to exercise their powers. The Pollution-control Board, one of these agencies, was established through the Pollution-control Act in 1956 to resolve these problems of overlapping jurisdictions. The

Board has not been successful in becoming a single, competent, authoritative agency responsible for the control of water pollution within the Province of British Columbia, for the following reasons:

1. It is not fully representative;
2. It has not established water quality and effluent standards criteria;
3. The education program is too limited;
4. It has insufficient budget and staff;
5. The jurisdiction of the Board does not include the whole Province;
6. There are ambiguities in the Act;
7. Insufficient power is delegated for the enforcement of the Act; and
8. Administration of the Act does not commence at a small enough level of government.

It is suggested that the Board may become the effective unified agency for the control of water pollution in British Columbia if deficiencies under the Act are rectified and if an efficient administrative structure is developed. The proposed administrative structure consists of a Development Board, with representation from the three levels of government, established within each Regional District. Existing and proposed Regional Districts would have to be altered to coincide with river-basin drainage systems or sub-basins in order to make this framework practicable.

With some relatively minor alterations in the existing

legal and administrative organization, the desired means of control of water pollution in the Province of British Columbia can be satisfactorily achieved.

## II. RECOMMENDATIONS FOR FURTHER INVESTIGATION

The establishment of Regional Districts is a very complex procedure because of the many functions which may operate within a specific region. It was suggested in passing that the various functions of Regional Districts could in all probability be more efficiently coordinated if the Districts were based on river basins or sub-basins rather than on school districts. This would provide sufficient subject matter for a complete study which the writer could not perform within the scope of this study.

## III. EVALUATION OF THE STUDY METHOD

The utilization of library research as the basis for obtaining the majority of the information, both specific and general, was very effective. Attendance at conferences on water pollution acquainted the writer more thoroughly with the subject matter particularly in respect to the Provincial situation.

A considerable amount of information, which is not available in literature, was obtained through informal interviews with people directly involved in water pollution control

at the three levels of government, with people who are only indirectly related, and also with others who are not involved in any way but are knowledgeable about and interested in the subject. Information which was collected by mailed questionnaire by another investigator not connected with this particular study also proved to be quite valuable.

The method of study used is considered to be quite valid and effective.

#### IV. VALIDITY OF THE HYPOTHESIS

The hypothesis of the study is that:

"Adverse physical conditions resulting from water pollution, which impede satisfactory urban development, can be minimized by implementation of appropriate legislation and policy at the regional level."

It has been documented throughout this study that physical conditions which result from water pollution are undesirable and can impede satisfactory local and regional planning. This is substantiated by the fact that water pollution can affect water supplies for domestic usage, industrial usage, recreational usage and for the propagation of fish and wild life. A concerted effort toward coordination of water pollution control means is urgently required. These means could be effectively coordinated within a regional planning framework. Legislation and policy can be implemented at the regional level of government for effective control of water pollution within the Province of British Columbia. The hypothesis of this study is considered to be valid.

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APPENDIX

POLLUTION-CONTROL ACT

and

REGULATIONS

PROVINCE OF BRITISH COLUMBIA

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**POLLUTION-CONTROL ACT**

(R.S.B.C. 1960, CHAPTER 289; 1963, CHAPTER 42;  
1965, CHAPTER 37)

*[Consolidated for convenience only, July 1, 1965.]*

and

**REGULATIONS**

*[Consolidated for convenience only, July 1, 1965.]*

## CHAPTER 289

## Pollution-control Act

[Consolidated for convenience only, July 1, 1965.]

- Title.** 1. This Act may be cited as the *Pollution-control Act*. 1956, c. 36, s. 1.
- Interpre-  
tation.** 2. In this Act, unless the context otherwise requires,  
 "Board" means the Pollution-control Board established under this Act;  
 "effluent" means anything flowing in or out of a drain, sewer, out-fall, sewage-disposal system or works;  
 "Engineer" means an engineer appointed under this Act;  
 "Minister" means the Minister of Lands, Forests, and Water Resources;  
 "municipality" means a village, town, city, or district municipality constituted under any Act, as well as an improvement district, a dyking, sewerage, and drainage district, and any special district constituted under any Act;  
 "order" includes any decision or direction, whether given in writing or otherwise;  
 "pollution" means anything done, or any result or condition existing, created, or likely to be created, affecting land or water which, in the opinion of the Board, is detrimental to health, sanitation, or the public interest;  
 "prescribed" means prescribed by this Act or the regulations;  
 "waters" includes all streams, lakes, ponds, inland waters, salt waters, watercourses, and all other surface and ground waters within the jurisdiction of the Province;  
 "works" includes drains, ditches, sewers, intercepting sewers, sewage treatment and disposal plants and works, pumping-stations, and other works necessary thereto, and outlets for carrying off, treating, and disposing of drainage and sewage, including industrial waste, and any other and all works, structures, lands, and conveniences included and necessary to the completion of a sewerage or drainage system. 1956, c. 36, s. 2; 1965, c. 37, s. 2.
- Pollution-  
control  
Board.** 3. (1) There shall be a board to be known as the "Pollution-control Board," which shall consist of a Chairman and such other members as the Lieutenant-Governor in Council may from time to time determine.  
 (2) The members shall be appointed by the Lieutenant-Governor in Council for such term or terms as the Lieutenant-Governor in Council may determine.
- Procedure.** (3) The Board may determine its own procedure and may elect an Acting-Chairman in the absence of the Chairman. 1956, c. 36, s. 3.

**Powers and  
duties of  
Board.****4. The Board has the following powers and duties:—**

- (a) To determine what qualities and properties of water shall constitute a polluted condition:
- (b) To prescribe standards regarding the quality and character of the effluent which may be discharged into any of the waters within the area or areas under the jurisdiction of the Board:
- (c) To conduct tests and surveys to determine the extent of pollution of any waters within the area or areas under the jurisdiction of the Board:
- (d) To examine into all existing or proposed means for the disposal of sewage or other waste materials, or both, and to approve the plans and specifications for such works as are deemed necessary to prevent pollution of the waters of the area or areas:
- (e) To notify all persons who discharge effluent into the said waters when the effluent fails to meet the prescribed standards:
- (f) To order any person to increase the degree of treatment of the effluent or to alter the manner or point of discharge of the effluent being discharged by such person to bring the effluent up to the prescribed standards:
- (g) To order any person who fails to comply with an order issued under clause (f) to cease discharging effluent into any waters in the area as and from a day and time specified in the order:
- (h) To appoint such advisory or technical committees from time to time as may be deemed necessary to inform the Board with regard to whatever matters may be referred by the Board.

1956, c. 36, s. 4; 1965, c. 37, s. 3.

**Penalty.**

- 5.** Every person is guilty of an offence against this Act and liable, on summary conviction, to a penalty not exceeding two hundred and fifty dollars and, in default of payment, to imprisonment not exceeding twelve months who wilfully contravenes any provision of this Act or any order of the Board, or neglects to do any act or thing required to be done by the Board under this Act or under any order of the Board or Engineer. 1956, c. 36, s. 5; 1965, c. 37, s. 4.

**6. [Repealed. 1965, c. 37, s. 5.]****Permits for  
discharge of  
sewage.**

- 7. (1)** No person shall discharge sewage or other waste materials into the waters of the area or areas under the jurisdiction of the Board without a permit from the Board.

(2) The Board shall not issue or amend a permit unless the applicant therefor has complied with the regulations and supplied whatever plans, specifications, and other information the Board requires.

(3) Where application is made for a permit, the Board may

- (a) refuse to grant the permit;
- (b) amend the application and grant the permit;

- (c) grant the permit in whole or in part upon such terms and conditions as the Board may prescribe;
- (d) require additional plans or other information prior to amendment of the application under clause (b) or refusal to grant the permit under clause (a) or granting the permit under clause (c); or
- (e) require the applicant to give security in the amount and form required by the Board,

and may, in dealing with any application, exercise more than one of those powers.

(4) Upon notice to all persons whose rights would be affected and after consideration of any objections filed and after notifying the objectors of its decision, the Board may amend any permit

- (a) to extend the time for the commencement of the construction of the works;
- (b) to extend the time fixed for the completion of the works;
- (c) to authorize additional other works than those previously authorized;
- (d) to correct any error in the permit;
- (e) to remove any provision of the permit that is inconsistent with this Act;
- (f) to extend the term of the permit; or
- (g) to transfer the permit to another person;

or for more than one of those purposes. 1956, c. 36, s. 7; 1965, c. 37, s. 6.

Classification  
of operations.

7A. Notwithstanding the provisions of section 7, the Board may classify operations according to the type of sewage or waste materials being discharged or proposed to be discharged, or by the type of treatment proposed or undertaken, or by the volume of the discharge or proposed discharge, or any combination of these, and may, with the approval of the Lieutenant-Governor in Council, exempt any class or classes of operation so defined from the provisions of this Act, and may further make such exemptions applicable to a specific area or areas under the jurisdiction of the Board. 1963, c. 42, s. 17.

Engineers,  
etc., of  
Department  
of Health  
Services and  
Hospital  
Insurance.

8. (1) There may be made available to the Board by the Health Branch of the Department of Health Services and Hospital Insurance such engineers, inspectors, technicians, officers, clerks, and employees as are necessary for the administration of this Act. 1956, c. 36, s. 8.

(2) Engineers, officers, clerks, and other employees necessary for the purpose of this Act may be appointed in accordance with the *Civil Service Act*. 1956, c. 36, s. 8; 1965, c. 37, s. 7.

Remuneration  
of Board.

9. The members of the Board shall be paid such remuneration as may be fixed by the Lieutenant-Governor in Council and such actual

expenses as may be incurred by them in the discharge of their duties. 1956, c. 36, s. 9.

Expenses of  
adminis-  
tration.

**10.** Any moneys required for the administration of this Act or for the carrying-out of the provisions of this Act shall, in the absence of any vote of the Legislative Assembly available therefor, be paid out of the Consolidated Revenue Fund. 1956, c. 36, s. 10.

Minister  
charged with  
adminis-  
tration.

**11.** The Minister is charged with the administration of this Act. 1956, c. 36, s. 11.

Application.

**12.** Notwithstanding the provisions of any other Act, this Act applies to

(a) all the areas of land, contained within the boundaries of a municipality, draining, by natural or artificial means, into the Fraser River or its tributaries from the Village of Hope to the Strait of Georgia, or into Boundary Bay, or into the area of the Strait of Georgia contained within a line drawn from the International Boundary-line at longitude 123° 15' to Halfmoon Bay, or into Burrard Inlet;

(b) any area designated by Order of the Lieutenant-Governor in Council. 1956, c. 36, s. 12.

This Act  
extends  
Health Act,  
etc.

**13.** This Act shall not be deemed contrary to the *Health Act*, the *Municipal Act*, or the *Water Act*, but shall be considered an extension of such Acts for the public interest. 1956, c. 36, s. 13.

Powers of  
Engineer.

**14.** In addition to all other powers given under this Act and the regulations, every Engineer

(a) may determine what constitutes pollution;

(b) may enter at any time in and upon any land and premises to inspect, regulate, close, or lock any works; and

(c) may order the repair, alteration, improvement, removal of or addition to any works. 1956, c. 36, s. 14; 1965, c. 37, s. 8.

Appeal.

**15.** (1) An appeal lies

“(a) from every order of an Engineer to the Board; and

“(b) from every order of the Board to the Lieutenant-Governor in Council, who may delegate any member or members of the Executive Council of the Province to hear the appeal and pronounce a decision thereon for or on behalf of the Lieutenant-Governor in Council;

and in this section the expression “appeal tribunal” means the Board, the Lieutenant-Governor in Council, or the member or members of the Executive Council of the Province delegated to hear the appeal by the Lieutenant-Governor in Council, as the case may be, to whom the appeal is taken.

(2) Every appeal from an order of the Engineer shall be taken within fifteen days from the date of the order, and every appeal from an order of the Board shall be taken within thirty days from the date of the order.

(3) The appellant under an appeal taken under this section shall give notice of the appeal as directed by the Engineer or by the Board from whose order the appeal is taken.

(4) Before hearing an appeal, the appeal tribunal may require the appellant to deposit with the appeal tribunal such sum of money as the appeal tribunal considers sufficient to cover the probable expenses of the appeal tribunal and the respondent in connection with the appeal.

(5) The appeal tribunal may, on any appeal, determine the matters involved and make any order that to the appeal tribunal appears just, and may dispose of any money deposited by the appellant pursuant to a requirement made under subsection (4).

(6) No appeal shall act as a stay of execution. 1965, c. 37, s. 8.

**Right of  
ingress and  
egress.**

**16.** The Board, every member thereof, and every Engineer has, for the discharge of duties and the exercise of rights, at all times a free right of ingress and egress upon, in, and over any land and premises. 1965, c. 37, s. 8.

**Objections.**

**17.** (1) Any person whose rights would be affected by the granting of a permit may, within such time as may be prescribed in the regulations, file an objection thereto.

(2) The Board shall decide, in its sole discretion, whether or not the objection will be the subject of a hearing, and shall notify the objector of its decision.

(3) If the Board decides to hold a hearing, the applicant and objectors are entitled to be notified of the time and place thereof and to be heard, and to be notified of the decision following the hearing. 1965, c. 37, s. 8.

**Inquiries.**

**18.** Whenever it appears to the Board that the proper determination of any matter within its jurisdiction necessitates a public or other inquiry, the Board may hold an inquiry, and for that purpose the Chairman has all the powers and jurisdiction of a Justice of the Peace under the *Summary Convictions Act*. 1965, c. 37, s. 8.

**Approvals  
and certifi-  
cates under  
Health Act.**

**19.** No plans, specifications, engineers' reports, estimates, information, or data shall be approved under section 24 of the *Health Act*, and no certificate shall be given under section 26 or 27 of the *Health Act* without the authority in writing of the Board. 1965, c. 37, s. 8.

**Regulations.**

**20.** For the purposes of carrying into effect the provisions of this Act according to their true intent or of supplying any deficiency therein, the Lieutenant-Governor in Council may make regulations not inconsistent with the spirit of this Act as are deemed necessary or advisable. 1965, c. 37, s. 8.

B.C. Reg. 159/59.

## POLLUTION-CONTROL REGULATIONS

(Made and approved by Order in Council No. 719 on March 26, 1957,  
and amended by Orders in Council Nos. 1452/58 and 1033/63.)

### *Interpretation*

1. In these regulations

- "Chairman" means the Chairman of the Pollution-control Board;
- "domestic sewage" means the sewage discharging from a residential building and sewage of a like nature discharging from other buildings;
- "Secretary" means the Secretary of the Pollution-control Board;
- "land" includes any estate or interest in or easement over land;
- "point of discharge" means the place where effluent is to be discharged;
- "member" means a member of the Pollution-control Board;
- "post on the ground" means to place copies of the application at conspicuous places at or near the proposed point of discharge of the effluent;
- "quantity to be discharged" means the quantity or rate of flow of effluent to be discharged;
- "type of effluent" means a description of the effluent in general terms based on its origin, e.g., domestic sewage, cooling water, etc.;
- "characteristics of the effluent" means a description of the effluent in specific terms, such as biochemical oxygen demand, suspended solids, temperature, pH, and the like.

### *Acquisition of Permits under the Pollution-control Act*

2. An applicant for a permit or his agent shall prepare and sign an application giving the following particulars:—

- (a) The applicant's name and address;
- (b) The name or a clear description of the source of effluent;
- (c) The location of the point of discharge;
- (d) The type of effluent to be discharged;
- (e) The characteristics of the effluent to be discharged;
- (f) The quantity of effluent to be discharged;
- (g) The legal description of the land upon which the effluent originates;
- (h) The date on which the application was posted on the ground;
- (i) The place where the application is to be filed;

and the application shall state that objections may be filed within thirty days of the first publication of the application.

3. The applicant shall

- (a) post on the ground near the point of discharge signed copies of the application;
- (b) within ten days of posting the application on the ground, file two signed copies thereof with the Secretary, which shall contain or have attached thereto a plan showing the applicant's land, and the location of the proposed works;
- (c) publish a copy of the application in two newspapers as directed by the Secretary;
- (d) publish a copy of the application in one issue of *The British Columbia Gazette*;

- (e) furnish to the Secretary any information requested concerning the applicant's title to the land upon which the effluent originates, details of the proposed works, and the description of all lands on which it is proposed to construct works, and any other matter the Secretary considers relevant.
- 4. Any person may, within thirty days of the first publication of an application in a newspaper, file with the Secretary an objection in writing to the granting of the permit.
- 5. Upon receipt of an application for a permit, the Secretary shall refer the application to the Health Branch of the Department of Health and Welfare for examination and recommendation.
- 6. Upon being satisfied that the pertinent technical information for review of the application is available, the Health Branch shall make recommendation to the Secretary concerning the application.
- 7. The Secretary shall make available to the members of the Board applications and the recommendations of the Health Branch at least ten days before the meeting set to deal with the application.
- 8. When, in the opinion of the Board, it is deemed advisable to inquire further into an application, the Board, or a committee of the Board appointed by the Chairman, may inquire into such application, and may hold such public hearings or inquiries as may be required.
- 9. The Board may incorporate into any permit such special conditions as may be considered desirable in the public interest.
- 10. All discharges of sewage and other waste materials are classified as follows:—
  - Class A: All discharges of domestic sewage where the flow is less than 5,000 gallons per day.
  - Class B: All other discharges of sewage or other waste material.
- 11. No person is required to obtain a permit from the Pollution-control Board to discharge Class A wastes.

B.C. Reg. 78/64.

#### POLLUTION-CONTROL ACT

ORDER IN COUNCIL NO. 643, APPROVED MARCH 14, 1961,  
EXTENDING AREA TO WHICH ACT APPLIES

That, under clause (b) of section 12 of the *Pollution-control Act*, being chapter 289 of the *Revised Statutes of British Columbia, 1960*, the said Act shall apply to the further areas described as "all the areas of land situated in the Province of British Columbia draining into the Columbia River and its tributaries and the tributaries thereto, including the watersheds of the Similkameen River, the Okanagan River, the Kettle River, the main stem of the Columbia River, the Pend d'Oreille River, and the Kootenay River":

And that this Order be effective April 1, 1961.

B.C. Reg. 79/64.

# POLLUTION-CONTROL ACT

ORDER IN COUNCIL NO. 2995, APPROVED DECEMBER 6, 1962, AS AMENDED BY  
ORDER IN COUNCIL NO. 3049/62, EXTENDING AREA TO WHICH ACT APPLIES

That, under clause (b) of section 12 of the *Pollution-control Act*, being chapter 289 of the *Revised Statutes of British Columbia, 1960*, the said Act shall apply to the further areas described as follows:—

1. All the areas of land situated in the Province of British Columbia draining into the Fraser River and its tributaries and the tributaries thereto, excluding thereout the areas already described in clause (a) of section 12 of the said chapter 289 of the *Revised Statutes of British Columbia, 1960*.

2. All those areas of Vancouver Island lying within the boundaries of the Esquimalt and Nanaimo land grant, together with those parts thereof lying within Otter, Sooke, Goldstream, Metchosin, Esquimalt, Victoria, Highland, Lake, South Saanich, North Saanich, and Sayward Land Districts and those waters of Johnstone Strait and the Strait of Georgia lying east of 126 degrees west longitude.

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in right of the Province of British Columbia.  
1965