

IMPLEMENTATION OF BRITISH COLUMBIA'S
POLLUTION CONTROL ACT, 1967, IN THE LOWER FRASER RIVER

by

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ABSTRACT

Over the past two decades, pollution in the lower Fraser River of British Columbia has become an increasing concern of Lower Mainland residents. The Fraser is B.C.'s largest and most historic river, and supports Pacific salmon runs of some international significance and much local interest. The public generally believes that the river is already or soon will be badly polluted, and there is widespread suspicion that the government's lack of enforcement of its own anti-pollution laws is to blame.

B.C.'s Pollution Control Act, 1967, forms the basis of the province's institutional arrangements for regulating the discharge of pollutants into provincial waters. The Act and regulations pursuant to it outline a permit system and a set of related procedures that together are the administrative framework of B.C.'s pollution control process. The Act also appoints a chief administrator--the Director of Pollution Control--and a semi-autonomous policy-setting and appeal body--the Pollution Control Board. The Board, the Director, and the Director's staff (the Waste Management Branch) have largely been responsible for implementing the provisions of the Act and Cabinet directives relating to it.

The purpose of this study was to conduct an independent evaluation of how the province's pollution control process has operated in the Lower Fraser. The evaluation has several

stages:

- 1) Outlining what I have termed B.C.'s "official" or "formal" pollution control process; that is, the one formally set up by the Act and further fashioned by high-level officials. Three stages were identified: setting pollution control objectives, issuing pollution control permits, and monitoring and enforcement.
- 2) Sketching the basic steps of a model for controlling point-source pollution in the Lower Fraser. B.C.'s formal process is then compared with this model process.
- 3) Describing how B.C.'s pollution control process actually has worked in the case of the Lower Fraser. This is accomplished primarily by referring to 13 examples that were chosen from Waste Management Branch files and to information presented in a number of Fraser River Estuary Study water quality reports.
- 4) Evaluation of the actual process according to three criteria. The first measures how closely practice is adhering to formal policy. The second assesses the generation and use of information by the actual process, while the third evaluates how well it has accommodated affected interests.

Objectives for pollution control were set by the Board on the basis of "technical" information assembled during public inquiries. The Objectives serve as targets, not binding standards, and heavily emphasize the control of effluent quality over the maintenance of receiving water quality. Inquiries only partially generated the information necessary to fully understand the consequences of alternative levels of pollution control. The intended flexibility in applying the Objectives to specific cases and the stated intent to review them at periodic intervals are appropriate responses given this ignorance. The narrow terms of reference of inquiries and their formal settings discouraged effective participation by the public. Several possible means of improving information, accountability, and public participation are suggested.

All waste dischargers in B.C. require permits signed by the Director. The permit stipulates a number of conditions to which the discharger must conform. Objectives are to be used as "minimum objectives" in setting permit conditions, and this was in part true. The Act's stipulations for circulating a permit application to other agencies for comment and advertising it publicly were well followed. In cases where another agency objected to an application, more often than not the objection was considered "unreasonable" by the Branch. The applicant and the Branch engaged in sometimes protracted negotiation in the setting of permit terms. Some but not all of the information needed to meaningfully assess an application came to light in the course of its evaluation by the Branch. The information typically made available to the public was poor in this regard.

Monitoring is to be carried on both by the Branch and permittees. Roughly half of the effluent monitoring required of permittees is actually being conducted, and some permittees need to constantly be "reminded" of this responsibility. Neither zone of influence monitoring conducted in the vicinity of outfalls, or general water quality monitoring conducted at selected stations in the river, both of which are the Branch's responsibility, are being carried out as frequently as they should be, probably because of funding limitations.

The Branch's philosophy towards enforcement over the past decade has been to negotiate compliance in as cooperative a manner as possible rather than to threaten or use prosecution frequently.

This approach is regarded as more realistic and even ultimately more successful at reducing pollution over the long term by experienced Branch engineers. On one hand, the widespread presence of violations tends to discredit this view, but on the other, recognizable progress has been made in reducing some discharges with the cooperative approach.

Two practical considerations probably also account for the minimal use of prosecution: a desire to maintain tolerable working relationships between Branch personnel and permittees, and the fact that litigation is so time-consuming and uncertain. The record of prosecutions that have been brought under the Act is not an impressive one, but experience from the United States indicates that this is not atypical. The fact that recent policy changes within the Ministry of Environment have led to a renewed interest in the use of prosecution as a deterrent makes this observation timely.

A number of recommendations are made that would strengthen the pollution control process in B.C.

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Chapter One

INTRODUCTION

The object of this study is to examine and evaluate the implementation of British Columbia's 1967 Pollution Control Act (R.S.B.C. 1979, c.332) in the lower Fraser River.¹ Concern for the Fraser has heightened in the last decade as appreciation of its resource values has grown and as the perceived and real threat to its water quality has increased.

Water is, of course, vital to all life on earth. Modern man places greater demands on it than ever, contrary to the myth that we have severed ties with our environment. Only its apparent abundance and availability "at the turn of a faucet" obscure these facts, allowing most Canadians to take for granted the continued availability of the services delivered by water of desirable quality and quantity, services that range from supporting aquatic life to assimilating waste. As economic and population growth have proceeded in Canada however, conflicting demands on water have intensified. Increasingly, active measures --not always successful--have been required to protect its quality, manage its flows, and mediate between competing demands on the water resource. The present investigation focuses solely on one aspect of the water resource problem in one setting: controlling point sources of water pollution in the Fraser Estuary.

Pollution is a problem that, by its very nature, calls for intervention of government into private affairs. Thus,

expressing concern for pollution of the Fraser is nearly tantamount to questioning how well certain arrangements devised and run by government have in fact functioned in controlling the sources of pollution that threaten the river's water quality and associated values. Indeed, this very question has become the focus of a regional debate: Are provincial and federal pollution control agencies "doing their job?" Do governments possess the "will to enforce" their own anti-pollution legislation? In part, this thesis addresses these questions.

In theory, at both provincial and federal levels, numerous laws could be used in checking pollution and managing water quality. In practice, two are primary--the provincial Pollution Control Act and the federal Fisheries Act (R.S.C. 1970, c. 14). Without downplaying the importance of the latter, I have chosen the former as the subject of this study for two reasons: because of its wider scope and because in the Lower Fraser, the province has assumed the lead role in pollution control (as authorized by the British North America Act of 1867) and therefore drawn the most criticism.

The Pollution Control Act establishes the Pollution Control Board, the Director of Pollution Control (the Act's chief administrator), and a licensing procedure for regulating waste discharge into provincial waters. The Board consists of up to a dozen civil servants and private citizens. Its two main functions are to set pollution control objectives and to hear formal Appeals of Orders issued under the Act. The Pollution Control Branch ² (which is never actually named as such in the Act) is the Director's staff and includes professional

engineers, biologists, and technicians, all responsible for administering the Pollution Control Act, as well as the Litter Act, on a day-to-day basis. Branch personnel are divided between the central Victoria office and the province's six resource management regions.

One feature of the Act and the process it has engendered is that they both concentrate on regulating indentifiable point sources of pollution. The larger, more complex problem of ambient water quality management has largely been neglected. The distinction between water quality management and point source pollution control is greater than may appear at first glance. Controlling point sources of pollution as they occur is really only a part of managing water quality (albeit an important one). It does not encompass the problem posed by non-point sources of pollution³ and it does not include a host of management tools ranging from flow manipulation to regional planning and local zoning.

In theory, perhaps the greatest fundamental shortcoming of the procedures developed under the Act (if they are regarded as the basis of a water quality management system for B.C.) is that their preoccupation with controlling effluent quality from individual dischargers is not contained within a larger framework for managing receiving water quality. In urbanizing regions like the Lower Fraser Valley, growing concentrations of dischargers are dealt with largely on an individual, ad hoc basis.

While noting here the general neglect of non-point sources of water pollution, it would be unfair to criticize the control

apparatus set up under the Act for failing to stem a type of pollution the Act itself does not cover. Thus, I have restricted this analysis to what the Act does cover--regulation of point-source discharges (from both effluent outfalls and leachate-producing landfills)--but it should not be forgotten that these are not the entire threat to water quality in the Lower Fraser.⁴ Figure 1 depicts the major pathways travelled by pollutants of water, and emphasizes those flows which are regulated under the Act. What is noteworthy is the number which are not.

The present study then, has four principal research objectives:

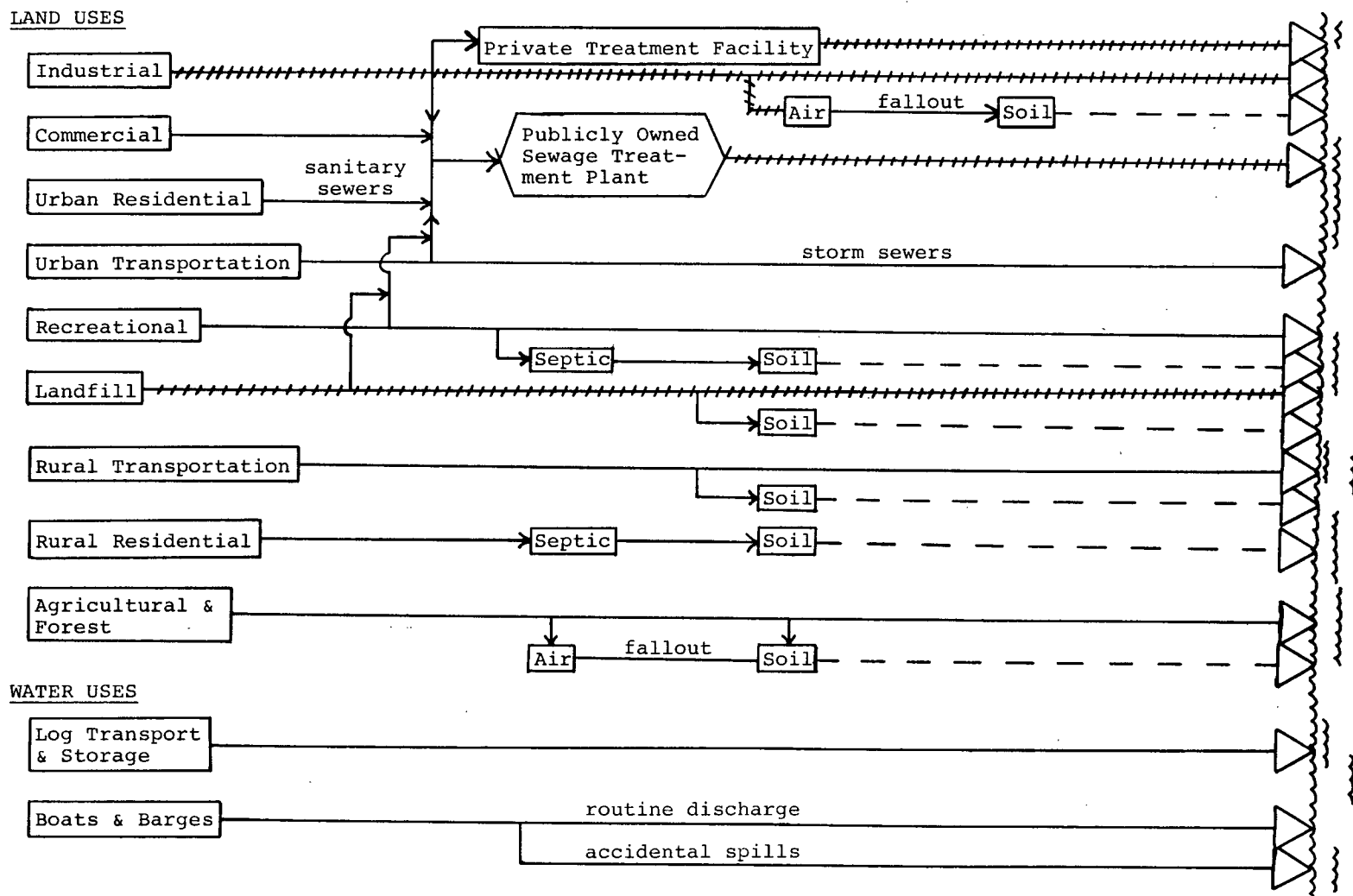
- (1) to describe how B.C.'s official or formal pollution control process is ideally supposed to function;
- (2) to reveal how the process actually has functioned in the Lower Fraser;
- (3) to analyze B.C.'s process according to a model process and certain criteria;
- (4) to recommend improvements in the process as suggested by the above analysis.

Section 1.2 discusses these objectives in greater detail.

1.1 Study Background and Rationale

The Fraser Estuary is valuable in its undeveloped state. It supports a rich resident aquatic fauna, the largest population of migratory birds in western Canada, and related opportunities for outdoor recreation and nature appreciation. Anadromous fish, most notably the commercially important (and

FIGURE 1 -- Water Pollutant Pathways, showing which segments are controlled under the Pollution Control Act, 1967



publicly acclaimed) salmon, utilize it in their journeys from inland spawning channels to the sea and back again. The Fraser is the most important river to B.C.'s ailing fishing industry and is widely regarded as the greatest, or one of the greatest, salmon rivers in the world. These resource values of the river and its estuary, tangible and intangible alike, are undoubtedly significant to Vancouverites and British Columbians and have only begun to be measured.⁵

However, the lower stretches of "The Mighty Fraser" are also economically important to the region for development-related uses. The river's sloughs, its foreshore, and its adjoining floodplain possess high value for development in a region with a notoriously limited land base. The river itself is used for fishing, transport and storage of logs, sand extraction, shipping (which necessitates periodic dredging), some pleasure boating, irrigation, industrial water intake, and--waste disposal. Not surprisingly, each of these uses affects the natural environment detrimentally to some extent. Waste discharges into the Lower Fraser have increased in the last three decades because of the region's population and industrial growth as well as because of past decisions both to divert Vancouver's sewage from its harbour (and beaches) into the Fraser and to relocate industry from the city core out into the Valley.

Before the seventies, little was actually known about the effect of pollutants originating from Lower Mainland sources on the water quality of the Fraser. According to Goldie (1967), the earliest studies date back to the fifties, when the B.C.

Research Council⁶ and the Canada Department of Mines and Technical Surveys⁷ both sampled various chemical and physical properties of the river water at several stations. In the sixties, the Greater Vancouver Sewerage and Drainage District (GVSD) carried out periodic sampling of dissolved oxygen (DO). The B.C. Health Department occasionally supplemented this programme with DO sampling of their own (Goldie, 1967).

In 1967, C.A. Goldie, a staff engineer with the Pollution Control Branch interpreted the existing research and summarized it as follows...

... in its natural condition or that pertaining in 1950-1951, the Lower Fraser water exhibits a high turbidity, suspended solids and iron content through most of the year and particularly during the run-off period. (p. 26)

and:

The general statement may be made that the main stem of the Fraser is regarded as a "clean stream" in terms of B.O.D. content. However, the rapid development of the Province could result in degradation of water quality so that planned preventative measures should be initiated to forestall any quality impairment although there is no cause for immediate alarm. (p. 49)

The water quality of the Lower Fraser has really only been extensively studied this past decade. 1972 marked the beginning of a four year, \$600,000 investigation by UBC's newly created Westwater Research Centre that culminated in 1976 with the publication of The Uncertain Future of the Lower Fraser (Dorcey, 1976). DO was found to be "very good" in the river's mainstem (about 90% of saturation levels) while the North and Main Arms of the Fraser both showed some depletion of oxygen, down to about 85% saturation (9 to 10 mg/L DO).⁸ This was still well above the 7.8 mg/L that the U.S. Federal Water Pollution Control

Administration recommended would provide a high level of protection for salmon (Hall, 1976).

The nutrient status of the Fraser was also found to look "very good".⁹ However, serious bacterial pollution, as indicated by the fecal coliform count, and as reported by Goldie nearly a decade earlier, was confirmed. Levels of coliform bacteria indicate the presence of human and animal excrement and the possible presence of associated pathogens. The coliform count of each of the channels flowing through the GVRD exceeded levels established for "safe" contact recreation, while the fecal coliform count on the North Arm in particular was higher than even the recommended levels for non-contact recreation (eg. boating).¹⁰

The lowland tributaries of the Fraser were discovered to have significantly poorer water quality than the Fraser itself (Hall and Wiens, 1976). Nevertheless, Westwater's main conclusion was summarized thus:

Compared with other heavily-used rivers of the world the Lower Fraser is still in relatively good health. However, its future is clouded with uncertainty. There is unmistakable evidence that toxic materials, including lead, mercury, pesticides and PCB's are beginning to accumulate in the sediments and fish of the river.
(back cover)

Westwater's highlighting of the potential threat represented by long-lived toxic substances corresponded to a dawning world-wide perception of this problem.

In recognition of the intensifying problems facing the Fraser Estuary, and the jurisdictional complexity that entangles the region (numerous agencies representing four levels of government), in 1977 the federal and provincial governments

initiated Phase I of the Fraser River Estuary Study (FRES). The goal of the Study, in brief, is to devise a management plan for the estuary, as well as to create a procedure by which major decisions affecting the estuary are to be made (FRES Steering Committee, 1978). Phase I was an inventory of the status quo of natural resources and land use within the designated estuary study area. Phase II of the Study, plan development, is now underway, and Phase III, plan implementation and refinement, is supposed to commence in 1982.

FRES has put considerable effort into documenting both the existing water chemistry of the Lower Fraser and the quality and quantity of effluent discharged into it. An analysis of some 35,000 effluent and 55,000 water chemistry measurements collected from 1970 to 1978 by a number of government and non-government researchers were presented in the FRES Water Quality Summary Report, eleven background reports, and five ancillary reports (FRES Water Quality Work Group, 1979). This compilation undoubtedly represents the most detailed account yet of Lower Fraser water chemistry parameters, significant sources of effluent, and probable impact of specific point source discharges and overall pollutant loadings on water quality. In general, the findings corroborate those of Westwater:

Most water quality parameters in the river are not measureably changed by the major discharges to the river, except near effluent plumes. There is some accumulation of heavy metals and toxic organic contaminants in aquatic biota, including fish.
(p. ii of Summary Report)

The Summary Report conveys the general impression that the threat to Fraser water quality is not so urgent that costly

investments in upgraded treatment need be made immediately. It does admit to numerous areas of concern and uncertainty, but argues that further study would be prudent before commitments to such schemes as secondary treatment of sewage and stormwater settling ponds are made.

The Water Chemistry background report (Drinnan and Clark, 1980), in examining the available data from 1970 to 1978 for such major physical water quality parameters as pH, DO, suspended solids (SS), dissolved materials, nutrients, and trace metals, was unable to detect a significant trend over this period for any of them. (It was not measuring accumulation of contaminants like heavy metals in sediments or aquatic biota.) Data limitations may have contributed to this finding (Clark, 1980a). Nevertheless, the absence of any significant trends probably means that--contrary to popular belief--the river as a whole is not rapidly "going down the drain."¹¹ (However, this does not necessarily mean that pollution control efforts are successful either.)

The FRES water quality investigations have not gone uncriticized. The summary report itself has been called a compromise, reflecting the unreconciled biases of the different agencies its ten authors represent. Some believe that it downplays the extent of cumulative "localized degradation." The fact that the summary report was released before most of its constituent technical studies has invited suspicion that its conclusions were foregone. Conservationists were unhappy with what they perceived as an overly reassuring tone to the summary report, while the popular press went so far as to say that some

of the report's authors attributed this to a deliberate attempt of other authors to obscure the seriousness of the river's condition:

{It} seems to suggest that the river is basically healthy, and can absorb the present rate of discharge of effluents. But a closer reading of the report tells a different story. It shows that in fact many kilometers of the river, sloughs and riverine marshes, including vital habitat of young salmon, are badly polluted....the impression that the report gives the river a clean bill of health, therefore, is misleading.... Members of the committee are quite frank privately about the reasons for this kind of double-talk. They say the conclusions were made deliberately obscure at the insistence of those committee members who did not want to alarm the public. And yet the alarming facts are there if you dig for them.

-- The Province, Jan. 14, 1980, editorial

This quote exemplifies a widespread suspicion on the part of concerned citizens about the government's real intentions towards the Lower Fraser. Fears are expressed that both provincial and federal levels of government, by allegedly not enforcing their own laws and regulations adequately, are allowing a precious resource to deteriorate little by little:

... inaction by civil servants, the present intergovernmental referral system, the present Pollution Control Branch permit system, and inept enforcement on most violations are resulting in the failure to protect habitat and water quality along the Fraser and its estuary...there is absolutely no evidence that would indicate that the Fraser Estuary Study will solve the piece-meal losses outlined above.

--Fraser River Coalition, Nov. 1979

There appears to be one unspoken reason why governments are not following through on their pledges to protect the estuary while they evolve a system of planning and research and resource priorities.

The will to enforce has apparently been sapped....

-- The Province, Dec. 3, 1979, editorial

The reasoning here is that if existing policies supposed to protect the river's water quality are rendered nearly

meaningless because of unsatisfactory implementation and enforcement, to believe that yet another set of administrative arrangements will cure the estuary's real problems is to ignore reality.

Yet this phenomenon--that of divergences between policy goals (eg. laws, water quality standards, pollution control objectives) and results--is neither new nor unique to the lower Fraser River. In a study of pollution control in the U.S., Holden (1966) contended that it is a political process, or in his terms, one "of conflict leading to the distribution of advantages and disadvantages." Concerning pollution regulatory agencies, he noted:

While these agencies certainly do distribute advantages and disadvantages, the distributions which occur are seldom consistent with the distributions which one would have expected if one took the policy norms involved in the creation of the agencies as clues to the agencies' most likely behavior. Yet it is reasonably clear that people expect that the policy norms will be conclusive guides. When the divergence of actual outcomes from presumptive policy norms becomes clear in any particular case or set of cases, there is a tendency to attribute this to the ethical deficiencies of the regulators, sometimes to their intellectual deficiencies, and often to what the critic believes an inappropriate organizational format. (pp. 9-10)

In other words, on the basis of how human beings in regulatory bodies very naturally behave in conflict situations that inevitably arise in pursuing their mandates, it is unrealistic to expect the outcome of policy initiatives to be identical with the a priori goals behind such policies. This conclusion concurs well with a cursory glimpse of pollution regulation in the Lower Fraser. I do not mean to suggest, nor did Holden, that ineffectual regulation must be an accepted fact

of life, but that pollution control as a bargaining process and outcomes that will diverge somewhat from what "The Law" dictates, are probable facts of life. Institutional arrangements that invite public scrutiny can help reduce significant deviations of outcome from policy.

The provincial approach to pollution control in the Lower Fraser is an evolving one, and any assessment of it must take this into account. Heightened public concern, re-organization within the Ministry of Environment, and a December, 1979 ministerial directive have all resulted in an intensified effort to crack down on unauthorized waste dischargers (Hehn, 1980). While this marks a significant policy change, it cannot be assumed to represent a permanent one. When the NDP government took power in 1972, they too initiated a vigorous enforcement programme (Franson and Lucas, 1974), and yet eight years later, the popular impression of most of the public and many professionals is that non-compliance is as rampant as ever.

The present initiative is costlier in a time of a general economic slowdown (although B.C.'s economy is healthier than most). Also, according to the principles of behavioral political science, it could possibly provoke a reaction by regulated parties (waste dischargers), who may not willingly surrender the advantage (of foisting the social costs of their pollution on other segments of society) they have presumably enjoyed for so long. Within the provincial Ministry of Environment (MOE), the proponents of this "crackdown" are confident that there is broad public recognition that serious enforcement is long overdue (Ackerman, 1980; Hehn, 1980). For

the time being, it enjoys cabinet-level support.¹² Whether the current vigilance endures in the long run however, depends on the real economic costs of implementing measures to curtail effluent discharges as well as the broader economic and social climate. In addition, there is still strong belief on the part of some Waste Management Branch officials that too tough an enforcement posture, if at the expense of friendly cooperation, will be counter-productive in the long run (Klassen, 1980). In any case, the Fraser's future is by no means assured.

At a time when the river still "has some life left," it may be advantageous to scrutinize closely some of those arrangements on which its future depends.

1.2 Study Objectives

The general goal of this exercise is to illustrate a pollution control process in action--how it is supposed to function versus how it actually does function, what it accomplishes, what it fails to, and what the possibilities for improvement are. These can be restated as more specific research objectives:

- I. Outline how the process is officially supposed to work (according to the Pollution Control Act and other official sources).

In Chapter Two, I will review the major provisions of the Pollution Control Act and discuss how these have been interpreted and incorporated into the major stages of a pollution control process by the Pollution Control Board and the Director of the Pollution Control Branch. I have divided the process into three major parts: setting of pollution control objectives (for receiving water and effluent quality), issuance of discharge permits, and the monitoring and enforcement of

permit "terms and conditions."

II. Outline how the process does work. There will, of course, be some variance between the official version and the real one. These divergences will be pointed out as best as they can be ascertained. My specific objectives are to:

A. (With regard to) setting of pollution control objectives...

1. to describe the public inquiry process by which objectives are established.
2. to ascertain type and origin of information used in setting objectives.
3. to note degree of participation by affected interest groups.
4. to establish origin of operating guidelines and effluent quality objectives. (On what technical grounds are they based? Acute toxic effects? General ecological considerations? Economic feasibility? Available technology?)
5. to compare actual revision of objectives with stated provisions for their revision.

B. Issuance of Permits...

1. to investigate means of identifying activities requiring permits.
2. to gauge numbers of permit applications approved and refused.
3. to identify who initiates contact and negotiations.
4. to trace through referral procedure as a means of consulting affected interests.
5. to establish length of time required for procedures.
6. to compare permit terms and conditions with objectives.
7. to document the effect of negotiations between the Branch, permit applicants, and other government agencies on permit requirements eventually set.
8. to determine the types of information used to assess applications for permits.

C. Monitoring and Enforcement...

1. to establish ratio of self-monitoring to government monitoring of effluent quality.
2. to establish who conducts receiving water monitoring and how much is done.
3. to ascertain how reasonable compliance with the law is interpreted.
4. to compare effluent quality required by permit with effluent quality actually attained.
5. to indicate the outcome of attempted prosecutions of violators.

III. Evaluate the above two (official and actual) processes in three ways:

1. Compare the official process with a model for controlling point-source pollution in the Lower Fraser (Chapter 2). The model represents an "ideal" approach and provides a useful standard against which to highlight some fundamental features of B.C.'s approach to point-source pollution control. The reason for this comparison is that it is not enough to simply evaluate how closely B.C.'s actual process follows its official one, for the official one itself may be flawed.

2. Compare the actual process with the official one to see how the government is carrying out its own mandate (Chapters 4-6). (Not all deviations of practice from policy are consequential--I will attempt to avoid "nitpicking".)

3. Formulate and apply evaluative criteria to the actual process (Chapters 3-6). The criteria are normative statements (implying what "should" be done) and they follow from considerations raised in Chapter 2 in conjunction with the presentation of the "model" process just discussed. They relate to the generation and use of information and public participation.

The ultimate criterion of a successful pollution control process is whether it leads to the level of water quality society desires and is willing to pay for (in terms of higher taxes, costlier products, or foregone economic advantages). However, making such a fundamental assessment is not as easy as it may seem. The way is clogged with complications and contentious methodological issues, while the result hangs on key (and debatable) assumptions. Hence, my evaluation steers toward more readily evaluated criteria pertaining more to the process of pollution control than the result, the implication being that a good process should lead to appropriate results.

IV. To the extent possible, recommend procedural or organizational changes that would improve the process according to my criteria. The suggested changes are intended to strengthen the existing regulatory process; I will not seriously explore more radical alternatives to the present regulatory system such as effluent charges, marketable "pollution rights", and so forth. Nor will I propose any changes in the present institutional structure.

From a "planning perspective" it is desirable to examine the pollution control process as a whole, rather than, say, one

of the stages discussed above. One consequence of a broader perspective however, is that many things will not be examined closely and some will not be at all. The Pollution Control Act and Regulations contain numerous provisions that I will only touch on or ignore altogether. I have selected those most directly related to the routine control of waste discharges. Thus, for example, I have largely omitted the Pollution Control Board's main role as an appeal body. It should also be remembered that I am only studying the implementation of the Act itself. Other government efforts are also part of the complete "water quality provision system", such as the Estuary Study and various programmes of federal and provincial environment departments and other agencies. I am ignoring these or only touching them indirectly.

1.3 Study Methods

My background and theoretical research consisted of reviewing general literature on engineering, ecological, economic, and administrative aspects of water pollution and its abatement, as well as many reports, documents, and papers on the specific pollution problems of the Lower Fraser. In addition, I examined written material on B.C.'s pollution control process--the 1967 Pollution Control Act itself (and amended versions), annual reports, and published and unpublished papers describing and assessing the process.

To evaluate the setting of provincial pollution control

objectives, I read the entire transcript of the proceedings of the public inquiry into establishing objectives for the "Food processing, agriculturally oriented, and other miscellaneous industries" of B.C. I also studied portions of the same record for the inquiry into "municipal-type discharges." I selected these two inquiries because both types of discharges are well represented in the Lower Fraser. For additional insight, I talked with six professionals who participated in these inquiries as members of advisory panels¹³, with two non-governmental inquiry attendees, and with the Chairman of the Pollution Control Board, whose responsibility it is to promulgate objectives and guidelines. Lastly, I studied several papers on the subject written by other observers.

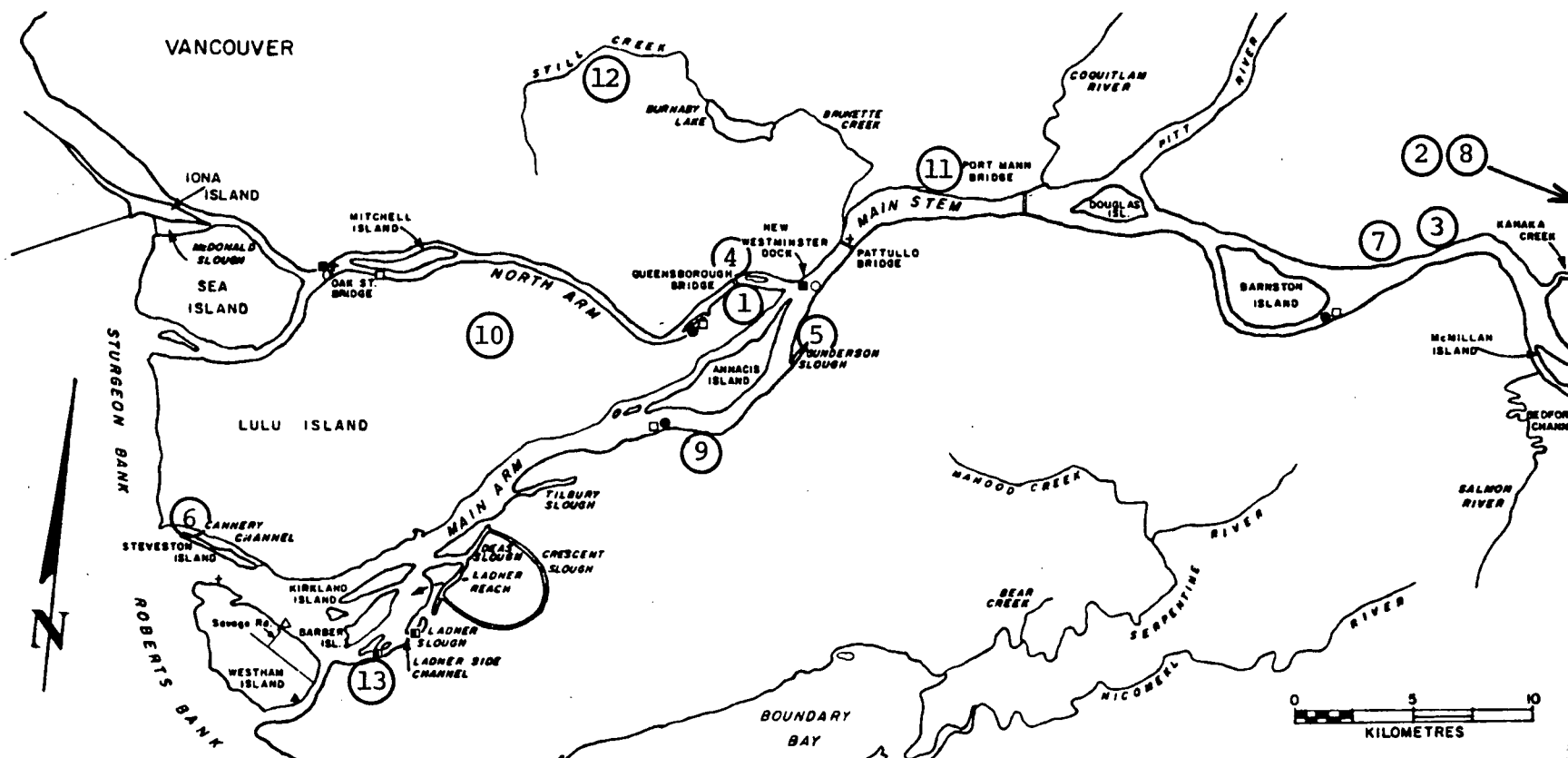
My principal sources of data in studying procedures for dealing with individual dischargers were 13 permit files supplied by the central WMB office in Victoria and the Lower Mainland Regional Office in Surrey. These are presented in Table I, and the locations of the discharges themselves shown in Figure 2. In addition to the 13 files, I inspected over 50 other permits (without the corresponding files) on view in the Lower Mainland Office. The Delta Environmental Control Office provided me with their file material in one case. On occasion, representatives of other provincial and federal agencies permitted me to peruse relevant material. FRES water quality reports compiled much effluent monitoring data that were useful in evaluating monitoring performance. To add to my insight, I interviewed and talked with individuals in the WMB, Ministry of Environment, Westwater Research Centre, federal Fisheries and

TABLE I

PERMIT FILES EXAMINED

1. PE-2 St. George Holdings Ltd.
2. PE-14 Corp. of the Village of Mission City
3. PE-77 Corp. of the District of Maple Ridge
4. PE-108 MacMillan Bloedel Packaging Ltd.
5. PE-161 Titan Steel and Wire Co. Ltd.
6. PE-1830 B.C. Packers Ltd. (Imperial Plant)
7. PE-2756 B.C. Forest Products Ltd. (Hammond Division)
8. PE-4125 Regional District of Fraser-Cheam (Town of Hope)
9. PR-4468 Vito Steel Boat & Barge Construction Ltd.
10. AE-4461 Varta Batteries Ltd.
11. PR-4745 VenDev Enterprises Ltd.
12. PR-5443 Corp. of the District of Burnaby
13. PE-5729 S.M. Products Ltd. & S.M. Properties Ltd.

FIGURE 2 -- LOCATIONS OF PERMITTEES WHOSE FILES WERE REVIEWED



(Numbers correspond to list on previous page)

Map reproduced from Fraser River Estuary Study Aquatic Biota and Sediments Report

Environmental Protection Service, municipal and regional government, public interest groups, and news media. I also interviewed one private consultant and one permit-holder. A tour of the Iona sewage treatment plant gave me a first-hand glimpse of waste treatment technology.

In selecting WMB files for review, I attempted to cover a range of operations: early and recent, effluent discharges and landfill leachates, private and municipal, large and small size, and varying types of effluent. I was fortunate in not being confined to cases that either defenders or critics of B.C.'s system assured me were "representative". However, two of 11 permit files I originally requested were denied me on the grounds that legal action was under consideration, and so it could be argued that I was missing an important fraction of permittees--those with the worst records of compliance. Still, of the 13 cases I finally did review, two are notorious among area environmentalists and are frequently cited as demonstrations of the Waste Management Branch's alleged anti-environmental bias. With the vast majority of my cases (11 of 13) however, I knew nothing of their reputations or records of compliance beforehand, so that these did not predispose the outcome of my analysis one way or the other.

Notes to Chapter One

¹ For the purposes of this study it is not necessary to distinguish between the "Lower Fraser" and the "Fraser Estuary", although in ecological studies such a technical distinction might well be drawn.

² In 1979, the Pollution Control Branch (PCB) was split into the Waste Management Branch and the Air Management Branch. For a variety of reasons, in this thesis I will use the terms Pollution Control Branch (PCB) and Waste Management Branch (WMB) interchangeably.

³ This is not to suggest that non-point contributions to pollution have been altogether ignored by the province. In the Lower Fraser for example, the problem of urban runoff has been recognized and researched (in a preliminary way) by Ferguson and Hall (1979). It is safe to say however, that non-point sources have not been controlled to date under the Act.

⁴ According to the Fraser River Estuary Study Water Quality Work Group (1979), fully half of the discharges to the Lower Fraser are from untreated stormwater runoff. The total contaminant loadings from the nearly 200 stormwater outfalls to the river were estimated to vary from between one-half to twice the loadings from the second largest sewage treatment plant in the GVRD (Annacis), depending on the pollutant in question.

⁵ For example, preliminary studies by Meyer in 1974 and 1978 on the recreational and preservation values of the Fraser salmonid stock showed mean annual "preservation values" ("value over and above that associated with recreational or aesthetic use of a resource") of \$526 and \$225 per Prince George and Vancouver household, and median household values of \$100 and \$50, respectively. Meyer concluded: "... it is clear that the residents of the Fraser River do not wish to lose any further salmon and steelhead from their river. Rather, they have a strong desire to see stocks built up to greater levels of abundance. When considering the interests of their children, this sentiment intensifies," (Meyer, 1978: p. 19).

⁶ B.C. Research Council. 1952. "Water quality in the Fraser-Thompson River System of British Columbia".

⁷ Thomas, J.F.J. 1954. "Industrial Water Resources of Canada, Water Survey Report No. 6, Fraser River Drainage Basin, 1950-1951." Canada Department of Mines and Technical Surveys, Pub.#842, Ottawa.

⁸ See Benedict et al. (1973) for more detail, B.C. Research Council (1972) for a corroborating study, and Hoos and Packman

(1974) for a compilation of studies to that date.

⁹ Even if excessive amounts of nitrogen and phosphorus did exist, the Fraser's natural turbidity would probably prevent serious algal blooms from occurring. There is presently, however, a debate as to whether increased nutrient loadings from the Lower Mainland are contributing to accelerated eutrophication of the Strait of Georgia (Stockner et al., 1980; Stockner et al., 1979; Clark and Drinnan, 1980; Drinnan and Clark, 1980).

¹⁰ The actual cost of these lost recreational opportunities to the people of the region is not easily determined. On one hand, the river's temperature, currents, and siltiness detract from its swimming potential anyway. (The Fraser River Estuary Study Recreation Work Group (1978) notes, "it is not safe to swim in the Fraser.") On the other hand, the Fraser's sandbars invite wading, beachcombing, and sunbathing, and the extent to which bacterial pollution deters potential enthusiasts is unknown. As well, nearby Wreck Beach, Tsawwassen, and Boundary Bay are popular swimming areas, the first of which occasionally approaches borderline contamination levels (Fraser River Estuary Study Water Quality Work Group, 1979). Two additional costs of bacterial pollution are the prohibition on shellfish harvesting and the added precautions that commercial fishermen and other workers on the river must take to avoid contact with the water.

¹¹ But at the same time it is not wholly inaccurate to refer to the river as a "sewer", because it is heavily polluted with human and animal waste. (See Vancouver Sun, Feb. 22, 1980, "The Fraser River a Sewer, Indians Say".) This designation is misleadingly ambiguous however, for along with the Fraser's natural muddy appearance, it tends to make the general public think the river is much "dirtier" or more polluted than it really is.

¹² In 1980, according to area newspapers, Environment Minister C.S. Rogers supported in principle the idea of a "permanent" enforcement staff for the Lower Fraser. In 1981, the Ministry announced the formation of a full-time staff of 10.

¹³ These were: J.E. Dew-Jones (WMB), M.W.H. Krueger (WMB), W.K. Oldham (UBC), R.J. Rocchini (WMB), J.R. Stein (UBC), C.C. Walden (B.C. Research).

Chapter Two

B.C.'s POLLUTION CONTROL PROCESS AND A MODEL

Water pollution is a classic, oft-cited example of a "negative externality," that is, an unintended side-effect of certain economic activities which imposes a cost on other members of society. The universal response to this widely recognized problem has been government regulation of private activities.

Since the orientation of this thesis is to the applied, I will not repeat here any of the economic interpretation of pollution presented in Seneca and Taussig (1974) and Kneese and Bower (1968), among many others. Neither will I consider the wider range of various approaches to water quality management that have been proposed in the literature.

The purpose of this chapter is to compare B.C.'s official pollution control process to a model developed in the next section. The model, which will only be sketched, is an "ideal," incorporating the basic elements and stages that I contend any serious water quality decision system must have if it is to be successful by design and not accident. The model serves as a framework against which to evaluate B.C.'s formal pollution control process. While it might be argued that comparing a "pollution control process" to a "water quality management system" is unfair and will automatically show the former to be deficient--for pollution control is only part of water quality management--I would respond that the process set up under B.C.'s

Pollution Control Act is for all intents its water quality management programme. A comparison is thus appropriate.

2.1 An Illustrative Model

A regulatory approach that is appropriate to the Lower Fraser would seem to involve:

1. The establishment of ambient standards for sections or reaches of the river and estuary in light of crude (qualitative) estimates of costs and benefits. Standards should be set for key water quality parameters; for those non-degradable pollutants with the potential for accumulation, limits should also be set for levels in sediments and organisms.

2. The estimation of total permissible loadings compatible with the ambient standards for each section, reach, or tributary of the Fraser Estuary.

3. The granting of permits to the extent consistent with the loadings allowance and the implementation of a method of allocating discharge rights between existing and future permittees once the loadings allowance is approached.

4. An ongoing programme of information generation and feedback relating to:

- a. compliance with permits and the effects of discharges on water quality;
- b. an improved understanding of the Lower Fraser's biophysical environment;
- c. changes in public preferences;

so as to permit adaptation to changes in public priorities and changes in the estuary's water quality towards or away from goals.

5. Enforcement.

The five stages of the process are not necessarily sequential, as shown here. Once the system is operational, each

may be happening concurrently. The information generated in stage 4 is fed back into each of the other stages, keeping the entire process in a continuous state of readjustment.

B.C.'s official process is now described in much more detail, and then measured against this basic model in Section 2.3.

2.2 B.C.'s Pollution Control Process

This section describes how B.C.'s pollution control apparatus is supposed to function according to its own designers' and practitioners' claims. It reviews the major provisions of provincial legislation'(the Pollution Control Act) and the ways in which these have been interpreted and implemented. I make no effort at comprehensiveness; only aspects relating to the purpose of this present study are covered here.

Accordingly, after preliminary remarks on the Act at large, the majority of this review is divided into three parts: (the province's provisions for) setting of objectives; issuance of permits; and monitoring and enforcement of permit terms and conditions. I feel that this breakdown emphasizes the stages exhibited by B.C.'s water pollution regulatory system. (Note that it does not quite correspond to the model just outlined.) Goals, targets, standards, or objectives (by whatever name) for effluent and/or receiving water quality must exist in any system, whether formal or de facto. Individual dischargers

must each be dealt with through some form of permitting or licensing procedure that authorizes the type and quantity of discharge allowed. Monitoring of effluent, receiving water quality, and pollution control equipment, even if only by visual inspection, is necessary to ensure compliance with conditions of the agreement between discharger and agency. Finally, regulators will have to deal with a certain amount of non-compliance, either by negotiating improvement or using economic or legal sanctions to combat those violations judged as serious. Halting major violations is important not only to eliminate the pollution they represent themselves, but also, as Drayton (1980) has pointed out, to set examples that will help prevent the entire system of voluntary compliance (upon which success depends) from unraveling.

2.2.1 The Pollution Control Act

The present Pollution Control Act was passed by the legislative assembly in 1967, and has been amended several times since. It is not B.C.'s first such statute. Another, called the Pollution-control Act, dates to 1956. This predecessor aimed mainly at controlling municipal sewage discharges. The latter and present Act deals with the pollution problem more generally, although s. 5 still exempts a number of activities that could well be considered "pollution"² (such as vehicle emissions, domestic burning of leaves, and various agricultural practices). "Pollution" is defined as:

the introduction into a body of water, or storing on, in or under land or discharging or emitting into the air substances or contaminants of a character to

substantially alter or impair the usefulness of the land, water or air;

while a "contaminant" is:

a substance whether gaseous, liquid, solid, odorous or any combination of any of them,
 (a) that is foreign to or in excess of the natural constituents of the air; or
 (b) that affects the natural, physical, chemical or biological quality of the air,
 and that is or may be injurious to health, safety or comfort of a person or injurious or damaging to property or to plant and animal life, or that may interfere with visibility or the normal conduct of transport or business or is obnoxious to the public;

"Pollution" is such an ambiguous, subjective term that one can see the need for precise (and ungainly) legal definitions.³

The Act charges two authorities with the power and duty to implement pollution control: the Pollution Control Board (continued from the 1956 Act) and a new administrative position, the Director of Pollution Control. The Board, defined and empowered in sections 2 and 3, consists of a chairman and other members (there are presently 12) appointed by the Lieutenant Governor in Council. It is authorized to appoint technical advisory committees and conduct inquiries that will enable it to prescribe effluent (and air emission) standards as well as determine what properties constitute a polluted environment. In addition, it serves as an appeal tribunal when formal objections or appeals are filed under the Act (sections 15 and 16).

The Director of Pollution Control is the chief administrative officer established by the Act. He possesses many of the same powers as the Board and others relating to administering the Act on a day-by-day, case-by-case basis. He is provided with a support staff (the Branch) to assist him in

discharging his duties. S. 12 states: "A director, assistant director and engineers, officers, clerks and other employees necessary for the purpose of this Act may be appointed in accordance with the Public Service Act ." The Branch now numbers nearly 200 and includes biologists and chemists as well as engineers. It used to be a department of the Water Resources Service of the now-defunct Department of Lands, Forests, and Water Resources. Reorganization has placed it within the Ministry of Environment, depicted in Figure 3.

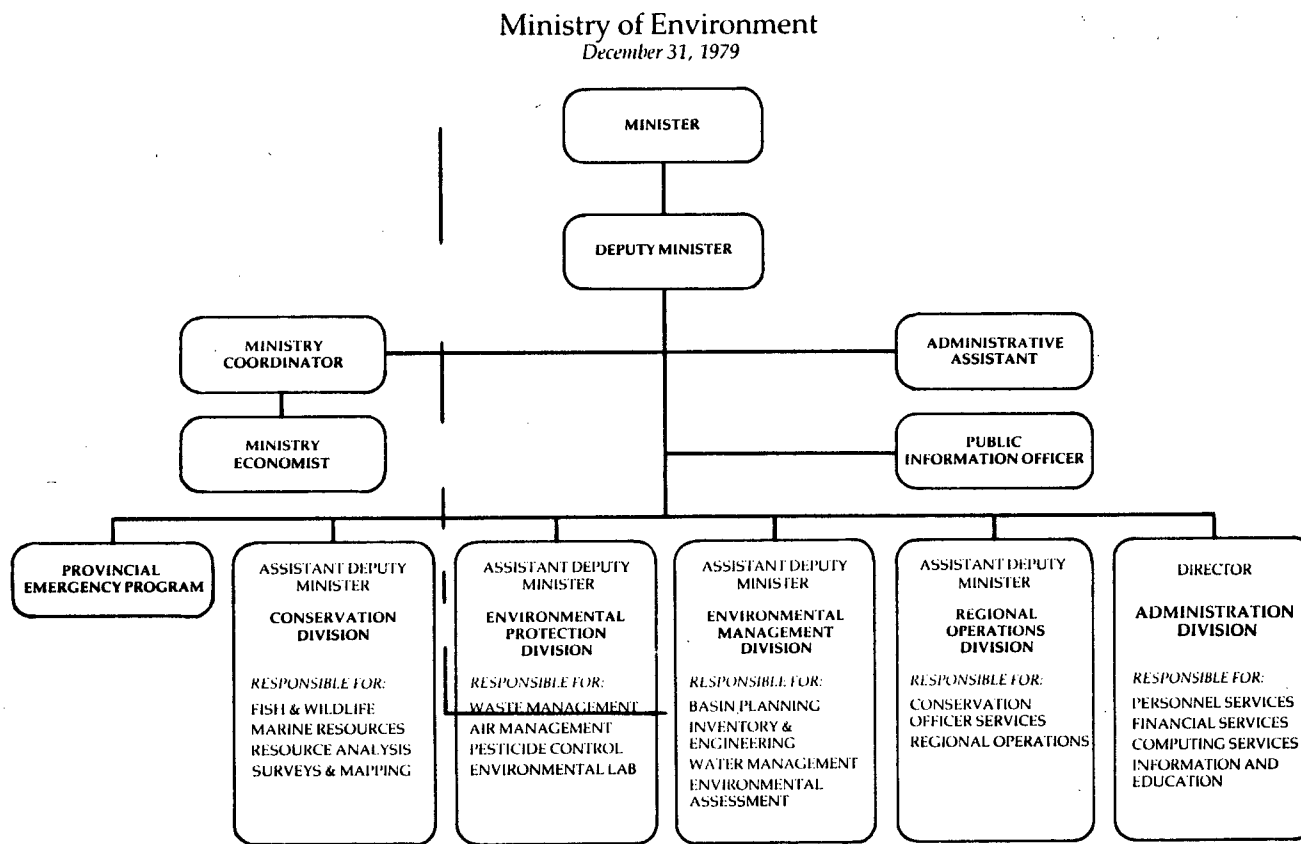
2.2.2 Setting Objectives

"The purpose behind the establishment and use of these objectives is to maintain and preserve the land, water, and air environment of British Columbia at the highest possible level."

--B.E. Marr, P. Eng., Chairman, Pollution Control Board,
Report on Pollution Control Objectives for
 Municipal Type Waste Discharges in British Columbia, 1975

The Act itself does not define levels of environmental quality the maintenance of which are considered the provincial government's explicit policy. That is, it does not specify that dissolved oxygen, for instance, should drop no lower than (say) 7 mg/l, that it should be kept at levels high enough for the survival of all fish species, or that suspended solids can be raised no higher than ten percent above natural background levels. Nor does it specify standards for the character or quality of effluent that must be met by dischargers within the province. Instead, this task is delegated to both the Board and the Director. Sections 3 and 13 respectively, give them explicit authority, "to determine what qualities and properties of water, land, or air constitute a polluted condition," and "to

FIGURE 3 -- Position of Waste Management Branch
in Provincial Bureaucracy



(From B.C. Ministry of Environment, Annual Report, 1979)

prescribe standards regarding the quality and character of the effluent or contaminant which may be discharged into any waters..."

In 1968 the Board issued its first set of pollution control requirements under the 1967 Act for the Lower Fraser--"The Policy of the Pollution Control Board of British Columbia Regarding Pollution Control on the Fraser River Below the Town of Hope" (B.C. Pollution Control Board, 1968). The "general objective", or policy, was "the maintenance of the Lower Fraser River as a multi-purpose water resource for the people of the province for all time". Two "specific objectives" were put forth to pursue the general objective. These were, first, to protect from "harmful pollution and toxic substances" areas of the river that were still clean, and second, to improve those parts of the river in which some degradation of water quality had already occurred.

While the above two "specific objectives" are hardly specific enough to use in regulating the discharges of individual river users, they do provide a general policy around which to structure more detailed measures. Along with calling for a comprehensive river monitoring programme, the Board listed six pollution control requirements. Among these were that all new municipal and industrial works discharging into the river required primary treatment right from the start, and that all existing works required primary treatment by 1975. In the North Arm, secondary treatment was required.

The final statement of the 1968 Policy was: "Any deviation from the above prescribed policy shall be at the discretion of

the Board."

According to another document by the B.C. Water Resources Service (1970), a study and public hearings preceded the setting of the above policy.

In the seventies, establishment of official provincial policy on water pollution began in earnest. In 1971 the Board issued two policy statements on pollution control: "Minimum Requirements for Disposal of Municipal and Domestic Wastewaters to Surface Waters" and "Minimum Requirements for Refuse Disposal to Land". The former specified that all municipal sewage discharges to freshwater exceeding 10,000 gallons per day (GPD)--an amount corresponding to the waste discharge from a very small village--would need secondary treatment. From 1970 to 1973, a series of five public inquiries were held to set "Pollution Control Objectives" for five categories of waste dischargers: forest products, mining and smelting, "municipal-type" (sewage and refuse), chemical and petroleum, and "agriculturally oriented, food processing and miscellaneous". ("Miscellaneous" dischargers include everything from metal finishing plants to dog kennels.)

"Objectives" take basically three forms--those relating to operating procedures, effluent quality, and receiving water quality. The first of these are recommendations and requirements on the operation of waste facilities covered under the Act. Landfills, for example, are required to cover their refuse at stated frequencies and may only accept designated waste materials.

The effluent quality objectives resulting from the first

round of inquiries manifest a belief in the desirability of flexibility in applying standards over wide areas. Industrial processes differ from plant to plant. Local receiving environments differ in their "assimilative capacity". Regions differ in their attitudes towards water quality. Plants differ in their profitability and in their economic importance to neighboring communities. Retrofitting older operations with pollution control equipment is more expensive than installing devices and processes at the very start in new plants.

The Objectives exhibit this flexibility in two ways . First, they are not "standards", as this word is commonly used to denote uniform, inflexible rules to which adherence is mandatory for all. The Objectives are more like targets: levels of effluent quality for which waste dischargers should be striving. As pointed out by the West Coast Environmental Law Research Foundation (1980), they have been tested in provincial court and are not legally enforceable. They are to guide Branch personnel and the Director in prescribing terms and conditions for waste discharge permits (which do have legal force). The second manner in which the Objectives preserve flexibility is that allowance is made for the greater difficulty of old and existing operations in meeting higher levels of effluent quality. In most cases, three levels of effluent quality--A,B, and C--have been adopted.

Level A is the most stringent Objective. It is the level recommended as the ultimate goal for the type of discharge in question. It is expected that, in general, all new operations should conform to Level A pollution control objectives. Level

B, an intermediate grade of effluent, is an interim objective for existing dischargers. Level C is the recommended objective all existing dischargers are expected to meet immediately or very soon.⁴ These objectives are recommended by the Board as "minimum requirements" for the various types of waste dischargers. It is still the discretion of Branch personnel as to how they should be applied in individual circumstances.

The Objectives for effluent are flexible in yet another way. The intent has been to subject them to review and revision (upgrading or downgrading, as the case may be) perhaps every five years, in order to incorporate changes in technology, economics, and environmental concerns as well as the experience gained in attempting to implement them (Venables, 1970).

A key feature of the Objectives is the cursory attention given to receiving water quality in comparison to effluent properties. In its earlier 1968 policy statement on the Lower Fraser, the Pollution Control Board stated: "The Board's chief concern is the quality of the Lower Fraser River.... however, the Board feels that is impractical to set standards for the receiving waters of the river, but instead, has decided to control individual effluents into the river and in this way, maintain or improve the quality of the river itself". Thus recognition existed that the ultimate social goal is the set of services rendered by a particular level of water quality, not successful regulation of effluent discharges per se. Regulation of waste discharge would, however, be the chief means by which the end of water quality preservation would be sought.

Three of the five reports list Objectives for receiving

water quality; the other two list "guidelines". The terms are essentially identical.⁵ Table II shows the guidelines for the quality of receiving waters for the "food processing, agriculturally oriented and miscellaneous" industries. These criteria are to be met outside of the initial dilution zone (IDZ) of each waste outfall (although if they are not, there is no violation, since receiving water quality guidelines and objectives are not incorporated into Permits). For rivers and streams, according to the Report, this zone is "waters contained within an area extending 300 feet down current from a point of discharge, and within a lateral distance not exceeding one-half the width of a river or stream at the point of discharge". For municipal discharges, it extends to only 25% of the river width. The IDZ concept recognizes that within the immediate vicinity of a major outfall, water quality will be somewhere between pure effluent and pure river water, and perhaps unsatisfactory in quality. The premise is that localized areas of some degradation in a body of water are unavoidable, unless effluent quality actually equals water quality, which is possible but exceedingly expensive. This point is a controversial one, for it is obvious that IDZ's will begin to overlap as the concentration of dischargers increases.

The studies that led to the establishment of each set of Objectives were all public inquiries, as suggested in s. 17 of the Act, and each included public hearings at which affected interests--individuals concerned about pollution and affected industries alike--could present briefs addressing the "technical considerations" relating to the type of pollution being

TABLE II
GUIDELINES FOR THE QUALITY OF RECEIVING WATERS^{1,2}

Parameter	Guideline
Dissolved oxygen (percent saturation)	Not less than 90 percent of the seasonal natural value. ³
Temperature (°C)	To be within 1°C of the natural level.
Turbidity (APHA units)	Not more than 5 APHA units above the natural level.
Floatable solids and scum	Negligible increase.
Settleable solids	Negligible increase.
pH	No change.
Toxicity	Below detectable limit.
Aesthetics	No decrease.
Colour	No appreciable change. ⁴
Coliforms (mpn/100 ml)	(5)
Chlorine residual (mg/l)	Below detectable limits.

¹ From "Pollution Control Objectives for Food-processing, Agriculturally Oriented, and Other Miscellaneous Industries of British Columbia."

² These guidelines are not applicable within the initial dilution zone.

³ Not applicable to lakes or natural impoundments, these will be assessed on an individual basis.

⁴ To be reviewed.

⁵ Most Probable Number Index per 100 ml, not to exceed established B.C. Health Branch Recommended Water Quality Standards.

assessed. Participants could cross-examine one another. These inquiries are called by the Cabinet or the Board and chaired by the Director, the Board Chairman, or their appointee. A technical advisory panel, chosen either by the Director or the Board for their expertise in the engineering, social, economic, and ecological aspects of pollution control, gathers information from the hearing and their own research, and assists the Board in drawing up recommended objectives. Participants are given the opportunity of commenting on draft Objectives before they are finalized.

In the longer run, however, no set of Objectives arising from any one Inquiry is "final." Their very basis is adaptability in response to feedback. According to a former Assistant Director: "the public knows that within 5 years, it will have an opportunity to re-examine the objectives and thus be assured of continued involvement." (Chmelauskas, 1972: p. 485).

2.2.3 Granting Permits

After January 1, 1970, it became illegal to "directly or indirectly, discharge or cause or permit the discharge of effluent or other waste material on, or in or under land or into water without a permit or approval from the director," (s. 4). It is the waste discharger's responsibility to apply for and receive a permit before discharge has actually commenced. To fail this is a clear violation of the Act. The Director is not to issue a permit until an applicant has supplied the necessary information, which includes proposed pollution control works and

procedures as well as the quantity and quality of effluent to be discharged. (Applicants for a refuse disposal permit need only furnish a description of the type and quantity of refuse, not an analysis of the potential leachate.) There is no requirement for an appraisal of its possible environmental impact. This is apparently considered the responsibility of the Branch and the resource agencies to which the application is referred for comment.

Upon receipt of an application, the Director forwards a copy to the Ministries of Health, Agriculture, and Environment for their consideration over a thirty day period or a longer time set by the Director (s. 4). The appropriate agencies may then file recommendations with the Director, who is ordered to consider, but not necessarily follow them in making his decision as to whether and under what conditions to grant the permit. "If any of these Departments decide to take a position which can be substantiated we will honour this position and if necessary reject the application." (Venables, 1970: pp. 7-8).

Individuals or other agencies dissatisfied with the Director's decisions do have legal recourse under the Act. Sections 15 and 16 outline the basic procedure for appeals and objections. Formal objections are made to the Director at the time a permit application or amendment application is under consideration. A former Director has stated that when an objection is made, the Branch's procedure is one, "of meeting informally with involved parties in order to establish clear understanding of the issues and to attempt to secure resolution of differences," (Venables, 1977: p. 99). Appeals lie from any

Order under the Act, and usually stem from permit approvals or rejections by the Director. The appellant may carry his case to the Board, Cabinet, or the B.C. Supreme Court for adjudication.

The procedures for new permit applications also extend to applying for those amendments to existing permits that would allow a larger discharge. In addition, the Director is empowered by s. 8 to amend any permit himself for a number of reasons.

These are the major provisions in the Act for issuing and amending permits. The Act's Regulations specify still more, and other practices have emerged as these provisions have been implemented. The Regulations state that the applicant must post a signed copy of the application on-site as well as publish other copies in The British Columbia Gazette and in local newspapers, as specified by the Director (2.01(g)). Both deeds are intended to inform the public of the proposed waste discharge.

The Regulations have been amended by Orders-in-Council a number of times, most recently in 1978. The 1978 Regulations provide an updated list of referral agencies that reflects government re-organization. Copies of the application are to be forwarded to the Comptroller of Water Rights, the Deputy Minister of Agriculture the Deputy Minister of Health, and the Deputy Minister of Recreation and Conservation. (Subsequent re-organization has moved the Fish and Wildlife Branch from the Ministry of Recreation and Conservation to the Environment Ministry, also home of the WMB.)

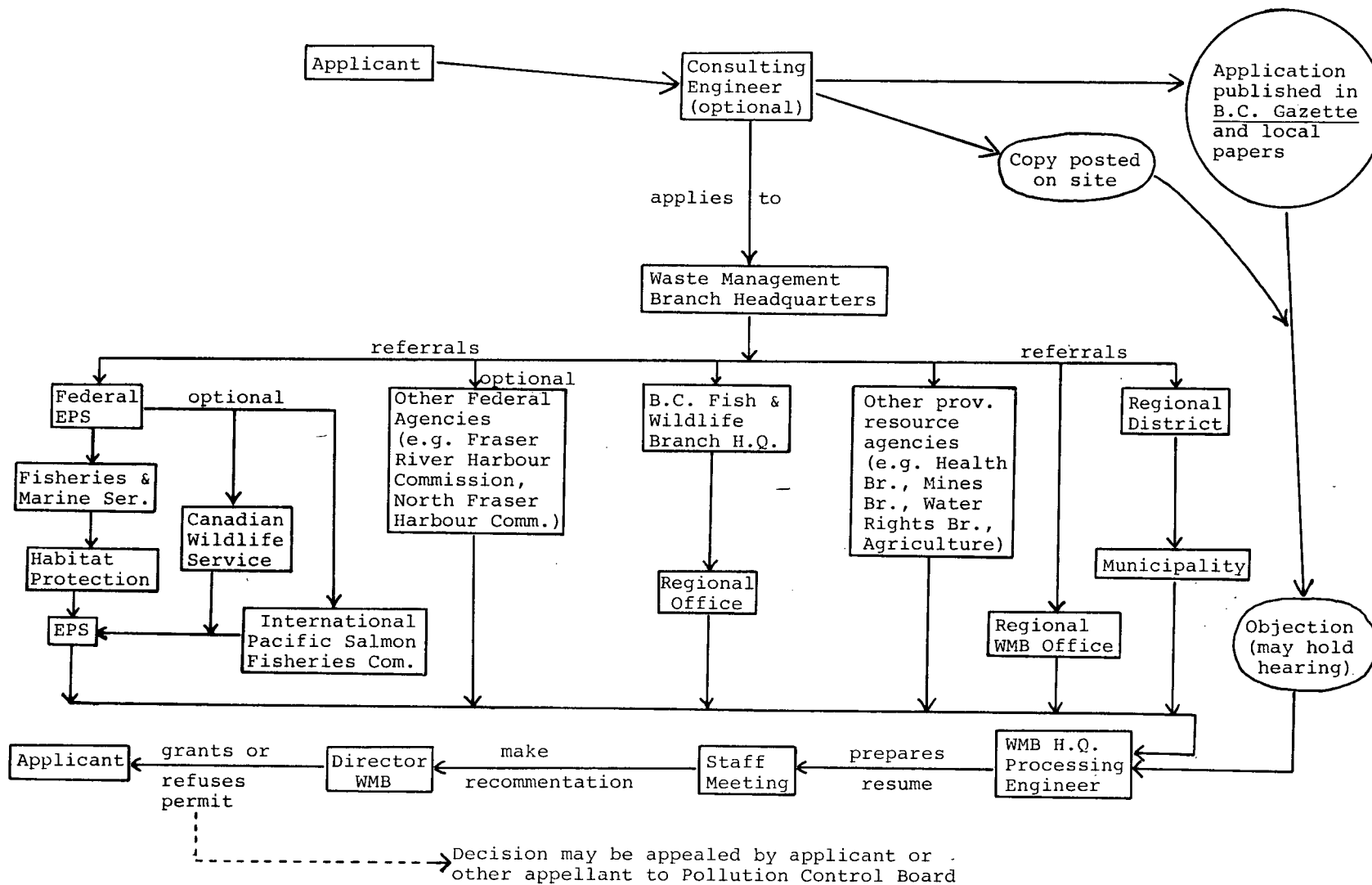
Since the early 1970's, an unwritten covenant between the

PCB and the federal Environmental Protection Service (EPS) on matters of joint jurisdiction has led the Branch to refer all permit applications to EPS as well.⁶ EPS then circulates them among other federal departments, particularly the Habitat Protection Directorate and the Fisheries and Marine Service of the Department of Fisheries and Oceans, compiles and summarizes the comments, and returns them to WMB processing staff. The Branch also makes a practice of forwarding a copy of the application to the Regional District office in which the discharge will occur. Figure 4 displays these referral procedures.

In actuality, at this time the Director himself does not conduct the routine investigation associated with each permit application. The head Victoria office contains a number of staff engineers, divided into the Industrial Division and the Municipal Division, who assemble and assess the pertinent information. In addition, the regional office, in this case the Lower Mainland Office (LMO), prepares its own assessment (including a site investigation report) which is sent to Victoria. The Victoria staff engineer assigned to a particular permit application prepares a "technical assessment" of the application, as well as a "resume". The latter incorporates technical considerations, responses from other agencies, objectors, the Regional Office, and a recommendation to the Director. Each application resume is reviewed in a meeting of the processing staff before going to the Director or Assistant Director (who may also sign permits) for a final verdict.

A permit itself specifies the quality and quantity of

FIGURE 4 -- Waste Management Branch Permit Application
Circulation Procedures



effluent that may be discharged by its holder. One way of doing this is by specifying average and maximum daily flow rates of effluent along with permissible levels of contamination specified on a mg/l basis. A typical example for a small factory discharging sanitary sewage directly into the river (instead of being connected to a municipal sewer) would perhaps be a maximum daily flow rate of 3 m³, and a BOD (5 day biochemical oxygen demand) of 45 mg/l and s.s. (suspended solids) of 60 mg/l. Another way of expressing loadings of pollutants to the river is in lbs or kg/day, which is often used in describing heavy metals and toxic organic compounds. Still a third way is to link loadings with factory inputs or outputs, or so many units of pollutant per unit of product. Fish processing plants are supposed to express their discharges in these terms. The fourth and final approach sometimes used in B.C. is to specify permissible concentrations of a substance over and above background levels found in the receiving water.

One might assume that levels of discharge considered permissible do not cause pollution as it is defined in the Act ("substantially alter the usefulness of the ...water"), but there is nothing in the Act or its Regulations that would prevent a regulator from knowingly or unknowingly setting too liberal a discharge that could indeed damage local waters. Hypothetically, a permittee could badly pollute a stretch of water and never break the law.⁷

In conclusion, B.C. approaches the problem of regulating the behaviour of numerous individual waste dischargers by requiring each to hold a permit specifying precisely the

quantity and quality of effluent that may be discharged. The onus is on private individuals contemplating an enterprise that entails waste discharge to approach the Branch for a permit. The application is advertised to some degree. A permit referral system exists to inform and consult potentially affected interests. Most of the work in processing permits is still carried out from the central office, although the government's policy of decentralizing its activities may see the workload shifting towards regional offices.

Chapter Five will probe this stage of the pollution control process more deeply by investigating actual examples of how it has worked in the Lower Fraser.

2.2.4 Monitoring and Enforcement

Once a permit has been issued and discharge commences, the job of controlling pollution has really only begun. Devices, equipment, processes, practices, and treatment facilities (all referred to as "pollution control works" in the Act and on permits) that have been added to the operation to curtail discharge must be properly installed and maintained or they will function inefficiently or not at all. To see how well the works are controlling discharges, and whether permit terms are being met, a monitoring programme is an integral part of any abatement programme.

If it is to function effectively, any pollution control system must rely on voluntary compliance. If all industries simultaneously refused to cooperate, there would be little the typical pollution control agency could do to stop them itself.

Regulators make the point that the great majority of polluters are cooperative (U.S. EPA, 1980a; Miller, 1980), but there will always be footdraggers with which to contend, and some means for dealing with them must be available. Drayton (1980) observes that most problems of enforcing anti-pollution regulations arise because the regulations typically require behaviour of people that is not in their economic self-interest: "...for example, a company must make a large investment in equipment which produces no revenue; the company does not recoup its costs, let alone make a profit on this investment. Nearly any other investment would be more profitable, so the incentive to delay or avoid compliance with regulations is great," (p. 5).

Therefore, the regulatory agency must devote a measure of its own resources to enforcement. In British Columbia enforcement would consist of ensuring that all waste dischargers have permits as required by the Act, that permit terms and conditions (both procedural and substantive) are adhered to, and that significant violations, deliberate or not, are terminated, either by negotiation or recourse to legal action. Unless the agency is perceived by would-be polluters as something more than a "paper tiger", the performance of many is apt to be less than desirable, and the efficacy of the entire system may eventually be undermined.

The Act provides penalties for convicted offences. S. 25 states that every person convicted of an offence against the Act is liable to a fine not exceeding \$10,000 or to imprisonment for one year or to both. If the offence is of a continuing nature, a fine of \$500 may be levied for each day it continues.⁸ It

should be stressed that offences are not construed only as dumping without a permit or discharging outside the terms of a permit (substantive violations) but also as refusal to comply with orders issued under the Act, such as to supply diagrams of certain pollution control works or to initiate and report effluent sampling (procedural violations).

S. 14 of the Act empowers officers, who include Regional Managers and Assistant Regional Managers, to "enter at any time in and on any land and premises to inspect, regulate, close or lock any works or premises..." Regional officers can also initiate prosecutions by recording the appropriate evidence and passing it onto Crown Counsel who, upon consideration of the likelihood that it will lead to a conviction, may decide to lay an information, or press charges. More recently, reorganization of the Ministry of Environment has given Conservation Officers, that is, agents of the Conservation Officer Service, a separate department within the Ministry, the authority to police the Pollution Control Act along with the others they already enforce.

In the seventies at least, it has been the unwritten policy of the Branch to negotiate rather than litigate compliance (Sproule-Jones and Peterson, 1976). The difficulty of winning court cases and the cost and time required to prepare them might be part of the reason for this. Another could be a "period of grace" in which dischargers are given the chance to comply voluntarily. As mentioned in Chapter One, some Branch officials believe that a cooperative approach ultimately leads not only to better relations but to better results as well. Some

prosecutions have been made under the Act however.

The Act itself stipulates no requirements for monitoring the performance of the permitted dischargers or the condition of the water resource itself. According to one regional pollution control engineer with whom I spoke, the Branch undertakes its own water quality sampling of the Fraser to monitor the background condition of the river. Effluent discharged into the river must also be sampled to ensure compliance with the discharger's permit. My inspection of over 50 permits revealed that virtually every permit-holder is ordered to conduct his own sampling and submit the results to the Lower Mainland office, usually semi-annually or annually. Monitoring has been a requirement of permits since about 1971. Data received from permittees are entered into the Branch's computerized information storage and retrieval system EQUIS (Environmental Quality Information System), where it is available for review by Branch personnel, other agencies, or members of the public (Venables, 1973).

If the firm is not in compliance with the substantive requirements of its permit, regional engineers and officers endeavor to work with them in an effort to improve performance and bring them into line⁹ (Miller, 1980; Wong, 1980). According to the former Director of the Branch:

Where the permittee is complying with his permit but the discharge, or the combination of other discharges, are causing pollution, the Director will use his powers...and amend the permit - or permits - to require additional works or improved operation that would result in abatement of the pollution. (Venables, 1973:pp. 3-4)

In the words of Sproule-Jones and Peterson (1976: p. 160):

"Unintentional violations, for example where the treatment process malfunctions, are, in the opinion of the Pollution Control Branch, dealt with much more effectively by dealing directly with the offending plant rather than through the courts." Chapter Six tests this claim.

2.3 A Critique of B.C.'s Official Process

2.3.1 Establishment of Ambient Standards

In 1968 the Pollution Control Board established their "policy" for the Lower Fraser (the only section of waterway in the province to receive such treatment), which might be construed as a rudimentary form of standard. The policy objective, it will be recalled, was "the maintenance of the Lower Fraser River as a multi-purpose resource for the people of the province for all time." One such purpose the Board undoubtedly had in mind was the Fraser's role as a transportation corridor for the commercially and recreationally important salmon and steelhead.

Deciding to preserve these fish corresponds to establishing "ambient standards... in light of crude (qualitative) estimates of costs and benefits," (Step 1 of the model). Based on a study and public hearings that the B.C. Water Resources Service (1970) says were held, the Board apparently felt that the value (benefit) of preserving the salmon run (and other existing uses of the river) outweighed the cost. One such cost would be that of controlling pollutants that otherwise might freely be discharged to the river, a convenient form of disposal. (It is

perhaps worth noting that the policy objective is very vague--it does not establish priorities between competing uses of the river. It would be useless in adjudicating specific conflicts over pollution, because no one source of pollution is likely to eliminate the entire fishery, i.e. threaten the river's status as a "multi-purpose resource," and therefore it would not violate the policy.)

Once a decision has been made to maintain the fishery, the next step is to prescribe--as well as knowledge permits--the conditions necessary for its maintenance. Ambient water quality standards are an attempt to explicitly articulate these conditions. In Chapter One I mentioned that the U. S. Water Pollution Control Administration believed 7.8 mg/L of dissolved oxygen provided a high degree of protection for salmon (Hall, 1976). As a preliminary step, a value like this might be set as the minimum level acceptable for each reach of the Lower Fraser. M. Clark (1980b), of B.C.'s WMB, has compiled a number of criteria for important water quality parameters reported in European, Canadian and American literature that would be useful in such a programme. Once set, standards could later be adjusted in light of new information on the degree of protection they afford or the cost of pursuing them.

B.C. has elected not to establish general ambient standards, criteria, guidelines, or objectives. The "receiving water quality guidelines" in existence pertain only to the impacts of specific discharges; they do not address overall conditions. The absence of formal ambient standards does not mean that ambient conditions are not considered tacitly in

decision-making. They have to be, for no pollution control effort makes sense except in reference to water quality conditions that are considered desirable (or at least acceptable). Not making such conditions explicit, in the form of standards (or whatever name they go by) serves only to obscure the effectiveness of pollution control efforts in pursuing desirable ends.

2.3.2 Estimation of Total Permissible Loadings

Since neither the WMB nor any other agency have established standards from which the estimates of permissible loadings are derived, these calculations have not been carried out.

In the FRES water quality investigations, the impact of the sewage discharge at Annacis Island on water quality in the Main Arm was estimated for the present and for future scenarios. The finding was that one approximation of acute toxicity would be approached by 2020 (based on the 1970 projected growth rate) during periods of low flow and assuming no upgrading of treatment. The factors in this calculation--pollutant loadings, river volume and velocity, mixing rates, tidal influence--are those that would be used in computing rough total loadings estimates based on ambient criteria. This exercise represents a modest step in the direction that should be taken if the river's assimilative capacity is to be taxed more heavily.

The Waste Management Branch need not necessarily develop its own expertise in modelling and estuarine hydrology, but might encourage, coordinate, and use research by other established institutions that already have some experience, for

example the Institute of Ocean Studies, Western Canada Hydraulics Laboratory, Geological Survey of Canada, and the UBC Dept. Of Civil Engineering, Dept. of Geology and Oceanography, and Westwater Research Centre. An example of a mathematical model predicting dissolved oxygen concentrations is found in Koch (1976), "Lower Fraser River/Estuary Dissolved Oxygen Dynamics," while Joy (1974) has modelled concentrations of pollutants in the Fraser Estuary resulting from assumed effluent discharges.

2.3.3 Granting of Permits

In evaluating each application for a permit, the Branch considers the ability of the river at the site of discharge to dilute the effluent, but since they do not possess overall loadings estimates, there is no explicit effort to relate the proposed discharge volume to some overall limit or ceiling.

The focus of B.C.'s current permitting procedure has been on curbing individual effluent discharges so as to reduce the pollution each causes by itself. According to the studies cited in Chapter One, overall the river still appears in more or less good shape relative to the minimum conditions necessary to support fish. Since physical water quality parameters remain high and showed no downward trend from 1970 to 1978 (Drinnan and Clark, 1980), it might actually be argued that the placement of any control measures on direct discharges to the river has imposed unnecessary or at least premature costs, since overall water quality is "at least as high as necessary." (This argument does not refer to smaller tributaries of the Fraser.)

In other words, the province has actually been too strict in applying any controls at all. A corollary is that serious efforts to curtail waste discharges should be made only when the capacity constraints of the river are actually being approached.

Such an argument has several serious flaws, all relating to a total disregard for caution. First, it assumes perfect knowledge both of the river's hypothetical "assimilative capacity" and of what substances of concern actually are being dumped into it. Uncertainty is assumed away. Second, concentrations of dissolved and and suspended non-biodegradable substances that appear to be safe according to water quality criteria may still lead to unacceptable accumulation in sediments and biomagnification in aquatic organisms. Third, to suggest that control should begin only when limits are actually approached is to underestimate the time needed to overcome social inertia and to achieve results. After more than a decade of existence, B.C.'s pollution control programme is still bringing long-term dischargers under control for the first time. Fourth, basing efforts to control individual discharges solely on river or reach ambient conditions ignores potentially significant localized degradation that may be repeated frequently. It is conceivable that a reach could show satisfactory conditions overall if water quality samples are averaged together, when in reality it has been seriously compromised through a number of zones of severe degradation. For all of these reasons it is prudent to have a control system in place well before conspicuous degradation actually appears.

2.3.4 Information Generation and Feedback

The official process allows for the determination of compliance by requiring permittees to sample their own effluent regularly and report the results at periodic intervals. Receiving water monitoring is conducted by the Branch to determine the effects of discharges on water quality. This information is stored in a central data bank.

The Branch itself does not invest heavily in basic research to improve understanding of the Fraser Estuary, but this would not be a shortcoming if other provincial or federal agencies or universities did instead. This does not appear to be the case however. According to Sroule-Jones and Peterson (1976), the research conducted in the Lower Fraser is not well-coordinated. The Westwater Research Centre (1979) observed: "It is our impression that research efforts in the Fraser are declining." The recommendations for monitoring and special studies made by the Estuary Study (FRES Water Quality Work Group, 1979) are a step in the right direction, but it remains to be seen just how completely that will actually be implemented.

B.C.'s approach would seem to be able to reflect changes in public preferences through participation in the Board's periodic inquiries, by Objections to permits and Appeals of Orders, and more indirectly through the normal channels available to citizens in a democracy: influencing the elected representatives who control the Waste Management Branch. The Branch does not appear to actively solicit the wider public's preferences through any of the techniques mentioned by Heberlein (1976). Instead, it carries out directives issued from a top by the

government popularly elected by the voting public.

2.3.5 Enforcement

B.C.'s process includes provisions for compliance with the Act. The Director can suspend or cancel a permit for failure to comply with permit terms. The Regional Manager or his assistant and Conservation Officers are able to lay charges against offenders. It has not been the policy of the Branch to prosecute or threaten prosecution where they believe a genuine effort to comply has been made or where real cost problems impede compliance. The maximum fine for convicted violators is \$10,000. This amount in itself would not seem to deter large operators from violating the Act. The official process, thus, relies on cooperation and negotiation, not stiff enforcement policies, to pursue its goals. If closer scrutiny of the process shows that this works, then it can hardly be considered a deficiency.

Notes to Chapter Two

¹ Although Ince (1976) and Sproule-Jones and Peterson (1976) between them list seven other provincial statutes that could conceivably be applicable to controlling water pollution in the Fraser--among them the Health Act, Water Act, Municipal Act, Litter Act, Fisheries Act, Land Act, and Environment and Land Use Act--in fact only the Pollution Control Act and the Health Act have been utilized to any extent in regulating water pollution. Apparently, this is due at least partly to an unwritten convention within the provincial bureaucracy of deferring all water pollution control matters to the Waste Management Branch, whose primary mandate is pollution control, to avoid duplication of effort. Health Branch officials seem to largely carry out their water pollution-related mandate through the WMB's permit application referral system.

² Some of these are omitted because other legislation already covers them, others because they are considered insignificant, impractical to enforce, or simply do not fit common conceptions of "pollution". Noise and radioactive wastes are certainly regarded as pollution by most people, yet are neither regulated by the Act nor specifically exempted from it in s. 5. (The former is generally controlled by municipal by-laws, the latter federally.) Many other frequently occurring, potentially damaging activities or their side-effects, like sloppy disposal of engine oil, construction-related erosion, indiscriminate garbage dumping, littering, oil spills, discharge of domestic wastes from boats, and many more, are not in practice controlled under the Pollution Control Act, although they are not specifically exempted from it. Some are covered by other legislation, some are not.

³ Yet as precise as this definition seems to be, in itself it is still imperfect in conveying what the Act intends to control. Many activities discharging wastes or contaminants into large waterways do not by themselves "substantially alter or impair" the waterways' usefulness, although the wastes would commonly be considered "pollution" and are indeed regulated by the 1967 Act.

⁴ It should be borne in mind that "immediately" or "soon" refer to dates that by now should be past. The original Objectives were issued in Sept. 1971 for the forest products industry, Nov. 1973 for the mining and smelting industries, March 1974 for the chemical and petroleum industries, Jan. 1975 for food processing, agriculturally oriented and miscellaneous industries, and Sept. 1975 for municipal-type discharges. Presumably by this time, at least Level C and perhaps Level B should have been met by all dischargers if the recommended objectives and schedule have been followed.

⁵ Originally, the word "guideline" was preferred so as to distinguish it from an effluent quality objective, which would be used in developing the effluent limits of a permit.

⁶ Actually, this "courtesy arrangement" dates back to about 1960, when staff engineers of the Pollution Control Board would directly notify the Federal Dept. of Fisheries about permit applications. EPS did not exist then.

⁷ Although some would argue that in practical terms, this could never happen because the regulator would fear an infuriated public, they overlook the ease with which unsavory practices can be perpetrated in remoter areas with few or no watchdogs.

⁸ It is unclear just how this clause would be invoked in a prosecution. To the knowledge of the Regional Manager of the WMB for the Lower Mainland, it never has been.

⁹ Sproule-Jones and Peterson (1976) provide an example of this sort of interactive approach in a chapter of The Uncertain Future of the Lower Fraser. The B.C. Packers Imperial Plant, a fish-processing operation on Cannery Channel of the Main Arm of the Fraser, installed a pollution control device tested by the Fisheries Research Board of Canada and the PCB later granted a permit based on the demonstrated capability of this device to reduce BOD and solids. In actual use, it failed to function as well as it had experimentally, so that B.C. Packers was consistently in violation of its permit. The Branch did not contemplate legal action, but offered assistance.

Chapter Three

EVALUATION CRITERIA

Describing how B.C.'s Pollution Control Act really has been implemented in the Lower Fraser is not enough. We also want to know how well it has been implemented. This implies evaluation as well as description, and evaluation implies comparison with some implicit or explicit norms, standards, criteria, or framework. In this chapter I develop three criteria and a number of sub-criteria around which to structure my evaluation of B.C.'s actual pollution control process in the next three chapters.

The first criterion is simply that the process actually found in the Lower Fraser should conform highly with the official process outlined by the Act and Regulations. The second and third criteria--relating to generation and use of information, and participation by affected interests--stem from general logic and broad democratic precepts widely espoused in modern Western thought (and equally widely flouted in Western practice). They are very similar to those used by other researchers in assessing various institutional arrangements for managing natural resources, for instance Fox (1970), Fox and Wible (1973), Swainson (1976), Sproule-Jones and Peterson (1976), and Franson et al. (1976).

The closer B.C.'s process comes to satisfying these criteria, the closer it comes to doing a "good" job, at least according to one set of measures.

3.1 Compliance with Prescribed Procedures

This criterion focuses on a question of much interest to the news media and general public: Is the law being followed? More precisely, ARE BOTH THE BRANCH AND DISCHARGERS COVERED UNDER THE ACT CONFORMING WITH STIPULATIONS OF THE ACT, ITS REGULATIONS AND STATED POLICY ?

In assessing this question, I will compare actual performance with prescribed requirements on four points:

- 1). Is the Branch faithfully executing the terms of the Act and Regulations in processing of permit applications?
- 2). Is effluent monitoring being carried out according to Permit requirements?
- 3). Are prescribed effluent limits (standards) being met?
- 4). Are all dischargers being controlled by Permit?

This criterion best lends itself to evaluating the second and third stages of B.C.'s process--issuing permits and monitoring and enforcement. (The first stage, establishing objectives, does not involve compliance with pre-ordained procedures so much.) The first question above pertains to issuance of permits, while the next three pertain to monitoring and enforcement.

3.2 Generation and Use of Information

In the pollution control field a number of decisions are made continually that depend on information such as the availability and cost of abatement technologies, effect of discharges on receiving waters, and so on. Setting specific targets for effluent or stream quality is one such decision, while writing the terms under which a discharger may dispose of

his or her waste is another. (These correspond to objective-setting and permit granting in B.C.)

It is recognized that information is neither complete nor free. In an ideal world public policy-makers would have perfect knowledge of both the value preferences of the public whose interests they serve, and of the consequences of their decisions. In reality they have neither. Values are relative, difficult to rank, and continuously in a state of flux in any one individual, not to mention a society of millions of different individuals. Understanding of the environment's complex behaviour is too limited to enable precise, reliable prediction of its response to different types of wastes discharged in variable quantities and combinations. The consequence of these two sources of uncertainty is that those making decisions regarding the types and quantity of waste discharged into the Lower Fraser must take risks. If they approve too high a level of discharge, they risk damaging the river. If they demand too low a level (higher treatment), they have forced industry or rate-payers to bear an unnecessary expense. Minimizing the risk of damaging the river often increases the risk of costly over-protection.

Although additional research can yield useful new information, it may be costly, unable to produce results soon enough to illuminate important decisions, and will always leave gaps that cannot be filled. As the Westwater Research Centre noted in their introduction to The Uncertain Future of the Lower Fraser just after spending \$600,000 to study water quality in the river:

... even if a much larger investment were made, full and complete answers are unlikely to be found for two reasons. One is that both the physical-biological aspects of pollution and the decision processes of a society--its legal and administrative procedures--are so intricate that an enormous investment would be required to provide an accurate and comprehensive picture of the problem at a given moment.... The other is that pollution problems are in a continuous state of change because new products are being developed each year (and some of these are destined to become pollutants), water use and associated land uses do not remain the same, and social preferences (or values) keep evolving.

(Dorcey, 1976: p.2)

In view of these dynamics, an integral part of a successful pollution control strategy is an ongoing research and monitoring programme to deepen our understanding of the aquatic ecosystem and pollution-generating activities and keep abreast of changes in them. It might include the following:

- controlled experiments on the acute and chronic effects of key pollutants in different concentrations, combinations, and conditions on the sediment, flora, and fauna of the Fraser estuary,
- studies of the pathways, behaviour, and destinations of key pollutants,
- a water quality monitoring system that would feedback to managers changes in water quality resulting from pollution control efforts,
- an effluent monitoring system to measure changes in discharges from each permittee,
- an efficient information storage and retrieval system.

The object should be to reduce those areas of uncertainty hampering informed decision-making on key issues that actually can be reduced at acceptable cost. In dealing with unavoidable

uncertainty, caution should be exercised so as to minimize the sum total of risks to the environment and to the pocketbook.

The second criterion then, can be posed as the general question:

DOES THE SYSTEM PRODUCE DECISIONS APPROPRIATE TO THE BEST INFORMATION THAT CAN BE GENERATED PRACTICALLY ?

In applying this to each of the three stages delineated in B.C.'s process, more precise question need to be asked:

Setting Objectives 1) Do the public inquiries set objectives on the basis of the information necessary to understand the benefits and costs of given control levels?

2) Are objectives updated periodically on the basis of new information?

Issuing Permits 1) Is the decision to grant a permit made on the basis of the best knowledge practically obtainable on the probable environmental impact of the proposed discharge as well as the impact of abatement costs on the discharger?

2) When the impact of a proposed discharge is uncertain, do decisions reflect an attempt to minimize the risk of both unnecessary or costly abatement expenditures and environmental damage?

3) Is the evaluation of each individual application made in the context of the cumulative effect of all dischargers on water quality?

Monitoring and Enforcement 1) Are existing discharges and their impact on receiving waters being monitored adequately and the data stored in retrievable form?

2) Is basic research being conducted to improve our understanding of Lower Fraser ecology so as to better predict biophysical impacts of waste discharge?

3.3 Participation by Affected Interests

In the 1970's the idea of "public participation" seems to have come to the fore. That people who are potentially affected by a prospective policy or development deserve the right to

participate in and influence the decision-making process is now a widely held belief (although many matters, insist some bureaucrats and specialists, remain "technical" ones, meaning either that they are not readily understandable by laymen or that they involve no value judgements or political decisions). The "right to participate" phraseology however, is so vague that it has little utility in prescribing a norm towards which governments should strive and according to which their efforts might be evaluated. I will attempt to define the standard more precisely.

Two justifications exist for encouraging public participation in matters of public policy such as pollution control. The first is that it will lead to "better" decisions, that is, ones that accurately reflect public preferences or advance the public interest further than other possible options. (In many instances a decision that advances the general public's welfare may still hurt some and benefit other members of that public disproportionately.) The second justification is that whether or not the outcome is superior, the mere right to participate in decisions that affect one's life is simply one of the most cherished precepts of democracy. As this is a self-evident value, it needs no further elaboration: either one accepts it or one does not.

There are two major reasons why institutionalized forms of public participation will encourage bureaucratic decisions more in accord with the public interest. One is that the affected public can contribute to the analytical process. Individuals concerned enough to participate can often share new information

or perceptions with officials, who, while they may claim superior knowledge of institutional mechanisms or scientific or engineering principles, may well be unaware of important factors particular to any one case. An example of this in the recent past is the Berger Inquiry into the proposed MacKenzie Valley natural gas pipeline (Berger, 1977), which would surely have produced different conclusions and recommendations had Mr. Justice Berger not visited the North and spoken personally with the native peoples in the affected region.

The second reason is that an open process can better inform the public so that it can decide on a course that reflects its true preferences, and not misconceptions or ignorance. As Fox (1970) states:

... technical information and analyses that indicate the physical, biological, and economic consequences (including the nature of the uncertainties), if communicated with fidelity to those who participate in the decision, should improve the quality of the bargaining process. This is an expression of faith in the utility and influence of information. (p. 881)

An informed public is less likely to tolerate "runaway bureaucracies", which have become more of a threat to public sovereignty in recent times. As society has become more complex and interdependent as a result of technological change and accompanying economic and population growth, regulatory functions of government have also multiplied and become far more complex. It is no longer possible (and has not been for some time) for all elected representatives to thoroughly understand and administer all of the thousands of government programmes that have arisen, thus the civil service has grown to implement

and administer legislative mandates. Considerable discretionary authority has been delegated from popularly elected bodies to bureaucracies, a move necessitated to a large extent by the crushing number of tasks governments are now called on to perform. The problem is one of maintaining popular control over civil servants insulated from the public will by the fact that they are not themselves elected, and are thus not directly accountable to the very public they serve. If we are to preserve democracy, the answer, according to someone like Mayo (1960), is that final decisions on contentious issues must rest with popularly elected representatives, with the majority opinion prevailing.

"Public participation" does not mean doing what the loudest voices at a public meeting are demanding should be done. A frequent complaint of the environmentalists or local people who often pack rooms for public hearings is that the whole exercise is a mere formality and that authorities are not really listening to "the public" (defined as those who are packing the room); the "real decisions" have been made already and the true purpose of the hearing is to placate activists by presenting the appearance that they were given their fair say. While such sentiments are undoubtedly well-founded in many situations, this should not obscure the fact that it would not be democratic to allow, say, solely those present at public hearings to decide among themselves what the fate of the proposal at issue is to be. It is well known that the interests of participants in hearings or members of politically active groups are not necessarily coincident with the interests of the general public

(Heberlein, 1976).

In The Logic of Collective Action, Mancur Olson (1965) outlines the conceptual basis for the difficulty widely diffuse interests have in organizing to protect or advance their collective welfare. The "transaction costs" of arousing a large group loosely affiliated by some common interest are usually high enough to discourage collective action; it is simply not in the rational self-interest of any one member of such groups to make large personal sacrifices in attempting to exhort his or her fellows to action. Small groups or well-defined, localized interests are mobilized more easily, raising the possibility of a zealous minority prevailing over an unwieldy majority. This leads to another rationale for the ultimate repository of decision-making power on matters of public policy resting with elected officials. They can choose as they will, influenced by those who shout loudest, or their perception of general public opinion, or their own preferences, but they must then be subjected to approval or rejection by voters at the next election.

Still another consideration a public involvement effort should take into account is that different groups may have quite unequal resources available for promoting their interests in the public policy-setting arena. The more capable, wealthy, or powerful interests do not necessarily lie closer to the general public interest. Waste dischargers, for example, often possess far more technical expertise, money, and manpower to present their view at pollution control hearings than do environmental groups. Fox and Wible (1973) noted that at a hearing into

setting water quality standards for the Wisconsin River in the late 1960's, 19 representatives were present from waste discharging industries as opposed to three from conservation groups. Twelve presentations were made, of which seven were by major dischargers, three by unions whose members were employed by major dischargers, and none by conservation interests. No one spoke in favour of higher standards than proposed by the State Department of Resource Development. The point then, is that it may be necessary to take other measures to obtain wider representation; at the very least it should be recognized that input received through channels such as formal hearings is not likely to be representative.

To recapitulate, broad representation of affected interests in the pollution control decision process can conceivably, (a) bring to the fore differing perceptions of problems and their possible solutions, (b) improve the likelihood of well-grounded public preferences, and (c) enrich the understanding of decision-makers of these preferences. Thus, public involvement increases the likelihood that the final decision will accurately reflect public preferences. Public involvement is inhibited by "the logic of collective action". "Transaction" costs and the costs of information generation and analyses reflecting the views of affected groups may preclude their effective participation. A serious attempt to involve the public may require more initiative and imagination than needed simply to hold formal hearings at which briefs may be presented.

The third criterion can be posed in the following manner:
ARE THE OPPORTUNITIES FOR PARTICIPATION BY AFFECTED INTERESTS

LIKELY TO PRODUCE DECISIONS THAT ACCURATELY REFLECT PUBLIC PREFERENCES ?

Setting Objectives 1) Do the procedures encourage effective participation by all affected interests?

Issuing Permits 1) Are all interests consulted during evaluation of applications for permits?

Monitoring and Enforcement 1) Is the public furnished ample opportunity to openly scrutinize the performance of the pollution control process?

Chapter Four

SETTING OBJECTIVES--THE REAL WORLD

4.1 Findings

The first half of this chapter discusses in detail my findings on how the process of establishing pollution control objectives has worked in reality. The second half is a critique of the process according to the evaluative criteria developed in the last chapter.

4.1.1 Nature of the Public Inquiries

Chapter Two mentions that the Board and the Director have exercised their powers to determine water quality and effluent standards by holding public inquiries out of which pollution control "objectives" have emerged. The general purpose of each of the seven such inquiries held to date has been to determine what "technical considerations and measures" for waste control must be observed by the dischargers in question.

The Director of Pollution Control seems to have instigated each of the first five inquiries. The latest two inquiries however, which are reviews of the original Objectives set for the forest products and mining and smelting industries, have been called for by Cabinet Orders-in-Council. McPhee (1978) states that a 1976 article in The Province newspaper reported that the second forest products inquiry was called for after a request to Cabinet by the forest industry for a review of the

original Objectives.

The inquiries can be divided into two parts: public hearings (and meetings) and additional background investigations by the advisory panels. (The word "inquiry" has often been used to designate only the public hearing stage of an inquiry.) The overall inquiries have usually extended over a period of several months to more than a year. Formal public hearings themselves lasted anywhere from three to eight days, depending on the volume of submissions. Panel members did meet a number of times on their own however, to review data and discuss recommendations. According to statements made by Branch spokesmen in the public hearings, the Director would announce draft objectives. Then, after a "suitable period of time in which the public and industry may react, the objectives are accepted or ammended and accepted by the Pollution Control Board," (p. 484, Transcript of Inquiry into Food-processing, Agriculturally-oriented and Miscellaneous Industries). In no case were the final Pollution Control Objectives printed within a year of the date of the public hearings themselves. This suggests ample time for concerned parties to express their views following the hearings (were they not aired satisfactorily then). However, I have no information as to whether participants in the process actually were satisfied with the provisions for commenting on and revising draft Objectives.

Outside participation (by industry, public, and other government agencies) in the objective-setting inquiries has taken two forms--formal hearings, all of which have been held in Vancouver, Victoria, and Kamloops, and more informal meetings

held in several locations throughout B.C. The meetings are a new feature, having been held in only the two most recent inquiries--the aforementioned second forest products (1976) and mining and smelting (1978) inquiries.

In the latter, six meetings were held in Kamloops, Nelson, New Westminster, Vernon, Prince George, and Courtenay. The meetings were advertised in advance, copies of the Objectives under review and the formal submissions to the Inquiry were on file at the district PCB offices, and members of the advisory panel attended each meeting. This effort to consult and inform the less organized public met with mixed success: no input at all was received at three of the six meetings (B.C. Pollution Control Board, 1979). Concerning the 1976 Forest Products Inquiry, McPhee (1980) observed that although the Branch attempted to hold informal meetings throughout the province, the programme was curtailed shortly after it had begun for lack of funds.

Public notices advertising the main formal hearings associated with each inquiry appeared in The B.C. Gazette and provincial newspapers three months to a year before they were to commence¹ (B.C. Water Resources Service, 1972) in order to allow time for preparation of briefs. Briefs on "technical matters" were invited from anyone proposing to attend the hearings.

The Act leaves the structure of any hearings the Director or the Board hold to their own discretion. Six of the seven inquiries were chaired by the former Director of Pollution Control, W.N. Venables, or his Assistant Director. Mr. Venables chose to conduct the hearings in a very formal manner,

exercising the powers of a justice under the Offence Act, as empowered by the Pollution Control Act. Each hearing began with a recital of a list of rules and procedures to be followed. A summary of the major ones reveals the degree of formality: only one person could speak to a brief, which was accepted and numbered as an "exhibit" (advisors could be summoned during cross-examination); following a presentation on the brief, the speaker would be cross-examined under oath, first by other participants (those submitting briefs) and then by panel members; non-participating members of the audience could ask questions (if deemed pertinent) only indirectly by submitting them to the advisory panel during cross-examination; participants on the stand could neither ask questions during cross-examination, nor were they permitted an opportunity for formal rebuttal at the close of the submission.

The specified purpose of the public hearings was to consider strictly "technical" matters specifically relating to the rather narrow jurisdiction of the Act. The Director attempted actively to adhere to these terms of reference. When one considers the grade of information exchange illustrated by the following example from the very first inquiry (August, 1970), it is apparent that there is a need for guidelines if the very real technical pollution control questions are to be answered in a public inquiry.

Q. "...the first sentence at the top of page three of your brief reads as follows: 'The excellence of the Vancouver water supply is due to the fact the logging has not been allowed in their watershed.'

"Please indicate where this information was obtained, this fact."

A. "Well, frankly, from a busdriver on a trip across Stanley Park. He stood there and looked across the water and he said, 'See, there has been no logging in this watershed.' And then I have read things, too. But he expressly spoke of the fact that logging had not been allowed and that Vancouver had good water. I might be wrong."

THE CHAIRMAN: "You answered the question. Next question, please."

(Transcript of the Public Inquiry into Waste Management and Environmental Control in the Forest Products Industry, August, 1970, Vol. 8, pp. 360-361)

The introduction to the Pollution Control Objectives generated by this inquiry states that:

of the submissions relating to pollution control practices in the forest products industry, only a few contained technical information and suggestions consistent with the inquiry terms of reference, whereas the remainder provided descriptive information and opinions. The briefs containing technical information have been dealt with in those considerations pertinent to the sections on discharges to air, land, and water which follow. The nontechnical briefs dealt mostly with aspects of pollution which are of a sensory nature, and which constitute a social or aesthetic nuisance. A number of submissions dealt with matters peripheral to the terms of reference of the public inquiry, and were outside of the jurisdiction of the Director of Pollution Control Branch as provided in the Pollution Control Act.
(p. 8)

Yet at the same time, in his introductory remarks to the proceedings of the public hearing, Mr. Venables stated: "An inquiry is a systematic investigation into matters of public concern and at this inquiry we intend to explore the truth and value judgments in an attempt to resolve the many problems created by the discharges and emissions from the forest industries,"(my emphasis, p. 5 in transcript of proceedings).

This very inquiry, the first of the seven, attracted far more non-technical input from a wider variety of participants than any of the subsequent ones have. McPhee (1980) believes

that by limiting discussion solely to arcane technical aspects of pollution control, to the exclusion of other aspects (e.g. social, sensory), the inquiry process is discouraging the participation of many citizens with something to say about pollution. He thinks that the decline in the number of submissions from 39 in the 1970 forest products inquiry to only 8 in the 1976 forest products inquiry is in part due to these restrictive terms of reference. W. Parchomchuk of the Okanagan Basin Water Board noted similar conditions in his closing remarks to the 1972 Inquiry into Food-processing, Agriculturally Oriented, and Miscellaneous Industries:

...I notice a lack of members presenting briefs from the general public, and I suspect that this is largely a result of the inaccessibility of detailed technical information to the general members of the public, and this is understandable. But perhaps maybe future Inquiries could be directed to the public, asking them what levels of water quality they would like to see protected, and then maybe we can go into the technical considerations necessary to protect those levels of water quality. We have not established this yet.

We are dealing with technical considerations, but to what level do we want to implement these to protect the quality that the public desires.

(p. 397 in transcript)

4.1.2 Composition of Advisory Panels and Pollution Control Board

Individuals and decision-makers each have their own predispositions and biases that can often be correlated with such factors as personal background, education, professional affiliation, and job ties. For example, we would quite naturally be more suspicious of an individual setting a pollution control standard for an industry to which he belonged.

Thus, it is illuminating to document the composition of the Pollution Control Board and the advisory panels to the Board. As indicated in Chapter Two, the Board actually sets objectives, while the advisory panels assist Board members in this by furnishing their technical expertise and making recommendations based on the public inquiries.

The Pollution Control Board used to consist entirely of government representatives, but over the decade more members from the private sector (or general public) have appeared on it. According to the latest annual report of the B.C. Ministry of the Environment (1980), in June, 1979 Cabinet constituted a new Board by Order-in-Council. It includes five government representatives from "Forestry, Agriculture, Mines, Public Health, and Fisheries" respectively, and seven members from the general public "representing diverse backgrounds and interests in environmental concerns." (B.C. MOE, 1980: p. 64). The Board chairman, Dr. C.J.C. McKenzie, is a professor in the Department of Health Care and Epidemiology at UBC. He is on record as saying:

In the future it seems that British Columbia will follow the path of the rest of the continent and alter its water systems to meet short term commercial needs with only a cursory nod to the possible implications....The Fraser Delta is under systematic destruction without any real consideration of the possible consequences....

Within a generation major wild rivers will be gone and British Columbia's waters will be tame. It is to be hoped that the process can be achieved with as much wisdom as is available. There is not much evidence at present to back this hope....

(Mackenzie, 1980: p. 76)

I have broken down the composition of the advisory panels in several ways to indicate the possible range of perceptions

represented by those who make recommendations on pollution control objectives. Of 49 advisors participating in the seven inquiries held so far (an average of seven advisors per inquiry), 16 belonged either to the Branch or Board, while 33 came from other organizations, approximately a 1:2 ratio. This would indicate (though not ensure) a healthy infusion of wider perceptions and interests into the process. (If all of those who set objectives belonged to the bureaucracy that implemented them, we could reasonably entertain doubts as to their objectivity.)

The 33 panel members who did not belong to the Branch or the Board usually came from other government agencies (mostly provincial) or universities, and somewhat less frequently, from the consulting field. In no case was an advisory panel member from the industry or interests whose discharges were under investigation.

Sewell (1971) has shown that an individual's perception of an issue or problem can be correlated with his or her professional affiliation. Therefore it is worth breaking down the advisory panels according to profession. The wider the range represented, the more certain we can be that a healthy range of views have been considered in setting the objectives. Reviewing the seven inquiries showed that advisory panels were composed as follows:

<u>Number</u>	<u>Background</u>
25	Engineering, technological, chemical
9	Biological, ecological
6	Economics
5	Health
4	other social sciences
<u>49</u>	

In each of the seven inquiries there was at least one panel member with a biological or ecological background. Health, economics, and "other social sciences" backgrounds were somewhat less represented. An overwhelming proportion (half) of the panel members were engineers.² Because waste treatment is a technical process usually demanding an understanding of industrial processes and equipment, it is not surprising that engineers play so important a part in pollution control. But pollution also involves impacts, damages, ecological processes, and accordingly, ecologists, economists, and health specialists can contribute to discussions on the levels of effluent and water quality that are appropriate. The fact that engineers, who have the clearest understanding of what technological control measures can accomplish, are a decisive majority, offers a clue as to the major considerations upon which levels of pollution abatement are actually based.

4.1.3 Outside Participation in Setting Objectives

Table III summarizes participation by inquiry and four types of participants.

It is evident that the first forests products inquiry in 1970 attracted the greatest outside involvement. In particular, it drew the greatest number of briefs from concerned groups and individual members of the public. Whether this is due to the auspicious debut of the "environmental movement" at the time (and a chance to publicly question the province's most conspicuous industry) or to subsequent disillusionment with the

TABLE III
PARTICIPATION IN PUBLIC INQUIRIES

	Affected Dischargers*	Agencies & Consultants	Individuals	Organized Groups**
FP I (1970)	8	5	6	17
MINE I (1972)	2	2	1	4
CHEM (1972)	9	2	1	1
FOOD (1972)	7	1	3	0
MUN (1973)	12	6	6	4
FP II (1976)	2***	2	1	3
MINE II (1978)	6	1	3	4
	<hr/> 46	<hr/> 19	<hr/> 21	<hr/> 33

FP I = 1970 Forest Products

MINE I = 1972 Mine, Mine-milling, and Smelting

CHEM = 1972 Chemical and Petroleum

FOOD = 1972 Food-processing, Agriculturally Oriented, and
Other Miscellaneous Industries

MUN = 1973 Municipal-type Discharges

FP II = 1976 Forest Products

MINE II = 1978 Mining, Smelting and Related Industries

*including private firms, industrial associations, municipal dischargers,
and affiliated unions

**civic and environmental groups, unions unaffiliated with dischargers

***one of which was the 500 page Council of Forest Industries brief
which "dominated" the Inquiry (McPhee, 1980)

inquiry process is uncertain. I have already described aspects of the hearing procedure that may account for such attrition. McPhee (1978,1980) and Franson and Lucas (1974) provide other criticism of the procedures that may limit public involvement:

-- The formal conduct of the hearings and the polished skills of some professionals can be very intimidating to "ordinary people." One participant to whom I spoke remembered very vividly how "formidable" the setting was. As McPhee (1978) remarks: "The nature of Pollution Control Board hearings requires that a group of individuals be knowledgeable of technical matters of pollution control, be able to articulate opinions, and be able to handle cross-examination." (p. 241)

-- Until the two most recent inquiries, no information was made available beforehand (except for the tersely worded public notices) to allow members of the public to prepare themselves. Such information could have more precisely defined the range of possible alternatives to be considered by the inquiry or have described the Branch's or Board's own thinking on the matter (Franson and Lucas, 1974). Instead, participants went in "cold".

-- No funding has been made available to assist public interest groups in the preparation of briefs (McPhee, 1980). Industries, on the other hand, have funding, technical expertise, and data. This mismatch between those arguing for tighter pollution control and those presumably arguing for lighter pollution control is reflected in the quality of briefs presented. It is unlikely that the panel would pay as much attention to a brief demanding stricter pollution control in principle than to one packed with hard information on technical control measures. On the other hand, the Objectives do not simply place an official stamp of approval on performance standards suggested in the briefs of dischargers, simply because they seem more authoritative. Finalized Objectives frequently diverged from recommendations by dischargers to the Inquiry panel.

The chairman of the public hearings on the Inquiry into Food-processing, Agriculturally Oriented, and Miscellaneous Industries was undisturbed that not a single representative of the general public participated:

...I have noted that certain individuals and associations from the public sector have not participated in this Inquiry. However, having regard for the complex and technical subject matters dealt with by the Inquiries, we arranged for a panel of highly qualified and competent

persons who are representative of the public in the true sense, in that they are remunerated from the public purse, and thus responsible to the public. (p.482)

It is also worth noting that in some of the inquiries, participation of the affected dischargers themselves was poor. This is somewhat surprising, since the Objectives emerging from an inquiry could potentially have a significant bearing on an industry's costs.

To conclude, procedures for participation in setting objectives have heavily favoured the technically informed, when the question is really one that depends at least as much on public value preferences as on technical considerations. To date, submissions by those outside government expressing "environmental values" have probably not influenced decision-making to any extent. This is not to suggest that environmental concerns are ignored altogether, but that panel, Director, and Board are probably guided much more by what might be called implicit values.

4.1.4 The Basis of Pollution Control Objectives

Two factors deserve examination here. The first is the set of considerations upon which actual effluent and receiving water objectives are based. If a BOD limit for an industry is 100 mg/l, why is it not 50 mg/l or 200 mg/l? Is 100 mg/l the level at which discharges of a given volume will not appreciably harm aquatic life in the immediate vicinity of an outfall, regardless of the cost to discharger? Is it what "best available technology" is capable of delivering? Is it what affordably priced (not necessarily most effective in reducing oxygen

demand) equipment will result in? The question of concern here is which of these takes precedence in setting down specific guidelines.

The second factor is the information that is collected and evaluated in making decisions on the above criteria. What are the sources of information and how are they tapped? How adequate is this information in illustrating the consequences of decisions based on it? This sub-section briefly examines this factor and the first one, insofar as transcripts of hearings and the memories of panel members will permit.

Considerations --As mentioned in Chapter Two, the Board and Director have regarded knowledge as too limited to warrant a serious attempt at setting ambient water quality objectives. "Detailed objectives cannot be prepared at this time due to the complexity of interactions among the parameters which define a body of receiving water. Parameters may also be dependent on site locations," (B.C. Water Resources Service, 1975: p.25). The general consideration behind the simple guidelines set is very straight-forward: "Minimum change from background or natural values is desirable..."

Each panelist interviewed would only say that a number of considerations underlie the effluent Objectives: ability of dischargers to absorb costs and still maintain profits, availability of technology, levels shown by experimentation to be acutely toxic to fish, health considerations, aesthetics. They could not or would not say that any of these or others had overriding value. It can be said that "best available

technology", regardless of cost, is not generally the chief consideration, in contrast to certain effluent standards in the U.S. Only measures entailing what were regarded as reasonable expenses were considered.

There seem to be a priori , unstated, inviolable values that constitute, perhaps, the "bottom line" in setting acceptable effluent criteria. They would avoid being set so high as to seriously tax an industry's profitability. They would avoid so low a level as to permit serious, long-term degradation of water quality over wide areas. A key assumption is that "adequate" levels of control can be achieved at "reasonable" costs. (To my knowledge, there has never been a permanent plant closure because of requirements it honestly could not meet. If there are genuinely serious problems in meeting a permit, the Branch has always backed off, indicating that the fear of economic disruption exceeds the fear of environmental disruption.) Within this range, judgement, guesswork , and negotiation come into play. Neither panels nor the Board explicitly construe the task of objective-setting as one of finding the point where the curves representing marginal benefits of control and marginal costs of control actually cross.

Information Acquisition -- Relevant information is of several sorts: plant operations and processes, availability of abatement technology and its costs, opportunities for substitutions and process alterations to reduce waste (as opposed to treating it), effluent properties untreated and under all treatment options, effects of effluent parameters on water quality parameters,

effects of changes in water quality parameters on aquatic life, visual aesthetics, odours, contact recreation, etc. The two ways of acquiring this information are through the submissions presented in hearings and through the panel members' own expertise and literature research. No original research is conducted to fill information gaps identified in the course of an inquiry (although the Branch is always collecting and storing background environmental information).

In the proceedings of the Inquiry into the Food-processing, Agriculturally-oriented, and Miscellaneous Industries, there were surprisingly small amounts of useful information presented in "technical" briefs submitted by industrial representatives. Such briefs usually described industrial operations and plant facilities, pollution-generating processes, existing pollution abatement practices, estimated volumes of discharge, and sometimes, effluent characteristics. However, it is available abatement technology and practices, their costs, and the effluent quality they deliver that are most useful to the panel in setting general effluent objectives. The economic feasibility of control measures, another important factor, was discussed only vaguely. Beyond claims of "limited resources", industries (understandably) never disclosed any financial information detailed enough to allow independent, serious evaluation of their ability to absorb pollution control expenditures.

The limited value of much of the data presented is illustrated by the following example:

Q: ...you state that receiving water quality is not

considered impaired at present, in terms of metal finishing wastes. How do you arrive at this statement? Have you been monitoring local water courses, to see, in fact, that water quality has not been impaired by metal finishing wastes?

A: This statement is based on the limited amount of data available, that we were able to obtain, and is given elsewhere in the {submission}.

Q: Is that the data referred to on page 52?

A: No, it is given elsewhere.
It is given on page 34, where data had been available for levels of copper, chromium, and nickel at two points in the Fraser River.

Q: So then your water quality data is limited to three metals at two stations on one water course?

A: That is correct.

Q: Do you feel that this amount of data justifies your statement that receiving waters have not been impaired?

A: It justifies the statement on the basis of the data available, that we were able to obtain at that particular time.

Q: Are there heavy metals other than copper, chromium and nickel in your effluents?

A: Yes there are.

Q: And do you have any receiving water data relative to these other heavy metals?

A: No. (pp. 196-197)

As well as illustrating the value of cross-examination, this example shows, by the types of questions asked, how little panelists actually know about the details of the operations whose discharges they are evaluating. It appears that the hearings are useful in familiarizing panelists with their subject, but that actual discussion of appropriate discharge levels occurs afterward.

One group of professional consultants, acting on their own

behalf, studied a number of industries under review by this Inquiry and prepared a lengthy brief which was considered and criticized at length in cross-examination. As the group's director pointed out however, they could spend only limited time and money on their research, for it was strictly volunteer. In addition, they were hampered in their data collection:

... since we were not acting on behalf of any industry, when we were collecting the data, we, in quite a few cases, weren't received all that well. In fact, we were told by some to go away and stay away. But on the other hand, we did, in all cases, receive very good reception from some members of every one of the groups.
(p. 442)

Since the hearings in this inquiry provided little information directly pertinent to establishing specific numerical values for effluent quality for each type of operation (of which there were more than a dozen very diverse ones, from tanneries to laundromats), it is obvious that such information had to be sought in the panel's own literature research. As I was informed by one panelist from the very first inquiry, since they are all "experts" in their respective fields, they are already supposed to be familiar with the relevant literature. Each panelist interviewed indicated that they used the results of studies done elsewhere in Canada and the world, and that they knew what effluent standards in other areas were.

4.2 A Critique

4.2.1 Generation and Use of Information

The first sub-criterion is posed by the question: Do the public inquiries set objectives on the basis of the information

necessary to understand the benefits and costs of given control levels? A simple "yes" or "no" answer will not suffice.

It is a logical approach to employ an advisory panel of specialists to study the situation and recommend objectives, as was done. It is also desirable to include specialists from different disciplines when considering issues as multi-disciplinary as those raised by control of pollution, and the process also endeavored to do this. In view of the emphasis of the inquiries on controlling effluent, the preponderance of engineers was not inappropriate. (Criticism of the virtual neglect of ambient water quality goals is made elsewhere.)

It is probable that since panelists were experts in their respective fields, they were also cognizant of relevant literature and experience elsewhere that would be important in setting levels of effluent control, but I cannot affirm this rigourously. The information submitted by B.C. dischargers themselves often was not such as to permit setting specific numerical levels of waste removal on the basis of estimates of benefits and costs. The sometimes elementary questions asked by panelists of industry spokesmen during cross-examination indicated an unfamiliarity with the particulars of the operations under review. This further fuels the suspicion that outside information sources and effluent standards from other areas must have supplied most of the basis for the levels chosen. (These opinions are based on the proceedings of the Food-processing, Agriculturally oriented, and other Miscellaneous Industries Inquiry. It may be that the greater size of industries covered by other inquiries permitted them to

submit more useful data. It may be that the greater uniformity or prominence of these same industries--if this is the case--made possible a greater degree of familiarity with their operations by panelists.)

In theory, we say that an effluent standard should be set at a level where marginal benefits and costs of abatement are just equal. Cost can usually be computed in dollars as the capital and operating expenses of the control measures used. The benefits however, of services obtained by some higher degree of water quality resulting from, say, reducing a BOD effluent standard from 200 to 50 mg/l presents a much more complex problem. Yet any one inquiry must perform literally dozens or hundreds of such mini benefit/cost analyses. To get around the insuperable problems of calculating benefits precisely, it seems that panels have probably used the levels of waste reduction themselves as proxies of the benefits to be obtained by a type of waste control. That is, the BOD of 50 mg/l is considerably more desirable than (though not necessarily four times as) a BOD of 200 mg/l. If it is achievable at some "reasonable" or affordable price, then it might be set as a level.

This substitute for serious benefit/cost analysis is probably unavoidable given the resources allocated to the effort to set objectives. What is wrong is that nowhere is there an explicit discussion of what the objectives are actually based on. "These objectives have been formulated on the basis of ecological, health, technological, and economic considerations from information available to the advisory panel as well as from the information presented at the inquiry," (Venables, 1975).

This is totally inadequate for those who wish to know, for example, if costs actually take first priority, or why many B.C. effluent objectives are not as stringent as their American counterparts. These are relevant questions for which no answers are provided.

There is a further problem in the acquisition of necessary information. Knowing the cost of control measures alone is not enough, because what is really important is the effect of this cost on the discharger who must bear it. It is a well-known fact that firms are reluctant to reveal their financial status and yet this must be known to estimate the impact of given control measures on their profitability. No industrial brief supplied any such information to the "Food-processing..." Inquiry.

No proper assessment of information acquisition in B.C.'s process for setting objectives can examine only one inquiry, for the process as a whole is intended as an ongoing series of inquiries, each of which builds upon the information and experience accumulated since the previous one. This expressly adaptive approach, if followed, is a good one, as it encourages readjustment in the face of uncertainty and changes in technology, costs, environmental quality, and public priorities. Ideally, politicians and civil servants are able to gauge (albeit roughly) from the response of industry and public and from scientific studies how closely the objectives come to approximating optimal or appropriate water quality levels. Whether we have the time, and the Fraser River the resilience, to meander towards appropriate control levels is a moot point.

FRES water quality studies press for action on some fronts but suggest caution on others involving costly investments.

In answer to the original question of whether the information needed is actually procured, the answer is "only partially". In answer to the corollary of whether improvement is possible, the answer is a qualified "yes", to be discussed in Chapter Seven.

The second sub-criterion asks whether objectives are being updated. As the original round of five inquiries was held between 1970 and 1973, by now all five categories should have received their first reviews, if the suggested five year interval were adopted. In fact, only two have: forest products and mining-smelting. One hopes this represents only a discovery that five years is not enough time to test the implementation of promulgated Objectives, and not less of a commitment to the principle of feedback and revision.

4.2.2 Participation by Affected Interests

Do the procedures encourage effective participation by all affected interests? No, for at least the following reasons:

- 1) a highly formal setting that all but experienced professionals would find intimidating,
- 2) terms of reference that limit discussion to "technical" matters,
- 3) the lack of materials distributed beforehand that could have briefed prospective participants and eliminated some confusion as to the purpose of the hearings,
- 4) the apparent lack of an effort to actively solicit briefs from public groups and some industries,
- 5) the lack of funding or compensation for interest groups, who are far out-competed by industry in their ability to prepare and present briefs. Few volunteers can afford a week's leave of

absence to even attend the hearings, no less prepare for and travel to them.

In holding less formal meetings in several locations around the province, the two most recent inquiries have shown some sign of improvement. In one inquiry, however, funding shortages curtailed the programme soon after it started and in the other turnout appears to have been poor.

In sum, it is obvious that the "public" inquiries to date have existed far more for the purpose of exchanging technical information than for encouraging the public to participate in policy-setting. The inquiries made no explicit attempt to connect the value preferences of the public to either effluent or water quality objectives. Nor, I am told by advisory panelists, did Cabinet ever outline to inquiries precisely what water quality goals it wanted effluent controls to pursue. Beyond lofty motherhood goals like, "preserving water quality at the highest possible levels," there is no political mandate. Without one, and without having reached directly to the public for an expression of preferences, we might say there is a "missing link" in the way B.C.'s objectives for pollution control are set. Objectives are being set according to what civil servants, scientists, and engineers think they should be, or what they believe the public would think they should be if asked. We can only hope they are right.

Notes to Chapter Four

¹ Such notices are placed in the classified legal ads section, however, where they do not receive any prominence.

² Two panel members who were biologists both said the presence of a majority of engineers, in their opinions, did not colour group interactions, or direct discussion away from ecological matters.

Chapter Five

ISSUING PERMITS--THE REAL WORLD

Most but not all of the material for this chapter and the next was gathered from WMB permit files over a four or five week period in the fall of 1980. My reason for stressing reliance on this source is that it might have influenced the basic impressions I have obtained. As Downs (1967) has stated, formal communication is not nearly as candid or revealing as informal communication. (None of us speaks as honestly to strangers or bosses as to friends.) Government files, which as permanent records are a form of semi-formal communication, may not tell the full story. For example, one former PCB technician (in a region outside the Lower Mainland), told me that he simply had to "fake it" every so often during inspections of facilities. Yet the reports he prepared that are probably still on file do not reflect this inability to effectively inspect a permittee's real performance, at least not to a casual observer. The final report of the Fraser River Task Force, appointed by the Ministry of Environment in 1980 to patrol the river for six months and enforce the Act, commented that: "The teams would encounter major violations which were easily identifiable yet would observe no record of the non-compliances....Three days after the team visited one site, two Waste Management Branch staff members visited the same site and reported no violations," (Ackerman and Clapp, 1980).

5.1 Findings

Permit issuing procedures and the monitoring and enforcement of control measures cannot be delineated in practise as neatly as my outline might suggest. Enforcement does not always follow permit issuance, as in cases, for example, where a discharge unauthorized by permit is detected. This chapter and the next thus cover overlapping territory.

5.1.1 Identification of Activities Requiring Permits

Interpretation of the Act over a period of years has clarified which actions or discharges fall within its jurisdiction or, in other words, what qualify as "contaminants", the disposal of which require permits from the Director. My own investigation did not reveal a large "gray area" of activities whose status as pollution-generating is uncertain or disputed.¹

Since the 1967 Act controls many more activities than the 1956 Act did, it was necessary at first to devise a procedure by which already existing discharges as well as new ones would be brought under permit. The first versions of the Act called for all discharges existing before January, 1970 to register with the Director by December 31, 1970. The Branch could then proceed to issue permits to a prioritized list of registered dischargers. Branch officials had estimated that between 8,000 and 10,000 dischargers would be required to register. (Another survey indicated about 2100 effluent and solid waste dischargers, and according to Franson et al. (1976), the reason for the discrepancy was never clarified.) However, by October, 1970, the Branch had received only 125 applications for

registration.² The Act was not amended in 1971 to extend the registration deadline, so that in 1971 thousands of waste dischargers were not in compliance with the law. (No prosecutions were ever undertaken (Good, 1971). In 1972 the legislature extended the deadline for registration to March, 1972 (Franson et al. , 1976).)

It seems fair to say that by 1980, virtually no large dischargers are unaware of the need for a permit before their operations commence. However, problems remain with numerous small operations claiming no knowledge of the need for a permit (Wong, 1980), particularly those disposing of hog fuel (or woodwaste) from the many sawmills in the valley, or other solid wastes. A refuse permit from the Branch is required even when using solid waste as fill material in preparing a site for development. In a three month survey, Gough and Moore (1980) discovered that unauthorized (illegal) hog fuel fills covered 6-8 hectares (15-20 acres) in the South Westminster area of Surrey alone. (When exposed to water, hog fuel generates a leachate highly toxic to aquatic life.) In 1980, after a good deal of criticism from the press and federal agencies, the Branch's Lower Mainland Region retained a technician whose full-time duty eventually became the investigation of unpermitted hog fuel fill and disposal sites.³ Monitoring a busy region's manifold activities for all potential polluters is an impossibly large job without outside assistance. The Branch is frequently alerted to problems by citizens or other agencies.

In late 1975, the Delta Environmental Control Office began receiving telephone complaints about an odour emanating from a

fill on the property of Vito Steel Boat & Barge Construction Ltd. (Subsequent investigation showed a toxic leachate accumulating in a ditch draining directly to the Fraser. The source of the problem was gyproc waste obtained from Domtar Construction Materials and used as a fill material.) A letter from the owner to E. Adams of Delta Environmental Control dated March 12, 1976 stated in part: "We did not realize the fill we were depositing, which consisted solely of drywall, sand and red cedar bark, would pose a problem such as this, and we are very sorry it has happened." They had no pollution control permit.

Adams informed the PCB of the problem early in 1976. Their initial response was two-fold. First, according to a summary document of Delta's file on the subject, "EPS and Delta advised by telephone that PCB will handle the leachate problem." Second, in a letter to Vito Steel, dated March 11, 1976, the Branch stated: "Disposal of refuse without a Permit or Approval is contrary to the terms of the Pollution Control Act, 1967 ... we advise you to immediately cease discharging refuse without a Permit... Please advise our office by March 17, 1976 on what action you intend to take on removing the accumulated refuse or controlling the leachate problem now present."

This example illustrates what is perhaps a typical initial response to the discovery of an unauthorized discharge. The violator is contacted and politely but firmly asked (though not "ordered") to conform to the requirements of the Act.

Another activity sometimes believed to elude pollution control requirements is the illicit disposal of portable liquid wastes. I found no consensus as to the seriousness of this so-

called "midnight dumping" problem, whereby some tank trucks allegedly dispose of their loads (sometimes containing very hazardous materials) into storm, or sanitary sewers, or directly into waterways. The file on Maple Ridge (PE-77) contained reports of incidents concerning illegal disposal of septic tank wastes. In this case, and presumably in others, outside informants alerted the Regional Office to the problem. This and the previous examples document the importance of an information network extending well beyond the Branch's own staff in detecting pollution.

5.1.2 Initiation of Application Procedures

By default, the Act and Regulations leave responsibility for obtaining the appropriate permit up to the prospective discharger. The discharger can contact the nearest regional office for the necessary application forms and return them completed to the regional office or Victoria head office.

In practice, this process does not always work according to the above sequence. On occasion, as the last sub-section noted, Branch officials discover existing unauthorized discharges. Rather than prosecuting, they attempt to enlist the discharger's cooperation in complying with the Act.

It is probably fair to say that large operations, in general, have a better record than small ones in adhering to formal procedure in the process of applying for a permit.

5.1.3 Numbers of Permits Processed and Issued

The Annual Reports of the provincial Ministry of Environment and the former B.C. Water Resources Service provide information on changes in the number of pollution control permits issued province-wide, shown in Table IV.

Figures for recent years provided by the Lower Mainland Regional Office are presented in Table V and show an expected increase in the numbers of authorized discharges as the Fraser Valley grows. The growth indicated here is probably higher than the actual increase of discharging activities requiring permits, because the Branch is still trying to bring certain existing activities under permit (notably hog fuel dumps).

5.1.4 Processing of Permit Applications

a) Participation by affected interests

The Act and Regulations provide for notification of interests potentially affected by discharges for which permits are sought by referring applications to other agencies for comment, by requiring their publication in The B.C. Gazette and local newspapers, and posting of them on the site of discharge. The Act orders the Director to "consider the recommendations" of the agencies to which permits are referred, and empowers him to decide whether any formal written objections from the public are such as to warrant a hearing.

Agency referral system In the 13 cases I studied, in general the Branch complied closely with requirements to circulate applications to the appropriate agencies for their review and comment. The Water Rights Branch generally responded

TABLE IV-- POLLUTION CONTROL PERMITS PROVINCE-WIDE, 1970-79*

	1970.	'71	'72	'73	'74	'75	'76	'77	'78	'79
Applications for permits... (effluent, refuse & air)										
...made	-	-	-	-	-	-	-	306	-	-
...refused	-	-	-	-	-	-	-	10	-	-
...withdrawn	-	-	-	-	-	-	-	126	-	-
...granted	59	99	166	398	582	305	295	240	288	283
Cumulative total permits...	-	470	-	1034	-	1921	-	2456	-	3036
Cumulative total points of discharge under permit...	-	470	-	1425	-	3226	-	4278	-	4927
Annual amendments made to existing permits.....	28	41	61	83	95	115	162	186	202	223

(Note: Figures do not always add up because of discontinued discharges, combined discharges, multiple applications, etc.)

* Compiled from Annual Reports of the B.C. Water Resources Service (1970-76) and Ministry of Environment (1977-79).

TABLE V -- EFFLUENT AND REFUSE PERMITS, LOWER MAINLAND REGION*, 1970-74, 1977-80**

	1970	'71	'72	'73	'74	'77	'78	'79	'80
Annual effluent permits issued	-	9	16	58	76	-	22	25	26
Annual refuse permits issued	-	+	+	+	+	-	+	+	+
		<u>3</u>	<u>9</u>	<u>25</u>	<u>20</u>		<u>6</u>	<u>12</u>	<u>25</u>
Annual effluent and refuse permits issued	-	=12	=25	=83	=96	-	=28	=37	=51
Total effluent permits	112	121	137	195	271	333	355	380	406
Total refuse permits	<u>1</u>	<u>4</u>	<u>13</u>	<u>38</u>	<u>58</u>	<u>81</u>	<u>87</u>	<u>99</u>	<u>124</u>
Total effluent and refuse permits	=113	=125	=150	=233	=329	=414	=442	=479	=530
Rate of increase (%)	10.6	20.0	55.3	41.2		6.8	8.4	10.6	

* Encompassing an area much larger than the Lower Fraser Valley: northwest to Powell River, north to Lillooet, east to Manning Park.

** Sources: for 1970-74, Annual Reports of the B.C. Water Resources Service; for 1977-80, Lower Mainland Regional Office files.

with a list of water license holders downstream. The other agencies who often responded with significant comments were the B.C. Fish and Wildlife Branch, B.C. Health Branch, and the federal Environmental Protection Service federal fisheries interests were represented through EPS.

I discovered only one complaint by another agency that the Branch had failed to contact them. Early in 1969, Maple Ridge (PE-77) applied for an amendment to almost double their discharge of raw, comminuted sewage to the Fraser.⁴ (The increase however, was not requested entirely to accomodate new loads to their sewers from new development, but in part to include an older area then discharging untreated, uncomminuted sewage directly to the Fraser via another outfall not even under permit.) The Regulations in effect at the time, while not specifically mentioning procedures for amendments to permits, did stipulate that appropriate agencies should be notified upon receipt of application for permits.

On April 10, 1969 then, the resume prepared by the processing engineer in Victoria noted that: "No objections to the original application {of half a year earlier} are recorded and it has not been thought necessary to notify others of the amendment." The Health Branch discovered the revised application on their own, and replied in part: "... inasmuch as this Branch has a vested interest in, and in some cases has provided information and/or made recommendations pertinent to the application, we suggest you reconsider your policy of not keeping the Health Branch informed of proposed permit revisions."

As noted above, this was the only example of expressed discontent with referral procedures , and it occurred in an earlier stage, perhaps before such procedures had become routinized. Section 5.1.4.3 discusses the influence of input received through the referral system.

Input by affected public In all 13 cases, compliance by the WMB with the terms of the Act and Regulations was good. In each case, the application appeared in The B.C. Gazette and at least one local newspaper. In each case, as required by division 2.06 of the Regulations, the applicant filed proof of publication (copies of the relevant pages) which was preserved in the Branch's permittee file. In several instances where this proof was late in arriving, the Branch contacted applicants by letter advising them of this commitment.

At least two member groups of the Fraser River Coalition (SPEC and the B.C. Wildlife Federation) have at times monitored the Gazette to keep abreast of developments of possible concern, although it appears there have been gaps in their efforts. The notices printed in local papers always appeared in the classified legal ads section near the rear of the paper, were in small type, and to this observer's mind, were unlikely to attract the average reader's attention. My own association with the Fraser River Coalition and other public interest groups leads me to believe that contacts with sympathetic personnel in the referral agencies are probably at least as important as any official means of notifying interest groups of applications raising significant concerns.

Posting of the application on site is more difficult to monitor, but there was never any mention in any file that this requirement had been ignored, while in at least one instance, posting was confirmed and reported to the WMB by an individual in another agency. While these posted applications (8 1/2" by 14"), inconspicuous as they are, may be observed by passersby on the grounds, they would certainly not convey to the average reader much sense of the significance (or insignificance) of the proposed discharge. Their value was probably highest in the case of existing discharges first being brought under permit, where onlookers might possess a more tangible idea of what is involved.

In the 13 permit files studied there were a total of four public objections to applications for permits, one against Titan Steel (PE-161) and B.C. Forest Products (PR-2756), and two against the Hope sewage treatment facility (PE-4125). One objector (to Titan Steel's 1966 application) was the United Fisherman and Allied Worker's Union (UFAWU), and the three others in the other two cases were nearby residents or property owners. The objector to BCFP's 1973 application voiced concern over the fly ash that had been "falling on us, our home, our cars, my washing, our fruit trees and our garden for as long as I can remember," as well as over the possible effect of its effluent on the Fraser's fish.

The two objectors to the proposed Hope sewage treatment facility both objected to the possible effect of odours on their property values. (It is notable that in this case it was not a proposed discharge that elicited objections, but the actual

effort itself to treat the discharge.)

In none of the 13 cases were any formal objections raised by groups claiming to act solely on behalf of the public interest. Generally speaking, there appear to have been few formal objections or appeals in the Lower Fraser by public interest groups. With their scant resources, they have tended to focus their efforts on the largest or most objectionable discharges. The Annacis Island Sewage Treatment Plant (STP), for example, has been a centre of controversy for nearly a decade. Recently, proposals involving the Iona Island STP and the Richmond Landfill, both of which have long concerned environmentalists, have met formal objections by SPEC, the Richmond Anti-Pollution Association, and the UFAWU.

b) Setting permit terms and conditions

Some of the more important "terms and conditions" for effluent permits are the permissible loadings of pollutants (often called "standards"), the authorized pollution control works, the schedule by which works are to be installed or standards met, and a monitoring programme. In refuse permits, some important considerations are the waste materials authorized in the fill, the total volume, rate, and method of application, and the distance to watercourses and water table.

Setting the terms that a permittee is bound to by law is an interactive process involving negotiation principally by the WMB and the permit applicant. Other resource agencies are frequent participants in the process, while the public rarely seems to be an active party. Setting the terms is not usually a simple

matter of applying the pertinent Objectives verbatim. (The whole point behind objectives, versus standards, is to preserve flexibility. They are to provide "guidance" to "expedite" the permit issuing process.) Many of the cases I studied began even before Objectives were promulgated, while each of the others involved circumstances that permitted ample room for bargaining.

In their assessment of permit application, processing engineers were cognizant of both the Pollution Control Board's 1968 policy on pollution control in the Fraser below Hope, their 1971 "Minimum Requirements for Disposal of Municipal and Domestic Wastewaters to Surface Waters", and later, the Objectives covering the type of discharge in question. The resume prepared for each application had a section entitled "Policy" or "Objectives" that relates the proposed discharge to the relevant policy considerations. Any deviation from these policies by the proposed discharge was noted and discussed.

Some indication of the degree to which provincial Objectives have been incorporated into permit terms for one type of pollution (municipal sewage discharge) is gained from an internal memo of the Branch's Municipal Division written in April, 1977, which reviewed all 16 municipal treatment plant discharges to the Fraser below Lillooet. It concluded that all permits issued subsequent to the Board's call for secondary treatment in 1971 did indeed require secondary treatment, except for the GVS & DD's Annacis Island STP (a large exception). It also noted however, that in several cases, attempts were being made to obtain less stringent permit requirements, under the newer Municipal Objectives.

Municipal sewage treatment generally employs well-developed, widely used technology, so that there is a fair level of certainty about the type of effluent deliverable by given systems of practicable (affordable) investment. Other industrial processes, however, and their waste treatment schemes, are less familiar, and thus, more uncertain.

The case of B.C. Packers Ltd.'s (PE-1830) Imperial Plant on Steveston's Cannery Row illustrates how Objectives have in fact been applied as heuristic guides and not hard-and-fast rules. B.C. Packers received a permit in 1973 (they had been operating many years) that called for achieving better than Level A effluent quality for two of its process lines by 1975. Level 'A', as defined in the Objectives, corresponded to the BOD , SS, and oil removal hypothetically obtainable when fine screening and a newer technology--air flotation--were both used to treat the waste. (One can see in this case then, that effluent objectives were based on levels deliverable by available treatment technology not deemed prohibitively expensive. Level B corresponded to effluent quality obtainable with fine screening, Level A to a quality obtainable with this plus air flotation.)

During the 1974 season B.C. Packer's consulting engineers conducted tests on a pilot air flotation cell to determine the efficiency of BOD and SS removal. Claiming that experimental levels of efficiency were not achievable in practice because of a variable wastewater stream, and that more time was needed to assess the desirability of air flotation, early in 1975

B.C. Packers applied to extend the deadline by which they were to have installed it. According to the Environment Canada engineer who conducted the original efficiency experiments upon which permit levels were based, better system maintenance should have eliminated the problem. The permittee disputed this. The decision to amend the permit to allow additional time was deferred until more information could be gathered, in effect acceding to the permittee's request. In the meantime, a running dialogue commenced between a B.C. Packers manager and the PCB processing engineer in charge of this case. An excerpt from a letter of the manager to this engineer illustrates many of the issues involved in setting and meeting effluent limitations:

Regarding your comments on air flotation, I feel I must comment. Firstly, to put in a flotation unit to handle the waste from the fish dressing operation, to my way of thinking, is just a flagrant waste of money. Can \$100,000.00 plus be justified for the installation of equipment plus the yearly costs of operation of \$30,000.00 be justified for the improvement gained? Costs, now in this operation are higher than the returns to the company. Maybe this requirement will be the final straw to close the door!!
As far as in salmon and herring, the benefits do not justify the costs of installation and operation and no logical argument can be made on the basis of plant location. Why should this plant be put in an unfavourable position especially when no harm is being caused to the environment?

In 1976, the PCB conducted its own tests at the plant, and in 1977, some two and a half years after the original application the Branch issued an amended permit with somewhat less stringent standards that seem to have been based on the results of these tests. Then a problem developed with the disposal of sludge generated by the air flotation unit. B.C. Packers had intended to offset, if not recoup, the costs of

pollution control by adding the sludge to their fish meal. According to the manager however, buyers of this meal informed them that they were liable for any mortalities from feed containing the alum-contaminated sludge. (Alum is used in the air flotation process.)

Under this condition, and after the company explored several other methods of sludge disposal, none of which satisfied their own criterion of cost acceptability, the plant ceased operating the unit and applied for another permit amendment to drop the air flotation requirement altogether. The amendment was granted with the condition that B.C. Packers continue the search for a solution to sludge disposal. Effluent limits were downgraded from almost Level A to Level B, and remain there today.

This example illustrates the experimental implementation of one set of Objectives and how an initially promising improvement in a discharge was withdrawn because of unforeseen technicalities and costs claimed by the permittee to be prohibitive. From the material on file, it is evident that the Branch's empathetic stance also reflected uncertainty as to exactly what damages, if any, depressed DO levels in Cannery Channel from fish-processing wastes were actually producing.

The official Level A Objective for salmon and herring process wastes is no longer being used as the objective with which all new fish-processing plants are expected to comply. In February, 1980, another applicant, S.M. Products Ltd. And S.M. Properties Ltd. (AE-5729), received a permit specifying only Level B effluent quality.

The Act empowers the Director to amend an application before issuing a permit, and this right was sometimes exercised. In the case just mentioned, the permit processors amended the terms--requiring stiffer effluent standards--before issuing the permit, prompting a strong protest by B.C. Packers over the "arbitrary performance standard" set. A meeting in Victoria between the PCB, the Fisheries Association of B.C. (an industrial association), B.C. Packers Ltd., and their consultants apparently allayed this concern and others, as a formal appeal was never lodged. Titan Steel and Wire Co. (PE-161) applied in 1973 for a permit to discharge iron, zinc, and lead at concentrations of 70 mg/L, 2 mg/L, and .7 mg/L respectively, in comparison with Level C Objectives of 1.0 mg/L, 1.0 mg/L, and .5 mg/L for iron, zinc, and lead.⁵ A permit was eventually issued specifying the Level C Objectives, a recommendation of the PCB's processing staff, not Titan.

The case of Titan Steel also exemplifies another aspect of setting permit terms and conditions: the sometimes protracted negotiations that occur between applicant and Branch. Excerpts from a December, 1974, memo by the PCB head office illustrate this situation:

Permit No. PE-161 was issued August 23, 1966 for a period of five years....

In June, 1971, the Permittee was advised that the Permit required admentment to include two additional discharges not covered by the Permit. A sample of the effluent taken by Pollution Control Branch personnel indicated that the Permit conditions were not being adhered to.

In June, 1972, the Permittee was again advised to apply for a permit amendment. An application was finally received dated August 10, 1973. The discharge has been

increased to an average of 525,000 gals. Per day. After a preliminary assessment of the application, the Company was advised that the proposed effluent characteristics were not satisfactory and a proposal to improve the treatment would be required.

The present status is that negotiations with the Permittee have not been resolved to the satisfaction of the processing staff of the Pollution Control Branch.

A permit was finally issued to Titan in September, 1975, some four years after their original permit had expired. In most of the other cases I reviewed, the applicant and the Branch came to terms more easily. Once a permit is issued, discussions can and usually do continue.

In conclusion, permit terms were set by a process of bargaining between the WMB and the applicant (primarily) in which the Objectives served as general guidelines for performance, any deviation from which was rationalized by particular facts of the case at hand. In the bargaining process, which could continue for months or years, several things are evident. One is that the Branch at least attempted to be "firm but fair" in dealing with applicants. While the impression conveyed by letters sent to applicants is one of polite firmness and authority, directives and urging frequently did not generate prompt, satisfactory responses. Dischargers often seemed to "hold out" for the best deal they could get, apparently not feeling it was necessary or to their advantage to settle quickly with the Branch. In 1980, the presence of a special investigative and enforcement squad (the Fraser River Task Force) with a reputation for "toughness" prompted hastened solutions to negotiations that had been dragging on in some cases for years, at least according to its leader (Ackerman,

1980).

A bargaining tactic commonly used by applicants was to insist or intimate that the cost meeting a level of effluent quality proposed by the Branch might make it unprofitable to stay in business, or was simply too expensive to consider. The record indicates that the legitimacy of such claims was not rigorously questioned or pursued by Branch personnel, despite the central position of cost questions in any theoretical discussion on appropriate control levels. Such claims evidently led to some erosion of permitted effluent quality in instances where the effect on water quality was thought to be minimal. In other instances, the Branch remained adamant in insisting on certain controls.

c) Influence of input by affected interests

The mere existence of avenues for third party input in the evaluation of applications for pollution control permits, and the use of these avenues by affected interests, do not alone guarantee that such input will actually influence decision-making. In this sub-section I assess the extent of this influence in those cases I reviewed, looking separately at the input of other agencies through the permit application referral mechanism, and input from the general public.

Referral agencies There is much dissatisfaction on the part of some personnel in some of these agencies with the outcome of their efforts to influence permit conditions through the referral system. For example, one estimate is that of those applications for permits for wood waste disposal (prior to 1979)

on which EPS indicated significant environmental concerns to PCB, nearly all were issued, and 80% with conditions that offered inadequate or totally unacceptable environmental protection (Langer, 1980). Ackerman and Clapp (1980), who reviewed WMB files during their enforcement efforts of 1980, observed that in "most instances" the recommendations submitted by referral agencies were ignored.

The case of VenDev Enterprises Ltd. (PR-4745) is worth examining to show the influence of different actors in setting the terms of one particular Pollution Control (refuse) Permit. Rather than discuss each and every condition, I shall focus on one of the more important and contentious ones--the width of the "leavestrip", or that undisturbed strip of land between a fill and a watercourse. VenDev's original application of Feb. 16, 1977, stated in part: "No fill will be placed within 50 ft. of any existing watercourse..." Noting this, the planning director of Coquitlam remarked: "...we would expect the 50 foot leave strip to be protected." The B.C. Fish and Wildlife Branch voiced concern that the operation would "adversely affect the quality of fisheries habitat present in Schoolhouse Creek through direct encroachment of the dump and the introduction of hog fuel leachate into the water." They also requested that the proponent clean up material that had already been deposited within the 50 ft. leavestrip. EPS reported that Schoolhouse Creek supported spawning runs of up to 50 coho salmon a year, in addition to cutthroat trout. They recommended that a permit not be issued at all ("the Department of Fisheries and the Environment strongly object to this application"), and that

VenDev should clean up the existing fill.

As a result of these protests, in July, 1977, a meeting was held, attended by representatives of EPS, Federal Fisheries, VenDev, Fish and Wildlife, and the PCB. Whether or not the permit should even be issued at all never came into question. Instead, the subject was what would constitute acceptable operational procedures. The outcome was that EPS and Federal Fisheries would study the situation in more detail and submit their findings and recommendations "as soon as possible".

In early September, EPS returned the joint recommendations. Concerning the leavestrip, these stated: "The physical integrity of Laurentian and Schoolhouse Creeks...must be maintained. To maintain these streams, no fill should be placed within 50 feet of each stream channel". In late September, PCB and VenDev met in Victoria to discuss the guidelines recommended by EPS. In attendance was the Vice-President & General Manager of VenDev. According to PCB notes of the meeting, he: "presented a proposal outlining the company's guidelines for the site development...." He also asserted that Schoolhouse Creek was actually a man-made waterway constructed by Crown Zellerbach (owner of VenDev) in the 1960's to drain the marshy area under application. The following note was also recorded: "VenDev would like to be permitted to fill...to within 5 feet {my emphasis} of the waterways but could live with a wider leavestrip, if such is required". The notes concluded with the statement: "We assured {the two VenDev reps} that we would expedite the processing of the company's application as much as possible".

A week after this meeting, PCB informed EPS: "We

feel...that the second guideline, wherein you indicated that no fill (inert or otherwise) should be placed within 50 feet of each stream channel, is too restrictive. It is our opinion that inert fill, properly diked, can be used to within five feet...provided that the waterways themselves are not disturbed". The letter repeated the assertion that Schoolhouse Creek was in fact a man-made watercourse. (The implication that since the fisheries habitat was "artificially created" anyway, that to lose it would represent no real loss of habitat, was never debated openly in this entire issue. I am unable to say whether it was the Branch's actual justification for allowing fill to within five feet, or simply a subterfuge intended to mute opposition by the other agencies.) The letter concluded: "We feel that by taking proper precautions, including most of your guidelines, and also allowing the using of inert fill material, properly diked, near the waterways the integrity of the waterways should be mostly maintained".

Two and a half weeks later, on October 13, 1977, PCB granted VenDev a permit with the five ft. Leavestrip. Within three weeks, the Regional Director of the B.C. Fish and Wildlife Branch reacted in writing: "Placing fill within 5-10 feet of the stream bank over the length of the site will destroy the natural flow regime of the creek....The suitability of this section of stream for fish production would...be greatly reduced. We recommend that the {permit} be revised to prohibit the dumping of fill material within 50 feet..."

On November 24, PCB and EPS officials met to consider a number of mutual topics, including VenDev's new permit. PCB's

notes of this discussion are revealing:

Mr. Langer {EPS} noted that the area in question is a marshy beaver dam area, and he felt a fifty foot buffer strip, as agreed to by the permittee, would maintain the physical habitat and the fisheries resource.

Mr. Klassen {PCB} stated that the Permit did not include this requirement as it was not considered reasonable. He indicated that originally the creek was just a ditch and much of it is man made.

Mr. Langer saw no reason why a stream with a fifty foot strip cannot be maintained in a residential or industrial area. He felt that a development plan should be obtained from the company so that a clean strip can be designed.

Mr. Klassen referred to a meeting held in New Westminster, between the representatives of the company and the Branch, on June 29, 1977. The results of this meeting indicated that the company would provide the buffer strip. Mr. Klassen further stated that he would have the Regional Manager contact Fish and Wildlife and, if they conclude that a buffer strip is required, the file could be re-opened.

On December 6, 1977, after a site inspection, the PCB Lower Mainland Regional Manager wrote in a memo to Victoria: "In view of the degree of concern expressed by...the Fish and Wildlife Branch, and in viewing the on-site operations, it is recommended the Director amend the permit in a manner that will provide greater protection for any fisheries in Schoolhouse and Laurentian Creeks and to modify encroachment of fill areas on these watercourses". The Regional Manager recommended increasing the leavestrip to an average 30 feet, minimum 25 feet width. The final width, thus, was about midway between what the conservation agencies and the proponent each preferred. What is significant however, is that this compromise was reached only by additional effort on the part of the conservation agencies. The original condition set by the PCB favoured the applicant against the clear recommendations of at least four other government offices.

In the 13 permit files I reviewed, there were two other instances in which other agencies objected to the very issuance of a permit and were overruled by the Branch. One was the case of B.C. Packers mentioned earlier. EPS recommended that an amendment to remove or defer the air flotation requirement not be granted. This position appears to have been based solely on water quality considerations (specifically, a survey that showed low dissolved oxygen levels in the bottom of Cannery Channel). Comments made in the EPS letter of objection indicate no awareness of the problems claimed by the permittee with regard to sludge disposal.

The other instance was an objection by the Health Branch to an application to discharge fish processing wastes treated by fine screening and not air flotation (PE-5729). Their reason was: "It is evident that screening of effluent wastes from a fish processing plant will not provide a waste that meets your or any acceptable B.O.D. Or suspended solid characteristics for discharge to a receiving body of water". To this the Branch replied:

With regard to the process effluent, fine (minimum 25 mesh) screening is considered to be the best practicable technology at the present time, and the Fraser River should easily assimilate the biological load exerted by the discharge.

On the above basis, we are prepared to recommend to the Director issuance of a Pollution Control Permit for the subject application. Thank you for expressing your concerns in this matter.

In other cases referral agencies recommended permit conditions that were not always followed. A permit for a landfill including hog fuel was issued to Burnaby (PR-5443) in 1979 for which EPS had suggested installation of leachate

containment and disposal works. Instead of making this an automatic permit requirement, the Branch elected to require it only in the event that leachate actually began to appear. (In the lone inspection of this operation recorded in the Lower Mainland file for 1980, on June 19, the following comments were made: "very high leachate production in perimeter ditches which empty into Still Creek;" "berms inadequate along ditch perimeter". "Action recommended" was to "install leachate collectin system". Six months later, in December, 1980, there were no new file entries indicating that action had been taken.)

In most of the other cases examined, the WMB received no comments at all from other agencies, received replies indicating no strong concerns, or received suggestions which were incorporated into permit conditions.

The Branch never adopted a position offering more protection for the environment than the position taken by EPS conferred. In general, the recommendations of EPS in pursuing their mandate indicated a greater willingness to impose costs of waste treatment on dischargers to avoid any risk of significant harm to a local environment--a very cautious approach. The WMB, on the other hand, generally preferred more concrete evidence of environmental degradation (or the risk of it) before insisting on stricter abatement measures (leading to criticism that they have a cavalier attitude to environmental protection, reacting only when the damage has already been done).

Disinfection of effluent through chlorination is an issue that illustrates the different approaches of the two chief pollution control agencies of the provincial and federal

governments. The EPS position is stated in a 1977 letter to the PCB:

It is recognized that some fresh water streams have better assimilative capacity for toxic constituents present in waste discharges, but, the threshold level tolerance of the biological communities cannot be ascertained with any reliance; nor is it desirable to reach the danger point prior to initiating preventive action.

The increased toxicity of chlorinated effluents to aquatic organisms has been well documented.

The PCB position is indicated in a 1977 letter to the EPS:

We have evidence that chlorine residuals have not been well controlled but little evidence or indication of damage to the fishing resource.... "{You refer to the}...documentation..of the...effect of chlorine...." This is perhaps the crux of our differences. We have no documentation to demonstrate that where massive dilution is afforded to a chlorinated discharge that there is a significant effect on the fish resource.

Notwithstanding the above, this Branch has already made substantial compromises in support of your position and we are concerned that this is not recognized from the copies of the permits and amendments we have sent to you. In particular, not only has dechlorination been imposed in a number of cases where dilution is several hundred to one, but many permits have been amended to delete chlorination residual requirements and some new permits which would previously have contained this requiremnt now omit it.

(A 1977 internal PCB memo shows that at that time six of 16 sewage treatment plants on the Fraser below Lillooet were indeed installing facilities to dechlorinate effluent before discharge.)

Even after this investigation, I am not able to say whether the differences in philosophy between the federal Environmental Protection Service and the provincial Waste Management Branch stem from a higher federal regard for environmental protection

vis-a-vis economic progress, or simply from the fact that the province always deals directly with dischargers in their capacity as operators of the permit system, and has developed more sympathy for their problems, real and claimed, in obeying regulations.

Public Members of the public became involved in the permit application processing stage in three of the 13 cases reviewed.

The objector to B.C. Forest Products' 1973 application (AE-2756) was a nearby resident who complained of fly ash and expressed concern about the effect of pollution on the Fraser's fish. The Branch contacted her twice by letter during the processing of AE-2756. The first letter read in part:

I wish to advise that the Pollution Control Branch has carried on detailed negotiations with the applicant to provide such pollution control equipment as is considered necessary to meet the objectives and provide an effluent quality which is consistent with current technology and does not create a condition of Pollution.

The letter went on to briefly describe the control equipment and the levels of effluent quality to be required "should a Permit be issued" in terms that probably did not mean much to the objector. Three months later (December, 1974), the Branch again wrote the objector, stating that:

The above application to which you have objected has received final review, and after considering all the information available it has been decided that your objection is not such to warrant a hearing.

This will also advise you that Pollution Control Permit No. PR-2756, dated December 31, 1974 has been issued. In adjudicating the application the contents of your correspondence were considered, but in view of the

measures proposed to control pollution, a permit has been granted in accordance with the Pollution Control Act, 1967.

There is not record of any other correspondence between this objector and the Branch on file. There is also no record of any informal face-to-face meetings between the Branch and the objector, contrary to what has been claimed to be standard practice (Venables, 1977: p. 99).

Two objections were made in 1977 to a proposed amendment to the Town of Hope's newly issued permit requiring secondary sewage treatment facilities (PE-4125). Both were from nearby property owners concerned about the impact of possible downwind odours on livability and property values. Again, the Branch contacted the objectors twice in writing during the processing of the application. In the first letter, information received from the applicant's consulting engineers was passed on: "...any properly operated aerated system has minimal offensive odours". The second letter, similar in content to the one quoted above in BCFP's permit, informed the objectors that their concerns were not such to warrant a hearing and that the amendment requested had been approved. Once again, there is no evidence of actual meetings with the objectors.

The third case involved a protest by the UFAWU of Titan Steel's 1966 application (AE-161) to discharge 50,000 gallons of treated acid waste daily into Gunderson Slough along the Fraser. The fishermen were concerned both with the possibility of corrosion of underwater metal fittings on the over 300 boats moored there, as well as the effect on salmon fingerlings, which

they contended used the poorly flushed slough as a resting place. They proposed piping the effluent to the Fraser itself, "where the volume of water and current would help to dissipate the effect". Shortly thereafter, PCB wrote to Titan's consulting engineers:

In view of the great length of the Slough relative to its other dimensions with consequent lack of flushing and to its intensive use as a docking area for fish boats, we cannot consider the present disposal area as satisfactory, and advise that alternative plans for discharge to the river through a suitable outfall be submitted.

The permit eventually issued did require an outfall directly to the Fraser. The Fisherman (biweekly newspaper of the UFAWU) hailed this as a victory with the headline: "Union Protests Stop Pollution", (June 17, 1966).

In summary, public participation in evaluation of permit applications was modest. All objections made were on the basis of threatened self-interest; none were put forward specifically on behalf of the public weal. Non-technical objections by unorganized individuals to the very existence of an offensive (or potentially offensive) operation appeared to have little impact on decision-making beyond encouraging the Branch that some form of waste control was desirable. The one objection by an organized interest (fishermen), for which a relatively satisfactory solution existed (laying additional pipe) short of imposing high costs on the discharger did influence the conditions of the permit issued.

d) Information used in evaluation of permit applications

Branch processing personnel commonly received information

from the following sources in evaluating the acceptability of a proposed discharge:

the proponent --indicated the location and number of proposed discharges, industrial processes involved, means of waste reduction and treatment, characteristics of the effluent, effects of treatment costs on profitability;

referral agencies --provided concerns and information about potential impacts on other water uses and resources;

regional office --generally conducted site inspections and reported on the local receiving environment;

head office --conformity of proposal with broad policies.

The information available for assessing applications was never perfect, so that decision-makers could choose with full knowledge of the consequences of each choice before them. For example, when the Branch required Titan Steel to incur the extra cost of building a longer pipe to discharge to the Fraser itself instead of Gunderson Slough, they did not know whether fishing boats in the slough would corrode or not, but the risk and its political ramifications would have made a decision to permit discharge to the slough unwise.

The following factors hampered informed decision-making:

- 1) In a new discharge (versus existing discharges just coming under permit), proponents appeared frequently to not know exactly or even roughly how much and what type of effluent they would be discharging, or what means of abatement they would employ. In my 13 cases, Branch engineers often wrote applicants to insist that they needed more information on specific details.

in order to process the application. They did not necessarily receive a useful reply.

The following observation by McPhee (1978) in his evaluation of pollution control in B.C.'s pulp and paper industry fits here: "The fact that the Pollution Control Branch was unable to generate its own information, clearly demonstrates that it is handicapped when assessing pollution control permits. Decisions regarding permit applications are often based on information produced by the permit applicant". Applicants and permittees frequently dismissed treatment options on the basis of their costliness, and the Branch, at least according to the record I observed, never seriously questioned such claims. They were generally taken as givens, as constraints. Even when prior experience with the cost of a control process existed, ignorance of the particular financial position of an operation (probably one of its more closely guarded secrets) seemed to impede pursuit of this issue.

2) Referral agencies, in their comments, could generally only suggest a vague risk of deleterious impacts. For example, the Fish and Wildlife Branch's response to an application by Burnaby for a landfill (Ar-5619) stated:

This office is concerned about the proximity of the proposed landfill to Still Creek which drains into Burnaby Lake and eventually to the Brunette River. Leachates from deposited hogfuel could have the potential to further compromise water quality in these systems. {My emphasis.}

We are particularly concerned about the possible effects of leachates and degraded water quality on the large numbers of waterfowl which are found on Burnaby Lake. In addition, further degradation of water quality may affect

our consideration for future enhancement of Brunette River fish stocks. Adverse impacts on these resources may have a pronounced affect {sic} on present and future urban recreational opportunities in the area. {My emphasis.}

Statements this vague, though honest in their admission of uncertainty, and necessitated by the inability to accurately predict future impacts, allow great room for incremental compromising of water quality.

3) Wholesale ignorance often exists as to not only the effect but even the very presence of certain toxic substances in effluent. Heavy metals, for instance, only began to be registered and controlled on permits in the 1970's, though they have always existed in discharges. The same ignorance exists with regard to the ultimate chronic effects of the combined loadings of hundreds of substances discharged in thousands of locations throughout the basin.

e) Time taken to process applications

My inspection of over 50 permits in the Lower Mainland Office indicated that most applications that do lead to permits being issued (the vast majority of them) take on the order of several months to half a year from date of application to date of issuance, although protracted negotiations can increase this period considerably. In several of my 13 cases, negotiations continued over a period of two or more years, while operations (and waste discharges) continued unabated. This accords with what others have told me happens in various "problem" cases (for

instance, Ackerman, 1980).

I interviewed one consulting engineer whose firm had dealt with the Branch on behalf of a permit applicant. He informed me that while his firm had enjoyed good working relations with Branch personnel, for a time he and his clients became frustrated at seemingly inexplicable delays (on the order of two months) in processing of the permit, when they were anxious to proceed.

5.2 A Critique

5.2.1 Compliance with Prescribed Procedures

Is the Branch faithfully executing the terms of the Act and Regulations in processing of permit applications?

In general I found that compliance with procedures from the Regulations and s. 4 of the Act concerning referral of applications to other agencies, their publication in the B.C. Gazette and local newspapers, and treatment of objectors was commendable and in compliance with the letter of the law. On some points, as with adherence to the precise times limits prescribed, there was frequent non-compliance, but this is a minor matter, and more often than not due to slow responses from other agencies. In two cases inexplicable delays in processing vexed, in one, the applicant, and in the other, an objecting municipality, but there is no requirement in the Act or Regulations on how long the Branch may take to decide on an application.

In my cases there was no evidence that the Branch was

discussing issues face-to-face with objectors, as it has been claimed they do. Considering the exchanges that occurred in writing, a meeting may have proven useful to the objector, although I cannot be certain they would even have wanted to meet with the Branch.

5.2.2 Generation and Use of Information

a) Is the decision to grant a permit made on the basis of the best knowledge practically obtainable on the probable impact of the proposed discharge and the impact of abatement costs on the discharger?

If the lack of a comprehensive, ongoing research programme to provide background information is ignored for a moment, the answer would be a qualified "yes". By conducting site inspections, soliciting information and concerns from other agencies, demanding more information from applicants when gaps are detected, and making crude estimates on the ability of the local receiving water to absorb the discharge, applications are evaluated in light of much of the information that is required. I could not assess the degree to which the literature was searched to learn from experience elsewhere. Major uncertainties still complicate decisions, but many of them simply could not be eliminated by any amount of research possible within the limited time frame. The Fish and Wildlife Branch's concerns for Still Creek and Burnaby Lake are an example.

At least two weak areas do seem evident. First, there are probably still many instances in which toxic substances present

in discharges are not detected or controlled, although the past decade has seen a great improvement in their identification and control. Further improvement is possible and necessary if we are to avoid risks of chronic impacts.

Second, as McPhee (1978) has also pointed out, the Branch is handicapped in assessing an applicant's professed ability to pay for controls. The Port Alice controversy cited by McPhee is a case in point. In 1973, when the Branch ordered Rayonier Canada Ltd. To install \$10 million of equipment to protect the waters of Quatsino Sound, Rayonier retaliated with production cutbacks and layoffs, insisting this was the only way it could comply. It also raised the spectre of a complete shutdown, with drastic consequences for the small community of Port Alice. Community reaction was sharp. Even the press, normally crusaders for environmental quality, saw this conflict in a different light: "Most newspapers reported the issue as one of environmental quality versus community survival and came out heavily on the side of the community," (McPhee, 1978: p. 283).

The Branch was inadequately prepared to assess Rayonier's real constraints. After holding full-scale hearings, the Pollution Control Board eventually struck what was widely regarded as a major compromise. This example illustrates a possible consequence of the Branch limiting its review to "technical considerations": the socio-economic/environmental trade-offs of real significance, if they are ever to be clarified, weighed, and debated openly, must be dragged through full-fledged Board hearings, something that happens in little more than a handful of cases yearly. It the vast majority of

cases, the issues of greatest priority are never really exposed directly. They will often surface in debates over seemingly arcane, technical matters.

b) When the impact of a proposed discharge is uncertain, do decisions reflect an attempt to minimize the risk of both unnecessary or costly abatement expenditures and environmental damage?

The record shows fairly clearly that the Branch had tended to opt for those choices which produce greater risk to the environment in order to ease costs of compliance for permittees. Sometimes these decisions have also led clearly to severe local pollution problems. In all three refuse permit files I examined, the Branch refrained from requiring higher safeguards, the result of which was eventually high leachate generation with consequent impact on nearby watercourses.

The same approach is adopted on broader policy issues along the river, the aforementioned chlorination debate between WMB and EPS being only one example. As an outside observer of this debate, on the basis of the few arguments I saw presented, I was neither convinced that present chlorination practices constituted a threat or that they did not. In dealing with this situation it is possible to err in one of two ways. EPS would prefer to err well on the side of over-protection even though it means costlier treatment. WMB leans in the other direction, preferring evidence of damage before taking decisive action that will cost money. In fairness, however, in this case they already had required dechlorination facilities in several

instances, despite remaining unconvinced that chlorine residuals were a serious problem.

Once again, an observation from Holden (1966) seems appropriate in describing this behaviour: "The more complex the technological situation, the more difficulty the regulator has in laying down rules which he feels confident in enforcing or which are actually enforceable no matter how confident he feels," (p. 31).

c) Is the evaluation of each individual application made in the context of the cumulative effect of all dischargers on water quality?

The primary focus is still on level of pollutant removal achievable in the individual discharge with the receiving environment a secondary concern, although there appears to be a modest attempt to take cumulative impacts into account. To date however, any such efforts have been isolated and rather crude. FRES water quality studies have produced rough estimates of total loadings of different pollutants to different reaches of the river as well as levels of water quality at different stations. Such estimates are essential to form the basis of any serious effort to control aggregate loadings, but they are not enough. What is still needed are predictive water quality models that will enable the calculation of acceptable loadings by reach. As the Fraser Valley, lower and upper, continue to grow, protection of water quality will increasingly demand a more systematic, sophisticated approach to the control of discharges than the ad hoc approach used to date.

5.2.3 Participation by Affected Interests

Are all interests consulted during evaluation of applications for permits?

It seems probable that official and unofficial channels of communication would inform environmental interests of applications raising significant concerns. It is less likely that all potentially affected land owners are reached by the existing procedures. Posting an inconspicuous sheet on-site and advertising in obscure legal ad sections is not a way to attract attention.

Once consulted, in general it appears that the interests of parties potentially affected by a discharge were accommodated only to a fairly modest degree in the decisions actually made. The Branch has insisted that it gives great weight to "properly substantiated" objections. It would seem that greater weight is attached to the economic rationales put forward by development or business interests. Even assuming an objection to a proposed discharge is properly substantiated--that the objector has demonstrated unequivocally that he, she, or the environment will be damaged--there is still the hard question of whether this damage exceeds the cost of averting it through higher control measures or prohibiting the discharge altogether, and the hard fact is that inevitably there will be a loser. In most cases so far where interests have clashed, environmental interests have been the losers. While the immediate implication is that the public interest is not being served, such a conclusion assumes that preservation of this stream for fish or that lake for waterfowl is always more in the public interest than being able

to develop this extra unit of land or spend that sum of money on goods other than pollution control equipment. Environmentalists typically assume (at least in their public posturing) that only neglect, irresponsibility, and greed are responsible for pollution; they downplay whatever the real costs of preventing it are. But unless these costs are publicized, which no one in the pollution control game is now doing (FRES reports discussing the cost of additional public sewage treatment facilities are an exception), we will continue to see some polluters bluff their way to lighter controls as well as a good deal of misplaced outcry about "what the polluters are getting away with".

One characteristic of the application evaluation process that tends to favour proponents over other interests is that the bargaining that occurs is primarily a two-party relationship between the regulators and the regulated. Objectors (a third party) did not, in my cases, even speak personally to either the Branch engineer conducting the evaluation or to the proponent himself. The Branch and the proponent meanwhile, interact much more closely while negotiating details and, at least from the correspondence I viewed, enjoyed a cooperative, if usually formal, relationship. Under these circumstances it is not surprising that there is some compromise in favour of the proponent.

Notes to Chapter Five

¹ There have been, however, numerous disputes between the WMB, the B.C. Fish and Wildlife Branch, federal Environmental Protection Service, and municipal agencies over the seriousness of certain pollution problems. Of the cases I examined, Vito Steel (PR-4468) and Ven-Dev Corp. (PR-4745) fall into this category.

² "Polluters Heed Warning", Vancouver Province , Oct. 30, 1970, p. 6. Reported in Franson et al. (1976).

³ According to this technician, many offending property owners and hog fuel carriers claimed to be unaware of pollution control requirements. The Branch's policy was to warn first-time offenders.

⁴ At the time of this application, they were not actually under permit, as their original one had expired in December, 1967.

⁵ While this operation and numerous others had long been discharging heavy metals into the Fraser, only in the 1970's (in B.C. As elsewhere) have efforts been made to monitor and control these.

Chapter Six

MONITORING AND ENFORCEMENT - THE REAL WORLD

6.1 Findings

The activities described in the preceding two chapters--setting objectives and permit requirements--are primarily expressions of policy intentions, and must still be implemented. Using my case studies and other sources of information, I now discuss matters related to the outcome of these intentions.

6.1.1 Who Monitors

I found that permit-holders sample their own waste discharges. Permits require them to sample those parameters for which limits are set and to report the results quarterly, semi-annually, or annually to the Branch. Since most operations do not have their own laboratory facilities, samples are most often sent for analysis to commercial labs. In the taking of samples, there is still ample opportunity for deliberate or inadvertent tampering, so that the Branch itself takes occasional samples to verify the integrity of the permittee's sample results.

I have pointed out previously that these prescribed effluent monitoring programmes frequently omit toxic pollutants from measurement, and also inadequately sample acute toxicity. In other respects, such as coverage of conventional pollutants (BOD, SS, pH, coliforms, oil and grease), monitoring programmes are more complete. They are also more extensive for larger dischargers, which is appropriate, for these are most likely to

impair water quality.

Receiving water sampling in the vicinity of the outfall was not required of any permittee by any of over 60 permits that I inspected. Rather, many permits state that: "Receiving water monitoring may be implemented by the Branch". Both receiving water and effluent sampling data are entered into EQUIS.

6.1.2 Water Quality Monitoring

The WMB conducts two general types of water quality monitoring in the Fraser: ongoing surveillance monitoring, intended to document water chemistry and changes over time in different reaches of the river, and zone of influence monitoring, to assess the impact of specific outfalls on nearby water quality. Systematic surveillance monitoring by the WMB dates back only a few years, but as indicated in Chapter One, has been conducted unsystematically by different agencies since the 1950's.

That good information is indispensable in making intelligent decisions on matters that can significantly affect the environment is self-evident. The FRES Water Quality Summary Report recommends a stepped-up programme of monitoring the Fraser's water at regular sites and intervals, as well as a number of other special studies to illuminate various unknowns. Yet according to M. Clark (1980) and G. Gough (1980), two of the WMB scientists responsible for implementation of an ongoing effort to gather environmental information, funds available for such background research have dwindled since the active research phase of the Estuary Study. A number of sampling points have

had to be dropped, and the whole programme is now "barely adequate".

Zone of influence monitoring appears even less than barely adequate. A 1979 internal LMO review of seven municipal treatment plants in the Lower Fraser Valley concluded that three of the seven permits required no receiving monitoring whatsoever. In those four cases where it was indicated that the Branch would implement a monitoring programme, in fact no water quality monitoring had been conducted at all. (In one case two biological studies were made.)

In none of my own 13 permit reviews was any regular receiving water programme implemented. In one (B.C. Packers) the Branch did conduct a biological impact study, while in two (B.C. Packers and Titan Steel) EPS did some studies of their own. In two of the refuse permits, VenDev and Vito, the Branch made inspections in an effort to assess the impact of the leachate generated on the small ditches and streams into which it first flowed. No samples were ever taken to assess the local impact on the Fraser itself. In summary, my research suggests that zone of influence monitoring has been non-existent to spotty at best.

6.1.3 Compliance with Procedural Requirements

Permittees are required to follow certain procedures such as properly maintaining pollution control works, recording certain information, sampling effluent and reporting the results at specified intervals, and submitting plans for approval. These "procedural requirements" are an important source of

necessary information, and although compliance or non-compliance with them has no direct bearing on pollution, the behaviour shown is an expression of goodwill, or the lack of it. "Substantive" requirements, or those connected with permissible discharges, are discussed in the next section.

Following is a summary of the record of compliance with required procedures for each permittee I studied in detail, as well as a short description of the Branch's related supervisory efforts.

PE-2 St. George Holdings Ltd. 10,000 Gallons Per Day (GPD) of domestic sewage; equivalent of secondary treatment; permit issued in 1957, originally no monitoring requirements. Amended permit issued July, 1973.

Excerpts from File PE-2:

Feb. 1975 - Letter to permittee from Regional Manager advising that first monitoring report was due half a year earlier. Report then submitted in March, 1975.

Nov. 1975 - Branch memo notes that whereas most recent annual monitoring report should have had 12 sets of data (one per month), in fact only one was supplied.

Aug. 1978 - Inspection Report says the permittee is up-to-date on monitoring.

May, 1980 - Letter to permittee advises: "Regional Office files indicate that the Company has failed to submit the effluent monitoring results as stipulated....Non-compliance with the terms and conditions of your Permit constitutes a violation of the Act". "Regional Office would appreciate receiving all monitoring data for 1979 by June 2, 1980 and on a regular basis thereafter".

June, 1980 - Technical Supervisor meets with permittee to discuss lack of data submission and lack of response to May letter. Permittee advises that samples were then at a lab, which was later verified. Permittee promises to comply in the future.

Aug. 1980 - Inspection Report says: "Housekeeping very poor....Liquor bottles seen floating in clarifier

tank".

Comments: Permittee's monitoring performance generally very poor. It seems evident that little if anything would be submitted without continual pressure from the LMO. The Branch inspected this operation an average of 2 times a year. 17 BOD and SS samples were collected by the Branch between 1972 and 1975. (Branch sampling after 1975 was unspecified.)

PE-14 Mission City 1,150,000 GPD of untreated sewage into the Fraser; issued in 1957, file closed in early 1976; no monitoring ever required.

Excerpts from File PE-14:

Dec. 1975 - Branch memo reads: "contacted...City Engineer, regarding referenced permit. {He} stated that this outfall had long been disconnected and that all municipal wastewater was directed into the main sewage treatment plant covered by PR-313. He promised to confirm the same by letter". The last previous entry in either Victoria or Lower Mainland files was six years earlier, in 1969.

PE-77 Maple Ridge 1,670,000 GPD treated sewage into the Fraser; permit originally issued in 1963 and amended four times; effluent monitoring first required in 1972; samples to be taken monthly and reported semi-annually to the Branch.

Excerpts from File PE-77:

1976-78 - Permittee contacted five times by LMO over lack of data submission. In this period four reports were required while two were actually submitted.

June, 1979 - Inspection of facilities by technician. Latest monitoring report due three months earlier. "Indicated to permittee that we would be needing that data soon he said he would send it in shortly". Sent in September.

Comments: Branch inspections averaged 2 per year, though none indicated for 1980. Plant house-keeping generally good. It is evident that permittee would not be submitting data without continual pressure from LMO.

PE-108 MacMillan-Bloedel Packaging Ltd. Permit issued in 1964 to discharge 25,000 GPD untreated industrial effluent to the North Arm. In 1974, in-plant recycling was to have reduced discharge to uncontaminated coolant

and process effluent overflows only.

Excerpts from File PE-108:

1977 - Inspection Report says: "there is no longer any effluent. The pipeline still exists but is disconnected. When they get too much to handle they call in a sewage company to drain out their septic tanks (so not even used for overflow)".

1978 - Inspection Report says: "good house-keeping"; "clear effluent (should be just coolant)"; "no data on file"; "no data submitted (should only be submitting temp. data". A LMO supervisor pencilled in: "The permit is for overflows only".

1979 - Inspection Report says: "clear effluent"; "In compliance".

Comments: Three LMO inspections were recorded between 1975 and 1980. There has been some confusion as to what the permit is for. Temperature values should be submitted for cooling water, but this has not been done. The absence of reports on contaminated effluent discharges indicates either that they have not occurred or have not been reported.

PE-161 Titan Steel & Wire Co. Ltd. 100,000 GPD of treated industrial effluent into the Main Arm; issued in 1966, amended in 1975.

Comments: The record indicates generally good compliance by Titan with its monitoring requirements. There is nothing on file indicating a continual need to remind them of this responsibility and copious data are presented in the FRES Industrial Effluents report (Swain, 1981). Inspected 2-4 times a year by LMO.

PE-1830 B.C. Packers Imperial Plant Permit issued in 1973 to discharge 1,500,000 GPD of fish processing wastes (seasonally) into Cannery Channel. Amended twice.

Comments: Permittee appears to have complied with a directive to search for a means of sludge disposal, although I cannot tell how concerted an effort was actually made. Also appears to have been submitting data regularly, for there is no record of pressuring ever used by the Branch and Swain (1981) indicates plentiful records. However, "Compliance of BOD, suspended solids, and oil and grease with the permit limits cannot be determined since production figures have not been recorded," (Swain, 1981).

PE-2756 B.C. Forest Products Ltd. 9,315,000 GPD of treated industrial effluent into the Fraser mainstem; permit issued in 1974, amended in 1977.

Comments: First monitoring one year overdue, "...due to delays in the installation of their effluent treatment facilities. They were of the opinion that any data collected prior to the start-up of their new treatment system would not be representative of their final effluent quality and therefore of little value".

The first data sets submitted covered only pH and temperature, omitting five other required parameters. Compliance appears to have been generally satisfactory after this. Inspected 1-2 times annually by LMO. House-keeping generally fair.

PE-4125 Fraser-Cheam Regional District (Hope) 1,500,000 GPD of domestic sewage treated with an aerated lagoon and discharged at Hope into the Fraser; permit issued in 1975 and amended in 1978.

Comments: Aerated lagoon began operating in late 1979. Two inspections made in 1980. April 1-80 Inspection Report indicated that sampling facilities were adequate and data reporting up-to-date.

PR-4468 Vito Steel Boat & Barge Construction Ltd. Permit issued in 1977 to fill a site near River Road in Delta. No leachate monitoring but other operating procedures required.

Comments: Discussed in next section under compliance with substantive requirements.

AE-4661 Varta Batteries Ltd. Application made in 1976 but permit never issued because process effluent, cooling water, and sanitary wastes diverted to municipal sanitary and storm sewers.

PR-4745 VenDev Enterprises Ltd. Permit issued in 1977 to fill site in Coquitlam. No leachate monitoring provisions included.

Comments: Discussed in the next section.

PR-5443 District of Burnaby Permit issued in 1979 to fill site with hog fuel and inert material near Still Creek. Leachate monitoring not specifically required.

Comments: Complied with requirement to submit for approval the design of a berm to be used in prohibiting direct leachate access to a ditch leading to Still Creek. (However, 1980 Inspection Report noted: "berms inadequate along ditch perimeter" and "very high leachate production in perimeter ditches which empty into Still Creek".)

PE-5729 S.M. Products Ltd. & S.M. Products Ltd. Permit issued in March, 1980 to discharge 45,000 GPD (max.) fish processing wastes into the Fraser Main Arm. Monitoring reports semi-annually.

Comments: First monitoring report due Dec. 31, 1980. Not in file as of Dec. 15, 1980.

To summarize, in these cases compliance with monitoring and other procedural requirements was inconsistent, with some permittees complying reasonably well (regularly submitting the required sampling results on time and unsolicited) while others were unreliable: not submitting analyses unless ordered to, and often not collecting all parameters required by permit or sampling as frequently as stipulated. The Branch's (LMO's) response to non-compliance was to contact the permittee by letter anytime from several months to a year after a missed deadline and advise them that neglected monitoring contravened the law. When this failed, it appears that LMO personnel would visit the operation and speak to the permittee in person. On more than one occasion the response was that the samples were just then at the lab or in the mail, leading one to the conclusion that only the Branch's felt presence led to any monitoring at all in these cases.

Though legal action was mentioned in several letters to

recalcitrant dischargers, the Branch does not seem to have ever seriously pursued this option in any of my cases as a means of enforcing compliance with procedural requirements.

It is very speculative to generalize from such a small sample, but it appears that larger operations may comply better. With larger staffs and operating budgets, monitoring would be less burdensome. (The larger sewage treatment plants such as Annacis and Iona actually employ their own lab facilities and technicians. The volume of data presented in the FRES Municipal Effluents report (Cain and Swain, 1980) indicates good compliance on their part with their monitoring requirements.)

In the FRES Industrial Effluents study, Swain (1981) noted the monitoring records of the different categories of industry in the Lower Fraser:

- Forest - 16 of 17 operations "comply with the intent of their monitoring requirements" for BOD and SS (p. 94). "A general lack of recent wastewater monitoring for acute toxicity is evident. Frequencies of monitoring for acute toxicity, as outlined in the objectives, are not being followed," (p. 94).

- Food - There is "a general lack of monitoring data on numerous operations," (p. 41). Five of the 17 operations were extremely poor in their monitoring; for two, no data at all were available.

- Metal Finishing and Fabricating - "The operations which continue to discharge to the river meet the intent of the monitoring programmes, required by permit," (p. 99).

- Cement - "The operations which continue to discharge wastewater to the river meet the intent of their required

monitoring programs," (p. 100).

- Miscellaneous - "The operations classified as miscellaneous appear to meet the intent of permit monitoring requirements," (p. 101).

6.1.4 Compliance with Substantive Requirements

The two chief substantive requirements in B.C. Pollution Control Permits are the maximum allowable concentrations or loadings of pollutants (the standards or limits) and the authorized pollution control works which are supposed to yield an effluent quality at least as good as the standard when properly cared for. (On refuse permits, substantive requirements consist of a set of operating rules and procedures.) A particular quality of effluent is inseparable from the pollution control works that deliver it.

PE-2 St. George Holdings Ltd.

Parameter	Permitted Level	Period of Record	No. of Values	Max.	Median	Min.
SS (mg/L)	60	1965-77	25	66	32	13
BOD (mg/L)	45	1965-77	25	116	36	12

(From FRES Industrial Effluents, Swain, 1981)

A summary of the PCB's own sampling from 1972 to 1975 showed violations in 6 of 17 BOD measurements and 1 of 17 SS measurements. The permittee has a small secondary aeration treatment plant. Since the permit limits are based on the performance rating of this plant, any non-compliance is probably due to malfunctions or poor maintenance, either of which is possible with the poor house-keeping WMB inspections have indicated.

PE-14 Mission City

Permit was for an outfall discharging untreated sewage

into the Fraser. It was discontinued in 1974. No monitoring ever conducted.

PE-77 Maple Ridge

Prolonged start-up problems originally led to poor effluent quality, noise, and odours (and a suit brought against the municipality, consulting engineers, and plant manufacturers that was settled out of court for \$10,000).

Lack of sludge disposal facilities results in the digested sludge being discharged to the river with the effluent. A 1978 request to extend the deadline for installation facilities to June, 1979 was granted. Memo noted: "Applicant is endeavoring to meet his Permit commitments with due dispatch and request appears to be reasonable". In Oct. 1979 it was noted that the facilities had not yet been constructed. There is no mention of the issue in the file at all in 1980. Presumably the facilities are still not constructed, with no extension ever having been granted.

Monitoring data summary from the FRES Municipal Effluents Report (Cain and Swain, 1979):

Period of Record	No. of Values	BOD			No. of Values	Suspended Solids		
		Max	Mean	Min		Max	Mean	Min
1974	1	51	-	-	1	70	-	-
1975	6	59	41	17	6	76	46	22
1976	3	67	63	58	2	37	-	20
1977	6	52	33	14	6	34	25	9
1978	14	56	26	14	14	34	20	10

Standard to July, 1979 = 130 BOD/130 SS
Standard after July, 1979 = 45 BOD/60 SS

PE-108 MacMillan-Bloedel Packaging Ltd.

Under Branch urging, the permittee installed an extensive internal recycling and treatment system that is supposed to have nearly eliminated all discharge of process effluent (from a previous flow of 4000 GPD). By July, 1974, any process wastewater was to meet the characteristics shown:

Parameter	1974 Permitted Level	Oct. 1974 Sample	Pre-1974 Permitted Level	Pre-1974 Sampling Median
SS	60	715	140	933
BOD	45	607	40	800
Oil & Grease	15	63.6	-	551

(All values are mg/L; Median values from Swain, 1981)

Although the sample shows improved effluent quality, there is still gross non-compliance for BOD, SS, and Oil & Grease. Despite these violations however, since the renovations are supposed to have cut back significantly on the volume of effluent, there would still seem to be a substantial drop in total loadings, even with the high concentrations shown.

PE-161 Titan Steel & Wire Co. Ltd.

A Jan. 1976 inspection by Environment Canada revealed: "At the outfall it was noted that the Fraser River water is visibly discoloured. The colour of the water was a deep green as compared to the natural muddy colour of the Fraser. It was also noted that the river bed in the vicinity of the outfall is covered with settled suspended material from the plant effluent discharge and that the area around the outfall is devoid of visible aquatic life".

A 1975 memo: "...EPS telephoned to say that the National Harbours Board Surrey Fraser Docks are showing signs of corrosion which may be attributable to the corrosive effluent discharge from Titan".

Monitoring Summary from FRES Industrial Effluents Report (Swain, 1981):

Parameter	Permitted Level	Period of Record	No. of Values	Max	Median	Min
pH	6-9	1965-77	44	12	7.1	1.6
SS	50	1965-77	115	7449	64.2	2.7
Sulphate	250	1965-77	99	11100	1640	470
Diss. Iron	1.0	1974-77	106	4050	0.115	<0.01
Diss. Lead	0.5	1974-77	105	18.4	0.05	<0.01
Diss. Zinc	1.0	1974-77	105	42.4	0.04	<0.01

(Except for pH, all values expressed as mg/L)

Titan completed installation of abatement facilities in 1976. In 1977 effluent quality improved significantly. Median values for SS and the three metals were well within limits, though sulphate values were still

significantly out of compliance. The file indicates no enforcement action by the WMB concerning this persistent compliance.

PE-1830 B.C. Packers Imperial Plant

With fine screening in place B.C. Packers should be able to meet Level B Objectives (on which their amended permit is based). Permittee has been supplying analyses regularly. However, according to Swain (1981), compliance cannot be ascertained because plant production figures have not been furnished as required. This issue was never raised in the file.

PE-2756 B.C. Forest Products Ltd.

From an Oct. 1978 letter from LMO to BCFP:

"Further to your letter of May 3, 1978, we note that the effluent test results...are still not in compliance with Pollution Control Permit No. PE-2756. At this time, we would like to know what action is being taken in order to bring the effluent quality into compliance with the terms and conditions of the above mentioned Permit".

From an Aug. 1979 letter from LMO to BCFP:

"We have received and reviewed your monitoring results. They indicate that the characteristics of the effluent are not in compliance....For example, Total Suspended Solids should be equivalent to or better than 125 lb./day above background level. The test results indicate that....The Total Suspended Solids above background = 3,260 lb./day".

In May, 1980, the permittee informed the LMO by letter:

"...we have now installed the additional screen and the system is now running closed circuit".

"We have noticed a significant improvement in the reliability of the system and in the clarity of the mill effluent".

PE-4125 Regional District of Fraser-Cheam (Hope)

Two inspections in 1980 say that the operation was in compliance. I did not personally examine monitoring data.

PR-4468 Vito Steel Boat & Barge Construction Ltd.

From a July 12, 1977 letter from the LMO to Vito:
Vito:

"...Vito Steel...{is} hereby ordered, under Section 11 of the Pollution Control Act, to...complete covering of the gypsum waste with inert sand or soils to the satisfaction of the Regional Manager...by September 1, 1977".

August 22, 1977 site inspection by LMO technician concluded:
"Order of July 12/77 complied with".

From a Feb. 1978 letter from the LMO to Vito:

"Inspection of the subject property by...this office on February 1st and 3rd confirmed:

- a. The order of July 12, 1977...has not been satisfactorily complied with.
- b. Toxic leachate is emerging from the western boundary of the subject site.

In view of the above you are requested to complete covering of the site as required. Failure to do so may result in prosecution".

Subsequently, a May, 1978 site inspection showed:

"It was revealed that the Permittee had done some work...however the work had not been completed as required".

Sampling by the LMO in May, 1979 revealed extremely toxic levels of hydrogen sulphide present in a ditch system eventually leading to the Fraser. (Flow rate was not mentioned, so we have no idea of the volume reaching the Fraser.)

By 1980, the problem had still not been solved to anyone's satisfaction, although leachate levels appeared to be subsiding on their own. It is evident by their respective actions and positions that the Delta Environmental Control Office considered the problem presented by Vito to be much more serious than did the Branch. Significant parts of the substantive requirements of the permit do not appear to have been complied with. Action taken by the Branch consisted of forcefully worded letters of the sort shown. While complete correction of the problem (such as total removal of the gyproc) would have cost hundreds of thousands of dollars, other partial remedies ordered by the LMO that would have partially solved it, such as complete covering of the material, were not obeyed by the permittee.

AE-4661 Varta Batteries Ltd.

Permit never issued; data never collected.

PR-4745 VenDev Enterprises Ltd.

A dispute developed between WMB and EPS over whether this landfill complied with the intent of its permit. Because of the value this case has in illustrating 1) the opposing interpretations of the same events by these two agencies, and 2) how the Branch defines compliance, it will be discussed in more detail under the next section, "Interpretation of Compliance".

PR-5443 District of Burnaby

Seems to be in compliance with terms of permit, but some pollution is still occurring, as noted in June, 1980 inspection. As of Dec. 1980, no corrective action had been taken by the Branch.

PE-5729 S.M. Products Ltd. and S.M. Properties Ltd.

No data received as of Dec. 15, 1980.

How do these findings, indicating only partial compliance with substantive permit terms, compare with other sources of information on levels of compliance in the estuary? The Fraser River Task Force, organized explicitly to investigate suspected violations, states in its final report: "Many sources of illegal effluent discharge were identified and included chemical manufacturing, steel manufacturing, paper recycling, wood treating, sewage treatment plants, and land fill leachates. Many of these effluents were extremely toxic and either had no permit or were out of compliance with their permits," (Ackerman and Clapp, 1980: p. 10). "Many sources," however, does not tell us whether 10% or 90% of all operations are in violation. Referring to the Estuary Study will better enable us to quantify

this.

Concerning discharges from the three major municipal sewage treatment plants (the combined flow of which exceeds all direct industrial discharges to the estuary), the Summary Water Quality Report notes:

- for suspended solids -
 - at Iona: "The pollution control limit of 70 mg/L was exceeded about 8 percent of the time from 1975 to 1977". (p. 14)
 - at Annacis: "The permit limit of 100 mg/L was exceeded less than 2.5 percent of the time". (p. 14)
 - at Lulu: "The permit limit (128 mg/L) was not exceeded". (p. 14)
- for BOD -
 - at all three plants: "Measurements show that the permit limits were exceeded about 50 percent of the time," (p. 15). The Report notes, somewhat paradoxically that, "The reduction in BOD, achieved at the three main plants, was within limits expected for primary treatment," (p. 15). (One wonders why the permit terms do not then take these limits into account.)
- for trace metals -
 - Annacis Island is the only plant with limits for these in its permit. Since data presented in the FRES Summary Water Quality Report are given as total instead of dissolved concentrations, only two parameters for which values were shown, total chromium and total lead, can be compared to permit limits. Means of these were well within compliance.

A very rough guide to the rate of compliance for all parameters and all industries throughout the estuary is possible by comparing standards with actual performances based on data presented in the FRES Industrial Effluents Report (Swain, 1981). Table VI is such a comparison. Using each permittee's long-term mean or median values for each parameter provides a conservative

TABLE VI -- COMPLIANCE AND NON-COMPLIANCE WITH PERMITS BY CATEGORY OF DISCHARGE AND PARAMETER

	Forest		Food		Metals		Concrete		Miscellaneous		Totals by parameter	
Parameter	C	N-C	C	N-C	C	N-C	C	N-C	C	N-C	C	N-C
Oil & Grease	2	1	1	-	4	-	-	-	1	-	8	2
pH	6	5	1	1	4	1	1	2	2	-	14	9
Sus. Solids	3	4	1	1	1	2	4	2	1	2	10	10
Temperature	7	-	-	-	-	-	-	-	2	1	9	1
BOD	4	2	-	2	-	-	-	1	-	-	4	5
Toxicity	2	3	-	-	-	-	-	-	-	-	2	3
Sulphide/ Sulphate	-	1	-	-	-	1	-	-	-	-	-	2
Tot. Organic Carbon	-	-	-	-	-	-	-	-	1	-	1	-
Cyanide	-	-	-	-	-	-	1	-	-	-	1	-
Diss. Iron	-	-	-	-	2	2	-	-	-	-	2	2
Total Iron	-	-	-	-	1	-	-	-	-	-	1	-
Diss. Copper	-	-	-	-	1	1	-	-	-	-	1	1
Tot. Copper	-	-	-	-	-	-	1	-	-	-	1	-
Diss. Chrom.	-	-	-	-	1	-	-	-	-	-	1	-
Tot. Chrom.	-	-	-	-	-	-	1	-	-	-	1	-
Diss. Zinc	-	-	-	-	2	1	-	-	-	-	2	1
Total Zinc	-	-	-	-	-	-	1	-	-	-	1	-
Diss. Lead	-	-	-	-	2	1	-	-	-	-	2	1
Total Lead	-	-	-	-	-	-	-	1	-	-	-	1
Diss. Nickel	-	-	-	-	-	1	-	-	-	-	-	1
Diss. Mn	-	-	-	-	-	1	-	-	-	-	-	1
Diss. Cobalt	-	-	-	-	-	1	-	-	-	-	-	1
Totals by Industry	24	16	3	4	18	13	9	6	7	2	61	41

C=compliance

N-C=non-compliance

As measured by mean and median values compared
with permit limits for tabulated data in FRES
Industrial Effluents Report (Swain, 1981).

estimate of the extent of non-compliance. (It will be noted that very few means/medians are actually available, testifying to the paucity of data.) 61 means/medians were in compliance while 41 were not. All this indicates is that non-compliance is widespread, but not universal. If it reflects unfavourably on pollution control efforts, it should be borne in mind that non-compliance with specific permit conditions can conceivably be widespread even as loadings of pollutants are actually dropping.

It seems that two general forms of non-compliance with a permit are possible. One is where the permittee simply has not installed the pollution control works necessary to meet an upgraded standard. The second occurs when the investment in better treatment and control has been made, but through poor maintenance, malfunction, or overloading, the works are unable to deliver the effluent quality that they are able to, and on which permit standards tend to be based. Swain (1981) points out that, for the forest industry at least, "The process wastewaters...usually are treated by proven treatment methods. At operations where limits are not met, there are indications that the wastewater treatment facilities are undersized for the loadings applied," (pp. 24-25).

6.1.5 Interpretation of Compliance

There are two forms of compliance. The first is actual conformity with literal permit specifications, or "the letter of the law". The second is what passes for tolerable performance or "reasonable compliance" to the regulatory agency. The Assistant Director of the Branch provided a succinct statement

of the Branch's approach to determining the second form during a 1974 meeting with a permittee (as recorded in the minutes):

- (a) the past history of the violations is reviewed and the permittee advised that he is in violation.
- (b) the Pollution Control Branch carries out tests at the plant.
- (c) the Pollution Control Branch requires to know corrective action to be taken and how long the permittee has been in violation of the Permit.
- (d) if there were no co-operation from the discharger, then the Pollution Control Branch could initiate court action.
- (e) the most drastic action would be for the plant to be shut down.

In response to a question regarding the inability to meet the parameters given in the Permit using the technology specified in the Permit, Mr. Klassen stated that if it could be shown that the technology would not meet the parameters and if the permittee was acting in good faith, then the permittee could apply for an amendment to the Permit to change the value of these parameters.

This idealization accords reasonably well with my own findings, although two points need elaboration. First, the Branch did not generally promptly notify permittees recently discovered to be in violation. There were numerous instances in which long-standing violations were on record with no corresponding initiative to correct them (either by improving treatment or by easing permit terms), presumably because the deviations were not considered significant or the possibility of improvement remote. Second, to my knowledge no plant in B.C. Has ever been permanently closed because of an inability to meet mandated pollution controls.

I did observe a number of instances in which the Branch response to non-compliance with either procedural or substantive requirements approximates the Assistant Director's version

above. Continuous pressure by the Branch in several of my cases did result in improved performance.

What constitutes "reasonable compliance" is still above all a matter of judgement and basic outlook. An example of how the exact same performance can be interpreted differently is furnished by VenDev Enterprises Ltd. (PR-4745), a Coquitlam landfilling operation discussed earlier. What follows is a chronology of WMB and EPS remarks and observations from file notes and correspondence.

1978

Feb. 23 -WMB- "The leachate from VenDev is getting worse, possibly due to a high groundwater level at the present".

Feb., Mar., Apr. -EPS- "...permit conditions were being violated and the problem of leachate generation was getting worse".

Mar. 23 -WMB- "Work on the hog fuel pile near Schoolhouse Creek is now progressing satisfactorily".

"Weekly visits will be carried out to ensure that the work is carried out as quickly as possible".

Apr. 26 -WMB- "The dissolved oxygen level of the leachate just before it enters Laurentian Creek was measured at 1.7 ppm (12.5°C). At this point the discharge was about 1 m wide by .3 m deep and flowing at a rate of about 3 dm/sec. Once the leachate enters the creek it is drawn...towards the center...completely blackening the water one-third of the way across....The water is black enough downstream from the discharge that the bottom cannot be seen from either bank....The effects of this condition are unknown but it may be disrupting the viability of fry observed in the creek. Two fry were observed swimming along the surface in a disoriented circular fashion in the blackened zone. This seemingly unusual behavior may be making them more susceptible to predation from below".

May 25 -WMB- letter to VenDev advising them of "...severe deficiencies in operation and variations from the intent of the Permit". Lists six corrective steps requiring "immediate action".

June 8 -EPS-memo to WMB: "...we do not consider the above site to be managed in accordance with the PCB permit. Furthermore, leachate from this site collected in Schoolhouse Creek has killed fish under laboratory conditions in fifteen minutes demonstrating a clear violation of section 33(2) of the Fisheries Act".

June 8 -WMB- "Inspection of the site showed it to be essentially a well operated demolition disposal facility. Work had been done along the Schoolhouse Creek which showed very little evidence of leachate, the types of materials being dumped has been restricted considerably, i.e. the general garbage type waste...were no longer evident...."

June 20 -WMB- "The Permittee has at all times been most co-operative in implementing directives from this office".

"During the course of the above events, the various newspapers in the area have reported on conditions at the fill site however I've noted no follow-up by these same reporters now that these conditions have been improved".

Sept. 1 -EPS- letter to WMB: "Your letter...outlines the precautions that VenDev Enterprises must take to meet the intent of the permit which was issued to them last fall. The conditions... Include recommendations my staff made....We accordingly are willing to accept these mitigation works realizing they will reduce environmental damage, not eliminate it".

Oct. 11 -EPS- "VenDev...still violating permit conditions and...not building the required dykes".

1979

Apr. 9 -EPS- "Site inspected....Leachate from dump is entering stream...toxic to fish in 57 minutes".

June 21 -WMB- "The conditions of the Permit and Letter of Transmittal have not all been met at all times, however for practical purposes the intent of the Permit has essentially been satisfied. This has taken constant surveillance and, as is documented, directives from this office to attain".

"We do not deny that the waters in Schoolhouse Creek and Laurentian Creek have suffered periodically from leachate and reports by our biologist in this regard are on file. We have taken steps to correct problems as they appeared".

"At the present time, the fill is being conducted in an acceptable manner and requirements of the Letter of Transmittal and Permit are being

satisfied. Some leachate is necessarily entering the drainage works however the effect on the waters would not seem to be serious".

July 4 -WMB- "Side slopes appear well covered and are considered to reasonably meet Permit requirements".

"A point of fresh leachate discharge into the Lougheed Highway ditch was noted. This was affecting the quality of water in Schoolhouse Creek visibly. The operator was again advised to correct this situation".

"Some of the fresh fill was noted to contain refuse not amenable to the type defined in the Permit".

Dec. 8 -EPS- "A very toxic leachate (sulphides over 5 mg/L) entering Schoolhouse and Laurentian creeks at several locations. Much fresh dumping of gyproc, office garbage and creosoted timbers and woodwastes".

1980

Mar. 19 -WMB- letter to permittee calling attention to six deficiencies in the operation.

Again, this comparison illustrates how differently EPS and WMB tend to interpret events. The Branch, though admitting it took constant attention on their part, seemed fairly satisfied with both efforts by the permittee and the result, at least to the extent of never threatening legal action. EPS was dissatisfied with both efforts and result. The example also illustrates that perhaps the principle criterion of the Branch in deciding "reasonable compliance" is the responsiveness of a permittee. The actual amount of pollution caused may be of secondary importance.²

6.1.6 Use of Prosecution

In April, 1980, the Opposition's Environment Critic, Mr. Skelly, asked the Minister of Environment Mr. Rogers:

"Between January 1, 1976, and March 31, 1980, how many charges have been laid under section 25, Pollution Control Act, R.S.B.C. 1979, chapter 332, against whom were charges laid, for what offences, in which cases were convictions obtained, and what was the penalty in each case?" (Hansard, April 29, 1980).

The Minister that between those dates 63 charges had been laid against 35 companies and individuals for alleged offences under the 1967 Act. It is useful to break these figures down in several ways in order to better appreciate them.

- Slightly more than half of the charges involved unlawful land/water related discharges (versus air emissions).

- Seven of the 35 companies and individuals charged were in the Lower Mainland Region. Six of these seven were for land/water related discharges. Three of these six occurred within the Lower Fraser watershed itself. None of these three was against companies or individuals discharging directly into the Fraser or a tributary watercourse.

- Of those court cases completed, convictions were obtained in 20 instances, while acquittals or penalty deferrals were awarded in 7 cases.

- For those 29 counts on which convictions were obtained, the range of penalties was \$10 to \$2,500, the median fine was \$250, and the mean was \$492.

One can see that the enforcement provisions of the Act have actually been utilized very rarely (except as a threatening device), and when used, with what appears to be mixed success at best. The penalties issued are a serious deterrent by themselves to most would-be polluters. The median penalty was only 1/40 of the \$10,000 maximum fine provided for in the Act, the maximum fine actually issued but 1/4. Surely the social stigma, expense, and time-consuming nuisance of a court

appearance exert far greater deterrence, if not an especially intimidating amount. D. Miller, the Assistant Manager of the Lower Mainland Regional Office, insists that for most companies, this is enough. A sense of civic responsibility may motivate obedience in others.

Miller also cites the tremendous time commitment and often frustrating results of prosecution as deterrents to the Branch's more frequent use of it as an enforcement tool. Drayton (1980) concurs. Referring to regulatory experience in the U.S., he mentions: "the frustrating role of issuing ineffectual threats that are only occasionally backed up by bouts of slow, uncertain, and probably ineffectual litigation," (p. 31-32).

In the recent case of Regina vs Vancouver Wharves Ltd.,³ five separate charges were laid against the company for alleged offences dating as far back as 1975. In her decision, Judge Nancy Morrison cited "...legislation and procedures that leaves (sic) some gaping holes". She added:

Generally, I found the evidence to be confusing, disjointed and incomplete. Perhaps it is unfair to criticize the lack of professionalism in obtaining, transferring, analysis, storing and producing of samples for court exhibits, but the same standards that apply to a narcotics case to such exhibits should and do apply in a pollution case.

All five counts were dismissed.⁴ In this regard, once again it is worth noting the U.S. experience. According to Drayton (1980):

Especially with criminal penalties, it is often hard for the agency to present an adequately rigorous case. Consequently, over the last several decades, the government's administrative agencies have increasingly tended to substitute civil for criminal penalties. By switching to

civil penalties, they are faced with a lower burden of proof and less stringent evidentiary requirements.

Most judges have not felt that imposing criminal sanctions, with the resultant criminal stigma, on a company or its managers for failing to comply with environmental regulations is appropriate unless there are severely aggravated circumstances. They--and many Attorneys General--have felt that environmental regulation is a form of economic regulation that does not involve issues of moral guilt as clearly as conventional criminal cases do. (p. 1)

In November, 1979, the Fraser River Coalition, an alliance of a number of civic and environmental groups and the Fishermen's Union (UFAWU), released a narrated slide show entitled "The Fraser Delta: An Estuary in Crisis" that purported to demonstrate in forceful terms how government mismanagement was dooming the Lower Fraser and its estuary. (It "fingered" a number of specific operations that were claimed to be "just a few of the many developments destroying the river".) The presentation received widespread publicity and editorial support in Vancouver's two major newspapers (Vancouver Sun, Dec. 3, 1979; The Province, Dec. 3, 1979).

In late January, 1980, Environment Minister Rogers appointed a seven man team "to satisfy ourselves that we are doing everything possible to protect the quality of the river. If we do not enforce standards and investigate serious allegations we are not carrying out our responsibilities as we should," (The Province, Feb. 1, 1980). Known as the Fraser River Task Force (or more glamorously as the "Swat Squad"), the group consisted of four of the Ministry of Environment's Conservation Officers and three technical assistants. On cases

approved by D. Hehn, the newly appointed Regional Director of MOE, and G. Hales, regional Crown Counsel, the team would collect legal samples and lay an information with the Attorney General's office. By the end of the summer, 1980, over a hundred investigations had been made, and over 20 companies and individuals had been charged. Although the Task Force was dissolved in July, 1980, one Conservation Officer remained to finish the work already started and both the Regional Director and Environment Minister suggested that permanent arrangements for a "standing force" to continue stepped-up enforcement would probably be made (The Fisherman, July 11, 1980; Burnaby Today, July 8, 1980). Indeed, in 1981 the Ministry announced the establishment of a full-time enforcement team of ten.

The outcome of the 1980 initiative is still in the making, as many of the cases are still before the courts. In a May, 1981 telephone interview with the Crown's chief prosecutor, Mr. Hales, I was not able to extract enough information to render even a rough appraisal of the province's effort. Mr. Hales could not or would not reveal to me over the phone just how many cases were completed and with what results. He did mention that from a prosecutor's point of view, the Pollution Control Act was a difficult piece of legislation to work with. The final report of the Task Force itself noted the same problem, and also pointed out that: "many of the Pollution Control Permits were written in ambiguous or vague terms and lacking (sic) specific information. This often made enforcement of these documents difficult," (Ackerman and Clapp, 1980: p. 13). It is likely, however, that even the mere presence of

an eager police force has had an effect. As the leader of the team commented: "We took a no-nonsense attitude and the minister gave us the mandate we needed. There has been a noticeable change on the river, and we have turned off a lot of taps," (Burnaby Today, July 8, 1980). A LMO technician with whom I spoke concurred that there had been a positive effect.

6.1.7 Involvement of Affected Interests

Many of the cases recounted earlier show that EPS and to a smaller extent the Fish and Wildlife Branch, Health Branch, and Federal Fisheries maintain scrutiny and negotiations after permits have been issued. Manpower limitations and probably the need for tolerable relations with the Branch restrict their efforts to only the more serious situations however.

Participation by the public during permit administration occurred in several of my 13 cases. In late 1974, a local of the International Woodworkers of America (IWA) wrote to the Branch expressing concern about B.C. Forest Products and two other companies who were, they alleged: "in varying degrees allowing sawdust, pulp chips and debris to flow virtually unchecked into the Fraser River". The letter suggested enforcement action. The Ridge Meadows chapter of SPEC followed with a letter of endorsement, citing: "...the companies responsible for the careless and polluting operation of their mills along the Fraser," and concluding that, "These matters are of great concern and they should be to you".

A month after their first letter, the IWA wrote again, saying in part:

Our Local Union has given further consideration to the matter and would suggest the following, that representatives from your department when investigating this situation assure that technical and engineering advice in detail be given to the said companies to assist them to correct any problems which are found. Also that adequate time be granted to faze (sic) in any new pollution devices which are deemed necessary to correct the situation.

Our Local feels that these are most important considerations particularly at this time when the forest industry is in a depression situation. We would not wish to see any companies shut down or our members out of a job because the company not given adequate time to implement new methods or could not afford them at this time.

The Director of the Branch at the time, W. Venables, in a memo to the Associate Deputy Minister of Water Resources, cited these letters as an example of the "flexibility" in the attitudes of some towards pollution control, and alluded to "...the very difficult road that we must follow in order to make decisions that are reasonable at all times".

The most striking example of public participation at the permit administration stage in my cases concerns the Hope sewage treatment plant. In 1976, after voters had already approved installation of secondary treatment facilities and a permit requiring the same had been issued, greater awareness of its cost prompted the local newspaper and various Hope residents to mount a campaign to eliminate the requirement for sewage treatment altogether, on the basis that this large expenditure of money would result in no appreciable improvement in the Fraer's condition.

The Branch's response to this sudden turnabout was to describe to local and regional officials the process by which

Pollution Control Objectives for municipal discharges had been set, advising them that: "...the matter has been considered on as broad and unbiased a basis as it was possible to devise. The objectives derived from this Inquiry show treatment to be necessary for your intended discharge". However, since secondary treatment for a discharge of Hope's modest size was more stringent than these Objectives required, it was suggested that an amendment signifying a lower degree of treatment be applied for. This was done, and today Hope has aerated lagoon facilities and a permit specifying BOD and SS of 100 mg/L, compared to the 45 mg/L BOD and 60 mg/L SS of a typical secondary plant.

In February, 1980, the Pollution Control Board held public hearings in Vancouver to assess the adequacy of municipal sewage treatment efforts in the Lower Fraser. The hearings served to convey information to the public as well as to focus a critical eye on the job being done by municipal and provincial authorities. In December, 1980, the Board published recommendations based on this inquiry, among them the adoption of "source control," the immediate upgrading of the Iona Island plant to secondary treatment, upgrading for Annacis and Lulu plants by 1990, the establishment of a hazardous waste disposal system for the region, and a study of stormwater discharges (FRES Water Quality Work Group, 1981).

In general however, once a permit is issued, there is even less public participation in and scrutiny of the pollution control process than in the objective-setting and permit-granting stages. Although the Branch claims monitoring

information is open to the public (Venables, 1972), there is probably little actual use made of this, because except in the case of prominent dumps, there is little to draw the public's attention to what any one permittee may be discharging. (For aesthetic reasons, Permits specify that outfalls must extend to below low tide levels. But this also protects the discharge from public scrutiny.)

Most public participation in the Lower Fraser has taken the form of general protests, such as the Fraser River Coalition's slide show, the UFAWU's 1972 sail-in protesting the Annacis Sewage Treatment Plant, and letters to the editor. There has been very little direct participation in the continuing process of controlling pollution from specific Permitted dischargers. This leaves the process vulnerable to the sorts of manipulation to be expected in a closed two-party relationship.

6.2 A Critique

6.2.1 Compliance with Prescribed Procedures

- 1) Is effluent monitoring being carried out according to permit requirements?

Compliance with prescribed monitoring programmes is sporadic. In my 13 cases, of the seven for which monitoring efforts could be compared to monitoring requirements,⁵ in two compliance was good, where the permittees sampled their effluent and submitted results according to procedures outlined, in two it was poor, where the permittees submitted incomplete data and then only when demanded by the Branch, and in three others it

was mixed or uncertain. There was some evidence that performance is improving.

Judging by the data in FRES reports, monitoring at the three largest sewage treatment plants complies with requirements. Monitoring of industrial effluents appears to vary by industry, with forest, metal, concrete, and miscellaneous industries generally showing good compliance and the food industry showing poor compliance, according to Swain (1981). I suspect that Swain's interpretation of what qualifies as general compliance with the intent of monitoring requirements varies somewhat from my own, for in the cases of at least one permit that I have labelled "poor" (because of infrequent collection of data and the continuing efforts required by the Branch to obtain it), there is no indication at all of unsatisfactory performance for this permittee in the Industrial Effluents Report.

The approach used to deal with non-compliance was to write a letter followed by a visit if the letter did not produce a response. This seemed to produce results, but the same routine was sometimes repeated again and again, the permittee not undertaking regular monitoring and reporting without continuous prodding. In none of the cases I reviewed in detail was serious consideration given to litigation as a means of forcing compliance, though it was occasionally held up as a threat to the flagrantly recalcitrant.

In general then, monitoring is not being carried out according to the law in a significant number of cases, even using a liberal interpretation of "compliance". It appears as

if the largest dischargers at least, are better fulfilling their requirements. The response of the Branch to persistent violations has produced data where none would be obtained otherwise, but has not led to swift improvement in conduct.

2) Are prescribed effluent limits (standards) being met?

Compliance with effluent standards is again mixed. In my case studies, of the six effluent discharges that can be appraised, one was in perfect compliance, one was in general compliance, and two were consistently out of compliance on more than one parameter. For two others no determination of compliance can be made. On the whole, in my cases it is obvious that improved effluent quality has resulted from the Branch's endeavors, though more slowly than it is supposed to have taken and generally not up to permit requirements for one or more parameters in each case.

Compliance in the three refuse permits I examined was generally poor, but it should be pointed out that two of these were examined precisely because of a certain notoriety I knew they had beforehand. Be that as it may, in all three cases noteworthy amounts of leachate were generated in spite of provincial and federal regulatory efforts, and in at least one of these fisheries habitat was damaged or destroyed.

My interpretation of data in FRES reports indicates that 40% of all measured parameters in direct industrial discharges were regularly out of compliance. This is a very conservative estimate of the extent of non-compliance; a much higher estimate would be obtained by using a tighter definition of the term. If we defined compliance as being achieved for only those

parameters in which a permit limit was never exceeded, in excess of 90% of all parameters would be "out of compliance". This should not be construed to mean that pollution control efforts have failed, for in fact, Branch efforts did lead to some reduction in pollution in most of my 13 cases.

In sum, it can be stated unequivocally that violation of permit standards is widespread but not universal. Two questions arise: How consequential are these violations, individually and in total, in terms of damage to aquatic resources? Should we be all that concerned with violations on numerous specific points if overall, effluent quality is improving or water quality is not noticeably deteriorating, as is the case in the river as a whole? Little can be said on the basis these aggregated conclusions alone. Certainly there are numerous individual polluters that, because of their impact on smaller tributary watercourses (some of which may play an important role in estuarine ecology) or because of severe degradation of segments of the Fraser itself, do warrant concern and action.

The Branch's response to non-compliance was to attempt to bring the permittee into compliance either by pressuring for upgraded treatment/recycling or by relaxing permit terms if the permittee appeared to be unable to meet the standard at "reasonable" cost. In cases where the Branch has refused to relax permit standards and the discharger has refused to budge, standoffs have resulted in which discharges continued unabated for years. The Branch did not vigorously demand improvement or compliance.

Prosecution, when actually used, has generally brought

disappointing results, at least in terms of the penalties achieved. It is hard to assess how powerfully the fear of prosecution would motivate potentially problematic dischargers to conform even if prosecution were a serious likelihood in the event of persistent violation. Members of the enforcement-minded Fraser River Task Force and certain Branch technicians believe that if permittees do see others being prosecuted that its threat is taken seriously and that this aids the Branch in negotiation.

3) Are all dischargers being controlled by Permit?

Virtually all significant effluent dischargers are controlled by permit. However, the fact that in my case studies there were one or two instances of permittees with unauthorized outfalls (many dischargers have more than one effluent outfall) undiscovered by the Branch for years suggests the probability of similarly unidentified discharges extant today. (This is implied as well by the fact that scientists do not know the sources of certain trace contaminants found in the river and tributaries.) Refuse disposal, primarily of hog fuel, is frequently unauthorized. Many of the Fraser River Task Force's investigations in 1980 were into hog fuel disposal violations. The LMO appointed a technician in 1980 to tackle the problem full-time. Thus the Branch appears to be responding to this problem, perhaps belatedly, and primarily in response to scathing criticism.

6.2.2 Generation and Use of Information

1) Are existing discharges and their impact on receiving

waters being monitored adequately and the data being stored in retrievable form?

Both effluent and receiving water monitoring are being carried out but not as frequently as they should be. FRES water quality reports were often forced to extrapolate heavily to arrive at loadings estimates, which are important data for water quality management purposes. Receiving water quality monitoring in the zones of influence of discharges seems to be nearly non-existent. A general background river water chemistry monitoring programme is in place, but it is "barely adequate". Special studies are being conducted on a modest scale. Overall, there is room for significant improvement in information collection.

Data can be stored in large volumes in the WMB's computerized Environmental Quality Information System (EQUIS) and retrieved quickly and in different forms depending on the needs of the user. This system of data management appears to be quite useful, although I did not examine it closely enough to determine whether its potential is being utilized or how it might be improved. At any rate, its full potential will not be exploited unless monitoring improves.

2) Is basic research being conducted to improve our understanding of Lower Fraser ecology so as to better predict biophysical impacts of waste discharge?

The Estuary Study represents the most comprehensive, coordinated research programme ever undertaken in the Fraser, but most of it was merely compilation of past original research, and it may be a one-shot effort. The Water Quality Work Group (1979) recommended a number of monitoring programmes and special studies, several of which are now going ahead, if in scaled-down

form. For example, it was recommended that stormwater from "at least three catchment areas...typical of industrial, commercial and residential districts" be monitored to estimate its contribution to contaminant loadings, something that has never been done in the region. The study is going ahead, but with only one station in a Vancouver residential area (FRES Water Quality Work Group, 1981).

The Westwater Research Centre noted tentatively in 1979 that basic research in the Lower Fraser was actually declining. It may well be that government commitment to basic learning, because it does not always promise a quick or obvious return on investment, is on the wane.

6.2.3 Participation by Affected Interests

Is the public furnished opportunity to openly scrutinize the performance of the pollution control process?

Monitoring information is available to the public, but beyond this the system has offered little opportunity for close scrutiny. A Public Inquiry held by the Pollution Control Board early in 1980 to assess the performance of municipal dischargers in the Lower Fraser is a healthy exception. Also in 1980 the public was invited to provide information on suspected polluters to the Task Force.

Scrutiny of the routine administration of Pollution Control Permits is made difficult or impossible for anyone wishing to assess for themselves how the process is working in specific cases. In my own experience, even a request to review permit files for academic purposes was initially deferred. I gained

access to the Branch's files only through contacts probably unavailable to one without academic credentials.

Most public participation in this phase of the pollution control process occurs outside of formal channels established under the Act and in an atmosphere of mistrust and some antagonism.

Notes to Chapter Six

¹ This report was labelled "confidential" and remained unseen for nine months by the public until it was leaked to a local environmental group, SPEC (Society for the Promotion of Environmental Conservation), and subsequently reported in the press.

² It is worth observing that a member of the Fraser River Coalition brought charges against VenDev under the Federal Fisheries Act in 1980 because he felt that neither federal or provincial governments would act to enforce their own laws. In 1981 a conviction was obtained.

³ Provincial Court of B.C., No. 4023, North Vancouver, May 27, 1980.

⁴ It may be said, colloquially, that technicalities are what lost the Crown the case. The judge averred that while the Act empowers the "Director of Pollution Control" to issue permits, it says nothing of a "Director of the Pollution Control Branch," whose title actually adorned the documents adduced as evidence. She added that it was her opinion, from reading the Act, that "only the Pollution Control Board can make a valid order, issue a valid permit..." If a point so very basic was ever an issue in any of the other dozens of cases brought to court, one wonders how any conviction could ever have been obtained. It is as though this was the first time the law was ever tested.

⁵ Of those six cases where this was not possible, three were refuse permits that did not require monitoring, a fourth terminated before the general advent of monitoring requirements, a fifth never led to the issuance of a permit, and the sixth was a new discharge for which no data had yet been submitted at the time of my research.

Chapter Seven

CONCLUSIONS AND RECOMMENDATIONS7.1 Results of Pollution Control Efforts

This thesis has largely focused on describing and evaluating the pollution control process, not the outcome of that process. Since ultimately it is this outcome that concerns us however, I will describe briefly what is presently known about it.

How have overall loadings of pollutants discharged into the Lower Fraser changed since control efforts began? It does not look as if even this basic question can be answered satisfactorily. The FRES Summary Water Quality Report provides estimates of current (1978) loadings from the various sources into the Fraser Estuary but does not attempt to quantify how these loadings have changed in, say, the last decade, even for the most widely measured parameters--flow volumes, BOD, and SS. Data are simply too fragmentary, especially in the early part of the decade when so many operations were just coming under permit. Even in arriving at the current estimates, the Industrial Effluents Report cautions: "It should be noted that these loadings have been determined in some cases on the basis of one or two measurements. Extrapolations using these values are therefore highly speculative and subject to error," (Swain, 1981: p. 104).

Since sources of municipal effluent are fewer and generally

better monitored than the numerous scattered industrial discharges and landfills, one might think that loading trends over the last decade could have by now been plotted, but neither the Summary Report nor the Municipal Effluents Report does so. (Such trends alone however, would actually be very poor indices of how total loadings from all sources to the Fraser have changed. Loadings from municipal sewage treatment plants have risen, but in part because industries and new localities continue to divert their effluent to the plants, with resultant declines in direct loadings elsewhere. Thus it would be wrong to conclude that because municipal loadings have grown, others have as well.)

This does not mean that evidence of the influence of regulatory efforts on pollution in the Lower Fraser is entirely lacking. The Municipal Effluents Report (Cain and Swain, 1980) for example, states that by the end of 1980 all discharges of raw sewage will have been eliminated from the Estuary Study area. All sewage should by this time be receiving at least primary treatment (except during periods of high rainfall in those areas with combined sewers, when raw sewage diluted with rainwater can still overflow directly into the river). This surely can be traced back to the Pollution Control Board's 1968 directive calling for all discharges to have a minimum of primary treatment by 1975. It does not mean that total loadings from domestic sewage sources have declined however, for the number of households has risen.

In the Industrial Effluents Report, Swain (1981) graphed combined flow, BOD, and SS data from 1972-1981 for the forest

products industry and from 1971-1978 for the food processing industry. For the forest industry, these show a total reduction in the effluent flows discharged to the river of 37%, of suspended solids 70%, and of BOD over 30%. These declines have generally resulted from the replacement of hydraulic debarkers with mechanical debarkers at six operations. What effect has this had on water quality? This is not discussed in detail, though Swain calculates that the reduction in loadings of suspended solids could have lowered SS concentrations in the North Arm at low flow by 3 mg/L. It is open to question just how much benefit the people of B.C. derive from these improvements.

In the food industry, the 1971-1978 data show about a doubling in the total effluent flow, over a doubling in SS loadings, and over a six-fold increase in BOD loadings. This does not mean that pollution control efforts have actually contributed to a significant increase in the discharges from this industry. In the early seventies, several fish processing operations opened or re-opened. One in particular--the Canadian Fish Company Gulf of Georgia Plant (PE-1814)--discharges 80% of the entire food industry's organic loading to the river (although this estimate is based on extrapolations from only two BOD measurements at the plant). Since 1974, SS and BOD loadings from the food industry have not changed. What does this knowledge imply for the welfare of British Columbians?.

These are the only data presented in FRES water quality reports documenting changes in loadings of pollutants that may in part be attributable to government endeavors. I have already

stated in Chapter One that Drinnan and Clark's (1980) overview of physical water chemistry parameters from 1970-78 showed no significant trends, either in main channel or slough measurements. (While sloughs had lower DO levels than main channels, there was no documented deterioration or improvement from 1970-78.) The Aquatic Sediments and Biota Report by Stancil (1980) did not or could not demonstrate that either sediments or biota were more highly contaminated with heavy metals or persistent organics at the end of the decade than at the beginning.

In conclusion, while regulatory efforts to date have doubtlessly contributed to some decrease of some pollutants for some types of discharge, information shortages prevent complete quantification of these changes in the aggregate. Furthermore, on the basis of the information that has been analyzed, it would appear that these abatement measures have really only led to marginal improvements in even those water quality parameters towards which they have mostly been directed (BOD and SS). The Fraser itself remains for the most part an oxygen-rich, muddy river despite our inadvertent attempts first to pollute it and now our deliberate efforts to clean it up.

What is so striking is how uninformed the public at large is about pollution in the Fraser and efforts at its control. The general consensus, propogated by the news media with all the seeming purposefulness of waging a holy war, is that, in the recent words of one federal MP, "the Fraser is nothing more than a sewer channel through which fish must migrate."¹ This, despite numerous studies over the years by B.C. Research, Westwater,

and provincial and federal agencies that have indicated consistently that for fish, at least, the river's channels are still reasonably healthy. Even the ecologically important sloughs and backwaters, while certainly degraded (partly from "natural" causes) to some extent, are far from being cesspools. What some environmentalists and the media have tended to do is pick on the most blatant failings of pollution control efforts and portray them as representative (which they are only sometimes) simply by ignoring those cases in which efforts have led to some success. Then, a leap is typically made to the conclusion that the river itself is "a filthy mess,"² which is simply not so. It does not follow that because permit violations are rife that water quality must therefore be poor.

The Waste Management Branch's engineers, on the other hand, understandably tend to view their own efforts in terms of the progress they have made in controlling this or that discharge, and thus may also lose sight of the larger picture. Both the Branch and its critics, in reaching different conclusions about the state of affairs, tend to "lose sight of the forest for the trees."

What emerges fairly clearly from my research is that the province's institutional arrangements are not unresponsive to calls for stepped-up control or enforcement. But neither do they initiate those calls. "We have taken steps to correct problems as they appeared," is the philosophy: one of risking some environmental damage rather than taking the risk of imposing measures at some cost to avoid that damage, measures that may turn out to be unnecessary. This approach does not

necessarily "doom the Fraser," but it does display a greater willingness to gamble with its future. The problem of heavy metal pollution first highlighted by Westwater in the mid-seventies (Dorcey, 1976) for example, will require corrective measures well before unsafe levels in fish become observable and widespread if we are to avert major long-term damage.

7.2 Setting Objectives--Conclusions and Recommendations

7.2.1 Generation and Use of Information

The public inquiry process generated some but not all of the information needed to set objectives for effluent quality in full light of associated costs and benefits. However, we cannot and do not expect omniscience--the questions raised in any one inquiry after all, are many and are beset with certain unavoidable unknowns. What we want to know is whether there is relevant information that might be acquired by the inquiries but is not.

There appears to have been at the very least a rudimentary technical understanding of the waste-generating processes under evaluation, and probably a sufficient general awareness of the relevant technological options for abatement, the costs of these options, and the level of effluent quality they are capable of delivering. The inclusion of at least one biologist or ecologist on each advisory panel suggests that current knowledge on the acute toxicity of particular levels of contamination would at least be available to panelists in their deliberations

as to appropriate levels of control. How heavily such environmental considerations were weighted relative to economic ones is uncertain, but there is indirect evidence to suggest that the Objectives are based primarily on "affordable technology." One major, easily correctible deficiency of the objective-setting process is that nowhere is a rationale, methodology, or set of assumptions ever explicitly laid out.

First Recommendation: The Reports that contain the Pollution Control Objectives which arise from public inquiries should spell out explicitly the methodology and assumptions used to set them.

The theoretical objection to levels of effluent quality that are based on currently available, affordable technology is quite simple: they may not be enough, or they may be more than enough, to lead to satisfactory levels of water quality. In the absence of hard information on what clean water is worth to society vis-a-vis other goods and services, those who set pollution control objectives (panelists, Director, Board members) resort to more simplistic notions, i.e. "best affordable technology" or whatever, of what levels of control are really appropriate. To the best of my knowledge, no standard tests or criteria of just what is "affordable" are applied at the objective-setting stage.

Aside from ignorance of public preferences, at least three significant information gaps hinder informed decision-making, one pertaining to the economic impact and the others to the environmental impact of alternative control levels. First, although the "retail" prices of various standard end-of-pipe

treatment options are fairly well-known, and the costs of in-plant recycling and process adjustments can be estimated roughly, the actual effects of some combination of these on a class of private firms can only be guessed at because of the firms' undisclosed economic viability. Clearly whether a firm or an entire industry can survive the imposition of given pollution abatement costs is an important question to policy-makers. The fact that, to this writer's knowledge, there has never been a significant, permanent shutdown of an industrial operation in B.C. signifies that either at the objective-setting or permit-granting and enforcing stage the regulators have treaded very cautiously.

Many dischargers have doubtlessly taken advantage of the Branch's ignorance of their margins of profit to bluff their way to lighter controls. In promulgating effluent limitation guidelines in the United States, the Environmental Protection Agency (EPA) has conducted industry-wide surveys, questioning individual firms on such economic factors as assets and capital investment, revenue, expenses, annual production, and others in order to estimate the economic and community impacts of proposed measures. Procedures are employed to protect the confidentiality of sensitive financial data (U.S. EPA, 1980b).

Second Recommendation: In setting and reviewing pollution control objectives for both effluent and receiving water quality, the Board should undertake a more rigorous analysis of dischargers' abilities to absorb the economic costs of pollution abatement.

A second gap is that the advisory panels are also unable to

predict (other than very crudely) the impact of discharges on receiving waters both because of our ecological ignorance and simply the vast number of different settings. The same loading that is tolerable at one time and place may be ten times what is tolerable in other situations. This is a problem that besets all attempts at defining effluent standards or objectives that are to be applied over a wide region. Its potential to produce inefficient results (more, or less, invested in pollution control than is needed to achieve the desired water quality) can be reduced by introducing flexibility into how the Objectives are applied in specific cases, as is done already in B.C., and by a coordinated programme of research aiming to improve our knowledge of the estuarine ecosystem, thereby reducing the ignorance that hampers impact assessment. The present such programme is small. Consequently, current Objectives are based on no more than crude guesswork as to the effect of toxic pollutants on the aquatic environment. In addition, we are not adequately monitoring either discharges or receiving environment (water, sediments, biota) to understand the full effect of existing discharges on the river. Slow progress is visible. In 1980, the Fraser River Estuary Study commissioned the Westwater Research Centre to study ecological research priorities in the estuary (Dorcey and Hall, 1981). The authors recommend priorities for water quality related research and suggest some possible means and costs of conducting it.

Third Recommendation: One government agency within the Ministry of Environment should be appointed to coordinate, encourage, and fund water

quality related research that, among other things, can be used by the Board in setting both effluent and receiving water objectives. Research efforts would be continuous and not linked to any one objective-setting inquiry. Greatest emphasis should be given to investigating possible effects of toxic materials in the environment through laboratory experimentation, field studies, and extensive literature review.

A third gap that is partially correctible occurs when the inquiries downplay or omit important parameters altogether. Poly-chlorinated biphenyls (PCB's), for instance, are not even covered under the last Forest Products Industry Objectives, yet these contaminants are a definite source of concern and are being discharged by the industry into the Fraser. For some types of discharges, the inquiries seem to have relied entirely upon the dischargers themselves for information on what contaminants are present in the effluent.

The combined burden of these pervasive uncertainties is responsible for three key features of the Objectives: their use as guides and not rigid rules, the provisions for their readjustment, and the short shrift given receiving water quality (ambient) objectives. The first two features are good; the third is not. The Objectives listed for those parameters of receiving waters that are covered at all appear to be nothing more than arbitrary goals; they do not represent an attempt at even a crude assessment of the costs and benefits of pursuing the stated levels. While this rudimentary approach may be acceptable in undeveloped regions of the province or where water quality is not a concern, certainly it is no longer suited to regions like the Lower Fraser, where growing concentrations of waste discharges eventually lead to overlapping Initial Dilution

Zones and cumulative degradation. The concept of the IDZ as it now stands does not even limit the degree of degradation permissible within the zone, which in some cases may stretch half-way across a watercourse and 100 yards downstream from the outfall.

Fourth Recommendation: The Board should revamp the Initial Dilution Zone concept as part of a larger effort to set ambient objectives in developed areas of the province. Inside the IDZ (not outside it as presently) limits should be set for key parameters signifying maximum tolerable degradation. Outside of the zone, water quality should be at least equal to the ambient objective for the reach in question.

The Board has heretofore maintained that it is "impractical" to set standards or objectives for receiving water quality that seriously attempt to approximate marginal costs and benefits of stated levels. Our pervasive ignorance and the diversity of environments throughout the province, it is intimated, would lead to costly, complex, and maybe flawed analysis. But the whole point of regulating effluent discharges in the first place is not to minimize them as an end unto itself, but as a means of pursuing some optimal level of water quality, stated or unstated. Holding a public inquiry to formally address the matter allows the public to openly consider and debate the various trade-offs associated with various levels. These trade-offs might not otherwise come to the fore.

To be sound, ambient objectives would have to be set separately for each basin or river reach, which could be a formidable undertaking for the entire province. Therefore, as a first step, the province should consider only those basins

appreciably threatened by pollution. The Fraser River below Hope or in the Greater Vancouver area is one such segment.

Fifth Recommendation: The Board should commence a process of holding inquiries to establish and periodically review (every five or ten years) a set of ambient water quality objectives for the Lower Fraser. Limits would be set for all relevant parameters and in addition, for concentrations of non-degradable pollutants in sediments and biota.

The provision for updating the Objectives has been invoked in two of the five categories of waste discharges within the suggest five year period--Forest Products; and Mining, Milling, and Smelting. In the other three--Agriculturally-oriented, Food processing, and Miscellaneous; Chemical and Petroleum; and Municipal-type discharges --between five and ten years have elapsed since the first and only inquiries and no new ones have been held or called for. This may mean general satisfaction with the existing Objectives, lack of commitment to the very principle of feedback and revision, or perhaps just hesitation until the reorganization called for by the recently introduced Environment Management Act is more certain. Various individuals I interviewed had no definite answer.

Sixth Recommendation: Pending the advice of scientists and permit processing staff in the central office and administrative staff in the regions as to whether existing Objectives are still adequate, they should be reviewed and updated as appropriate in all five categories of waste discharge.

In this round of inquiries greater emphasis should be placed on setting province-wide Objectives for the control of

toxic and non-degradable pollutants, especially those that were neglected in previous inquiries. For degradable pollutants--those for which dilution is an acceptable solution (BOD, SS, pH, pathogens, nitrogen, phosphorus, and certain others)--province-wide objectives should be downplayed and ultimately abandoned altogether, for the great variation in the assimilative capacity of the province's different waterways renders the general application of uniform effluent standards pointless, if preserving water quality is our only goal. (In fact, such a move might encounter political resistance. Regulators need to appear "equitable" by requiring the same measures of everybody (Venables, 1972)).

7.2.2 Participation by Affected Interests

It is reasonably clear from the record that existing procedures do not encourage participation by all affected interests. In fact, the technical and formal nature of the public hearings held to date discriminates in favour of the technically informed, the well-financed, and the verbally adroit. These characteristics are likely to be possessed by the affected dischargers themselves; environmentalists or other concerned members of the general public seem at a distinct disadvantage. That this is the case is indicated as well by significantly lower levels of participation by public interest groups following the first inquiry held in 1970, and the generally non-technical nature of the briefs presented by these groups.

It seems likely that the most influential testimony--that presented by affected dischargers--is slanted in favour of less stringent requirements than the public at large probably supports. I was not able to ascertain the extent to which decision-makers were cognizant of this and compensated for it in their deliberations. Short discussions with several panelists indicated what seemed to be a general impression that the setting of effluent objectives is largely a technical exercise anyway.

In the absence of effective public input or scrutiny, the scientists, bureaucrats, and engineers charged with setting objectives presumably acted on behalf of what they perceived the public interest to be. If however, the theories of various students of administrative behaviour such as Simon et al. (1950) apply here, it may be that panelists and the Board have acted more on behalf of their "clientele" (affected dischargers--those whose participation was greatest) than on the basis of any vague notions of the popular will. As one's own personal and professional biases inevitably colour value-laden decisions, perhaps it is of note that about half of the Cabinet-appointed Pollution Control Board members are career civil servants, the other half being private citizens with some knowledge of or concern about pollution. Of the advisory panel members who study and recommend Objectives to the Board, about half have been professional engineers with the other half divided between the biological sciences, health field, chemistry, economics, and other social sciences. However well-trained specialists may be, they are no more qualified to decree

policy on matters as value-laden as pollution than any common citizen is.

Three recommendations suggest themselves on the basis of this analysis:

Seventh Recommendation: The Board should conduct periodic, standardized surveys (every five or ten years) to register public preferences on the relative importance of water quality as a social good.

Does the public value it highly enough to (say) spend an extra \$30 per capita per annum for secondary sewage treatment? Questionnaire design should be undertaken by a competent professional to avoid methodological flaws. The response would serve as a basis for the level of public spending on pollution control, as well as being used in setting ambient water quality objectives. The surveys would best be conducted regionally, not province-wide, for preferences may differ from region to region.

Eighth Recommendation: individuals and groups who present briefs at inquiries and who can demonstrate a need should be reimbursed at the very least for their travel expenses and lost wages or salary. Serious consideration should be given to funding of advocacy groups, who are at such a disadvantage in marshalling information to effectively present their cases. (The precedent for this has already been set by the Royal Commission of Inquiry into Uranium Mining in British Columbia.)

Formal hearings on technical pollution control measures are useful in gathering information and should continue, but they should not be construed as providing for public participation.

Ninth Recommendation: As in the two most recent inquiries, the Board should hold well-advertised, informal meetings throughout the province at which the public is encouraged express views and request information.

7.3 Issuing Permits--Conclusions and Recommendations

7.3.1 Compliance with Prescribed Procedures

In the processing of permit applications, procedures outlined in the Act and pursuant Regulations as to circulation and advertisement were for the most part followed quite closely by the Branch.

As to the use of the Objectives in setting permit effluent standards, I found that they were always consulted explicitly and seemed to be a major consideration. However, they have not always served as the "minimum standards" they have been claimed to be. While new municipal discharges largely display permit standards identical or superior to Level AA Objectives (except for Annacis Island--larger than all other municipal discharges to the river combined), and the FRES Industrial Effluents Report notes that many permits for the forest products industry in the Lower Fraser are stricter than Level A, the same report also comments that some metal processing plants have limits for some parameters that do not yet even meet Level C, which they were supposed to have done "immediately" or "soon" when the Objectives were first published in 1975. Fish-processing plant effluent parameters are set predominantly at Level B. One accounting problem that can confound attempts to compare permit

limits with Objectives is that they are frequently written in different terms. Objectives for the concrete industry, for example, measure waste according to kgs. of contaminant discharged per tonne of product. Yet permit limits appear as mg/L of waste concentrations. Similar situations exist in much of the forest and metal processing industries. (In addition, permittee monitoring data often appears in different terms or units than the the permit standards, making a swift determination of compliance all but impossible.)

First Recommendation: Objectives, permit standards and monitoring data should all employ common terminology so as to facilitate rather than discourage comparison.

A tentative conclusion is that the general policy of upgrading effluent quality from Levels B and C to Level A is being pursued, but with more inconsistent and slower results than originally promised.

One other test of compliance of practice to policy in this stage of the pollution control process is whether all waste dischargers are covered by permit. It does appear that the significant point-sources of effluent are now under permit after an effort carried out in the late sixties and early seventies to register and then license all discharges. However, the fact that scientists are detecting traces of heavy metals and toxic organics that cannot be accounted for by known discharges means that pollutants of concern are escaping regulation by permit. Also, a significant amount of unauthorized dumping of refuse, principally wood waste, is occurring in the Fraser delta.

Although the FRES Summary Water Quality Report indicates that the effect of this dumping on main channel water quality is insignificant, there is little doubt that numerous ditches and small fish-bearing streams are being damaged through a combination of pollution and habitat destruction. The fact that Northcote (1974) states unequivocally that tributaries and sloughs are important to much of the Lower Fraser's aquatic life³ should make indiscriminate dumping and filling with wood waste a source of concern, however minimal its impact on main channel water quality.

7.3.2 Generation and Use of Information

Many of the remarks under this heading reiterate themes traced earlier about generation and use of information in the setting of provincial Pollution Control Objectives. Setting the conditions under which any one waste-producer may discharge, after all, is only a more specific version of the same task: assessing the magnitude and distribution of associated costs and benefits.

In reviewing applications, the Branch assessed all aspects: engineering, economic, and environmental, though not equally. While most emphasis was placed on the economically palatable technical means of obtaining an effluent quality in accord with the relevant set of Objectives, the processing staff (all engineers) did not ignore local receiving water conditions. The volume of stream flow and hence the dilution capacity was used sometimes as a rationale for permit conditions more or less stringent than the Objectives. In acquiring its information,

the Branch--

- held meetings with applicants and inspected their operations or plans with a view to opportunities for cost-effective reductions in effluent generated;
- conducted site inspections and occasionally supplemented them with water samples;
- reviewed its own files for pertinent material;
- and, when warranted, consulted other agencies not already on the referral list about special questions.

The Branch's application referral mechanism succeeded in bringing to light certain information and concerns from other provincial and federal resource agencies. However, in many of the cases I studied, firm predictions of impacts were simply not possible, so that the dominant response (in those cases where concerns existed) was an expression of concern about a potential risk of impact, not a detailed or quantitative estimate of just what the impact would be. EPS frequently responded with suggested engineering works that would offer a higher level of protection than that proposed, though at a higher cost, the magnitude of which was never discussed. Interestingly, though it would seem that the dollar cost of proposed treatment works or protective measures is a major consideration, it never entered discussions, at least according to the written record. Many of the conflicts among agencies, and between agencies and the discharger, that sometimes emerged can be linked directly to the ingenuous pretense that the question at hand is solely a "technical" one of preventing pollution, in which the quantification of the dollar costs of preventive measures is not relevant.

In general, the major information-related shortcomings of the province's procedures for assessing the costs and benefits

of individual proposed discharges would seem to be:

(1) Decision-makers are unable to distinguish between unwillingness and inability to pay for abatement measures on the basis of the information provided by the applicant. (Their only gauge is really how forcefully the applicant resists measures proposed by the Branch.) This precipitates a bargaining game that rewards successful use of such tactics as bluff and procrastination by the applicant. Hypothetically, the negotiated compromise in such a situation would be the maximum which the discharger could afford and still stay in business--an "optimal" solution. In reality, by not possessing key facts and being reluctant to prosecute, the Branch is bargaining at a disadvantage. My opinion is that too often they gave dischargers the benefit of the doubt.

(2) Virtually all studies have shown high levels of dissolved oxygen (except near the bottoms of certain sloughs) and high natural levels of suspended solids in the Fraser. This leads one to believe that two parameters of relatively minor significance in effluent are BOD and SS. Yet what we actually find is just the opposite: overall, the Branch has tended to place much greater emphasis on them than on any other parameters (except perhaps pH). This is reflected in the data presented in the FRES water quality reports: by far the most complete data are for BOD, SS, and pH. In contrast, data on such toxic substances as ammonia, phenolics, cyanide, and heavy metals are scanty, and it is these, because of their toxicity and/or persistence, that present the Lower Fraser with its most serious long-term threat.

Presumably this misdirected emphasis is because BOD and SS are readily measurable, they are the most widely used conventional indices of water and effluent quality, and engineers are familiar with the technical means for their control. But the point of pollution control should not simply be to reduce loadings of this or that for its own sake; the point is to pursue some level of water quality that yields benefits--tangible and intangible--to society.

(3) Evaluation of any one proposed discharge tends to occur in isolation from a regional context. That is, the emphasis is on controlling the proposed activity to the extent the Branch can persuade the proponent to go along with, instead of first deciding what the receiving environment can accomodate and then limiting the discharge to the appropriate level, which might conceivably mean no controls on the discharge at all. In some cases however, and an increasing number if the Fraser Valley continues to grow and if water quality is to be preserved, limiting discharges to some hypothetical level may necessitate refusing the permit altogether. Presently there is little likelihood of this happening.

The major technical reason for not adopting a so-called carrying capacity approach (U.S. EPA, 1973) to water quality management in the Fraser is the scant knowledge of what happens to pollutants once they are discharged. Presently the Branch uses an extremely crude estimate of the dilution capacity available based on the entire channel's extreme low flow at the site of discharge. That is, it is assumed that the effluent is

instantaneously diluted by a factor equal to the entire river flow, which is absurd. In addition, dilution is no solution to those toxic, long-lived elements and compounds that may accumulate in sediments and biota at the same time their concentrations in the water are below detectable limits or within what are considered safe levels.

(4) The information made available to the public at the time of application gives virtually no "feel" for the possible effect of the proposed discharge. All that is printed in the legal ads that announce the application is the effluent flow rate, the site of discharge, and a description of the effluent. These figures are scientifically meaningless and unintelligible to most of the public.

The above observations suggest the following recommendations:

Second Recommendation: The Branch should be given the authority to procure pertinent financial data whenever an applicant claims that the cost of proposed measures is "prohibitive" and the Branch has reason to doubt the claim.

Third Recommendation: Greater priority must be given by the Branch to the control of toxic and ecologically persistent pollutants, which even now are neglected on many permits, despite the long-term threat they pose.

Originally, permit conditions were based on data the applicant himself supplied, and this may still be occurring to some extent. For all but food-processing and small domestic sewage discharges, the Branch should carry out tests of its own to insure there are no significant omissions.

Fourth Recommendation: In evaluating a proposed discharge, the Branch should place greater emphasis on assessing its potential impacts on the receiving environment in relation to the impacts of other discharges--a "regional framework" is needed.

The Ministry of Environment should commission or develop itself hydraulic and/or mass transport models that can predict pollutant concentrations, temporally and spatially, from one or more discharges. In this way loading limits can be computed that are commensurate with water quality objectives for some reach, and an individual applicant's proposed loadings can be evaluated in the light of their regional significance. If studies show that reach loading limits are being approached or exceeded, the Branch will have to develop mechanisms for allocating "discharge rights" among competing dischargers. There is ample literature on this subject and even a degree of local expertise.

Fifth Recommendation: Ways of publicizing the predicted impact of the proposed discharge on a routine basis should be explored by the Branch. Although it would lengthen the time taken to process applications by a month (about 20% longer than it now requires), an abbreviated version of the resume now prepared for each application could be circulated among the public prior to the Director making a final decision. This might come in the form of a press release sent to local papers or an announcement sent to potentially interested groups and the neighboring community.

7.3.3 Participation by Affected Interests

Setting permit terms is not usually a simple matter of slapping down the correct Objectives. Rather, it is primarily a two-party bargaining process between the regulator (the Branch) and the regulated party (the applicant), with frequent input by affected third party interests, in the form of other agencies or the public. The two referral agencies most likely to raise concerns in recent years are the federal Environmental Protection Service and the provincial Fish and Wildlife Branch. Both responded more frequently in the case of refuse disposal permits for wood waste than with effluent permits for discharge to the Fraser itself (probably because of the more identifiable impact of dumps on local habitat).

Certain members of both EPS and Fish and Wildlife are very dissatisfied with the Branch's accomodation of their concerns, which usually relate to the degradation of fish-bearing waters. Indeed, I found that these concerns went unheeded much more often than they were heeded. The Conservation Officers who headed the 1980 Fraser River Task Force noted likewise:

In most instances, we observed that the recommendations submitted by the Regional Biologist and technicians of Waste Management Branch, B.C. Fish and Wildlife Branch and Federal Fisheries staff which identified present and future problems, such as leachate, were ignored. This ultimately, in many cases resulted in either illegal pollutions (sic) or severe environmental damage from permitted sites. (Ackerman and Clapp, 1980: p. 13)

My view is that this account probably exaggerates the situation somewhat: in my own study cases, advice was sometimes followed. Frequently, what was "identified" was not impact per

se , but concerns that impact might materialize. When the suggestions of other agencies were not heeded, according to the Branch it was usually for one or both of two reasons. Either the concerns over possible impact were not "properly substantiated", or the proposed mitigative measures were not considered "reasonable" (i.e. would involve higher costs for the permittee than considered necessary or fair). Since such costs were never openly quantified, it is impossible to know how unreasonable they really are. The "substantial" profits that Ackerman and Clapp (1980) declared were won by some haulers and developers from illegally deposited wood waste would suggest that in some cases at least, the costs of preventive pollution control measures to the proponent or permittee are not prohibitive.⁴

What of the claim cited in Chapter Two that "properly substantiated" positions will be honoured by the Branch? Based on the record, either these agencies are not properly substantiating their cases, or the claim is simply not true. The answer, it seems to me, is some of both. Actually, as stated, the claim displays greater political acumen than intellectual honesty, because whether or not a position can be substantiated, there is still the question of whether the substantiated impacts represent significant damage. If a conservation agency can document unequivocally to everyone's satisfaction that a proposal will destroy a stream tributary to the Fraser with a run of 50 salmon, does this mean, laws aside for a moment, that the application should be rejected outright? What if the only fish present are suckers and carp?

The answer is that it depends on what the fish--whatever kind--are worth relative to the value of foregone opportunities. It may well be that if we are to permit further growth and development in this region that deleterious influences on water quality are inevitable (assuming, that is, that per capita pollution control expenditures will have to rise, and that at some point, they will climb higher than what most of us are willing to pay. It seems more likely that now and in the immediate future however, that a reasonable degree of control can be provided at a "reasonable" cost.⁵

Public participation in the evaluation of permit applications was meager, limited to a total of four formal objections in three of my 13 cases. Each of these objections was made to safeguard a threatened private interest; no objection was launched expressly on behalf of the public interest, although class actions are not prohibited by the Act. One of the four objections was successful, but it was made by a well-organized group (the United Fishermen and Allied Workers' Union; the other objectors were individuals) and offered an inexpensive solution. The other three were objections in principle to an entire operation. No hearings were called, as it is the Director's prerogative to do, and the effect on decision-making was probably slight, beyond bolstering the regulator's sense of purpose. In my judgement the Director's decision in these cases was not unfair. On the other hand, it appeared that the Branch's efforts at communicating with the objector were perfunctory and not all that helpful. I cannot

predict how the Branch would have decided in the case of multiple objections to an application, as this situation did not arise.

Sixth Recommendation: The Ministry of Environment should conduct, or preferably, fund through a university (to help insure impartiality), an evaluation of the Branch's record in the adjudication of disputes that emerge in response to proposals advanced in permit applications. The study should be made public and should address itself to unsettling allegations, not put to rest by this thesis, of a "pro-industry" bias in the Branch's decisions.

I will refrain from recommending that federal agencies more spiritedly oversee their jurisdiction (beyond submitting rather passively to the Branch's dominant role as operator of the permit system) only because it strays from my topic and enters the delicate realm of higher-level federal/provincial relations.

7.4 Monitoring and Enforcement--Conclusions and Recommendations

7.4.1 Compliance with Prescribed Procedures

Non-compliance by permittees with their monitoring requirements was a significant problem. My file search indicated that perhaps only on the order of one-third to one-half of all permittees comply precisely as they are required to. Fraser River Estuary Study water quality reports suggest a somewhat higher rate of compliance that varies by industry, the food industry having by far the worst record. The WMB's reponse to non-compliance has been to write letters to the permittee reminding them of their responsibility and to visit the operation in person if this does not produce a satisfactory

response. This approach appears to have had mixed success at best in inducing prompt voluntary compliance.

There is also a significant amount of non-compliance with substantive permit requirements (discharges exceeding allowable limits). Here the WMB's response depended on how cooperative they perceived the permittee to be. While prosecution was threatened a number of times, it was only very rarely invoked. In some cases the permittees responded at least enough to reduce pressure from the WMB. In others, the WMB was not able to resolve the issue to their satisfaction by resorting to threatening tactics, and so violations have simply continued.

The prosecution of violators under the Act has to date by an ineffective means of enforcing general compliance. The time required to prepare cases is substantial, judges tend towards leniency, evidentiary requirements are very stringent in a criminal court, and penalties, even when they are obtained, are puny. Although convictions are obtained in a majority of cases, the mean penalty was \$492. The paltry fines typically handed out can only signify to potential violators that the province does not take offences against the Pollution Control Act very seriously.

First Recommendation: In view of the above problems, serious consideration should be given to experimenting with civil assessments as an alternative to criminal sanctions as an enforcement tool.⁶ In a 1980 article in the Harvard Environmental Law Review, Drayton describes the attractive features of this approach, outlines it in some detail, and discusses its application in the state of Connecticut, where enforcement by conventional court prosecutions has produced results as

disappointing as British Columbia's.⁷ The approach should be implemented in the Lower Fraser on a trial basis, in conjunction with the standard approach (litigation in the provincial courts) now being used.

The seven man Fraser River Task Force's activities in 1980, which included investigations of possible violators and the laying of charges, all with wide media coverage, appears to have had the effect of frightening some problem violators into more compliant conduct (which demonstrates that the real possibility of prosecution does have some deterrence value). Although those in the Branch who deal daily with permittees have understandably felt that a confidence or trust has been violated by this intervention from outside into their affairs, and that it may have damaged constructive working relationships, it is probably necessary to divorce the management function from the enforcement function because of the ease with which managers can be "captured". In dealing with permittees on a day-to-day basis, in seeing their problems from their point of view, and in forming at least a cordial relationship in order to be able to communicate at all, it then becomes very difficult to turn around and charge the permittee with unsatisfactory performance.

Second Recommendation: The enforcement function proper should be made external to the Branch by giving it to the Conservation Officer Service, as is now being done. The Ministry of Environment however, should study the impact of this move not only on general compliance along the river, but also on the working relationship between Branch administrators and permittees.

7.4.2 Generation and Use of Information

Effluent monitoring by permittees is inadequate. It is not possible to estimate total loadings to the river without using a good deal of extrapolation. In a number of cases effluent monitoring is too sketchy to even be able to determine permit compliance. Sources of some toxic contaminants found in the river are still unknown.

In the 13 cases I examined, zone of influence monitoring in local receiving waters was carried out very infrequently, not enough to detect detrimental influences if they actually occurred. A Branch memo stated that monitoring of the receiving waters of seven small sewage treatment plants in the Lower Fraser was nearly non-existent. I infer that zone of influence monitoring in general is inadequate for management purposes.

Funding reductions have curtailed the background monitoring programmes given impetus by the FRES water quality studies, foregoing the opportunity to develop a comprehensive base of data from which to observe long-term trends in water quality on the river. Some but not all of the special studies recommended by the Estuary Study to reduce information gaps are being carried out.

7.4.3 Participation by Affected Interests

There is some opportunity for participation and scrutiny by the affected public. The existence of this study testifies to that. Monitoring data are supposed to be available to the public upon request, and with them, compliance with permit terms can be determined. However, what the public would really need

to know is how a given reach is being affected by discharges, and mere compliance or non-compliance with permits does not reveal this. The paucity of information on zones of influence hampers reaching any conclusion as to the adequacy of pollution control measures.

Since permit correspondence files are not normally released to anyone but formal objectors or appellants, it is not possible to scrutinize the record of negotiations between the Branch and the permittee. This can be very useful information in assessing the performance of the two parties, which is certainly one reason why they are reluctant to allow access.

Early in 1980, the Board held public hearings to review the adequacy of municipal sewage treatment in the Lower Fraser. This provided an opportunity to review and criticize the performance of both the Branch and the permittee (Greater Vancouver Sewerage and Drainage District). Most public involvement in the monitoring and enforcement stage, however, occurs through political channels external to the defined pollution control process.

Third Recommendation: Zone of influence monitoring should be stepped up so that both the Branch and the public can assess the impact of given discharges upon their immediate receiving environments.

Fourth Recommendation: The Ministry of Environment should sponsor a biennial report supplying up-to-date information on the water quality of the river, reach by reach, as well as on changes in aggregate loadings of pollutants discharged to the river.

The compilation of this report should be assigned to an

independent research group with scientific expertise and a credible reputation, such as B.C. Research. A public hearing should be held in conjunction with the issuance of the report, which should be distributed as widely as possible. The purpose of this whole effort would be not only to inform the general public on a regular basis (in the belief that an informed public can better contribute to intelligent political decisions), but also to remind resource managers both of their commitment to the public and of what they do know versus what they should know and could know (given proper research) about water quality in the river.

7.5 Government Commitment to Pollution Control

"Spending priorities depend upon the perceived needs of people for government services and programs and also the need for the government to manage the Province's natural resources and stimulate economic development." --B.C. Ministry of Finance. 1980. "Medium-Term Economic Outlook and Fiscal Analysis"

The level of funding provided for a government service is an indication both of the support it enjoys within government as well as government's perception of the support it enjoys among the electorate. Thus we can gain a telling insight into the importance the B.C. Government thinks British Columbians attach to pollution control efforts. The following information comes from the "Estimates of Revenue and Expenditure" presented annually for approval to the legislature.

For the 1980-81 fiscal year, estimated expenditures on the

Waste Management Branch were \$6.6 million, or .12% of the total provincial budget. Neither of these figures tells us very much however, except that the administrative cost of pollution control to the public is infinitesimal relative to total government expenses. More revealing is that in the 1972-73 fiscal year, expenditures on the Pollution Control Branch accounted for .18% of the entire budget. Thus, over the so-called "Decade of the Environment" spending on pollution control by the British Columbia government actually declined by 33% relative to all the services government feels called on to support.

Yet another index is the rate of change in funding levels from year to year. In the 1980-81 fiscal year, the Ministry of Environment (which includes the WMB and other related agencies) funding allocation was increased 13.2% from the year before, or several percent in real terms (above the rate of inflation). This compares to a 21.5% average increase among all other ministries. In the 1981-82 fiscal year budget, MOE has been marked for a 9.4% increase, compared to a 16.7% increase government-wide. The only ministry of the 21 others to receive a smaller funding increase was the Ministry of Forests. For all its rhetoric about fostering more intensive resource utilization and improving environmental management, the government has not "put its money where its mouth is".

Many of the shortcomings I have cited can be related to an under-funded, undersized staff, and in turn many of the improvements I have suggested will require greater government commitment to pollution control. While the number of permits to

administer and enforce has more than tripled since 1972, the total size of the Branch has changed little-- from 185 to about 200. In the Lower Mainland there is one regional manager, his assistant, three other staff engineers, one biologist, and six technicians to administer and enforce over 600 effluent, refuse, and air permits, the Litter Act and Project SAM. Ackerman and Clapp (1980) of the Fraser River Task Force recommended:

That Waste Management Branch staff be increased in the Lower Mainland Region by substantial numbers to administer and enforce the overwhelming number of permits and violations that occur on an annual basis in this area. At present, their numbers are far too low to even keep up with their present workload. (p. 26)

The lack of funding support is also reflected in cutbacks that have been made in the Branch's long-term water quality monitoring programme and other special research studies. At the same time, the government has announced that it will establish a permanent enforcement team of about twelve Conservation Officers and technicians for the Lower Fraser Region. While this is not unwelcome, one cannot help but feel that the politicians are neglecting long-term management needs by emphasizing solely that stage of pollution control (enforcement) certain to gain attention and popularity.

Notes to Chapter Seven

¹ "Fraser Fish to Get More Protection," The Province, April 23, 1981.

² "Lower Fraser 'A Filthy Mess'," Vancouver Sun, April 15, 1981.

³ Although salmon have been linked in a number of ways to the Fraser estuary's sloughs, marshes, tributaries, and banks, the precise relationships are still uncertain. We are unable to predict, with assurance, just how drastically the loss of this habitat would affect Fraser salmon. For a discussion of the major uncertainties, see Dorsey et al. (1978). As the authors point out, uncertainty is not an excuse for heedless development or unchecked pollution, but a rationale for proceeding cautiously in allowing any physical habitat destruction or additional pollution.

⁴ They describe instances in which the value of land was raised many-fold by the application of wood waste. Granted, this is one particular type of operation and the conclusion that control measures are affordable may or may not apply to industrial dischargers of effluent.

⁵ Studies have been conducted in the U.S. which suggest that the overall impact of pollution control measures on the economy is bearable. For instance, a 1972 report prepared for the Council on Environmental Quality, the Department of Commerce, and the Environmental Protection Agency--"The Economic Impact of Pollution Control: A Summary of Recent Studies"--noted:

In general, the studies found that the impact of those pollution control costs that were estimated and examined would not be severe in that they would not seriously threaten the long-run economic viability of the industrial activities examined. However, the estimated impact...is not inconsequential in that there are likely to be measurable impacts both on the economy as a whole and on individual industries.

⁶ "Civil assessments" refer to penalties or fines imposed by regulatory agencies outside of a court of law. An agency presumably is delegated the authority to enact such assessments by the legislature.

⁷ According to Drayton:

Central to the Connecticut approach is an economic standard that recaptures the gains realized from noncompliance by charging violators an amount just sufficient to make compliance as economically attractive as profitable commercial expenditures,

thereby denying scofflaws the unfair advantage they would otherwise have over law-abiding competitors. This recapture standard sets a financial charge exactly fitted to the facts of each case, one that varies directly with the value and duration of noncompliance. A simple formula using capital budgeting concepts translates capital costs, operating and maintenance expenditures, taxes, lost profits, and other variables over time into a monthly assessment equal to the average monthly benefits of noncompliance....

Using this recapture standard, a regulatory agency can adopt a host of economic remedies which lie between jawboning, which is often ineffective, and major sanctions, such as permanent injunctions, which are often too expensive and politically unwise....

This economic standard makes it reasonable to allow administrative agencies to impose assessments without first going to court. The formula-defined assessments are ministerial and can be reviewed and corrected easily. There is also the safeguard that no firm can ever be charged more than it has saved by ignoring the law. The Connecticut legislature authorized--and the Connecticut business community did not oppose--the delegation of administrative civil penalty powers to the state's environmental agency chiefly because they understood that these safeguards would be effective...

Early indications are that this economic approach to enforcement, which has been in use in Connecticut's air compliance program for five years, works well. Where the response to noncompliance has been automatic (small assessments for procedural violations), compliance rates have risen from just over fifty percent to ninety-eight percent....In short, the early evidence is that these tools do what they are supposed to do--reinforce compliance by the majority and deal effectively with the recalcitrant minority.

REFERENCES

- Ackerman, A. 1980. Personal communication.
- Ackerman, A. and B. Clapp. 1980. "Fraser River Task Force Report". Unpub. govt. document. 30 pp. + app.
- Benedict, A.H., K.J. Hall, and F.A. Koch. 1973. "A Preliminary Water Quality Survey of the Lower Fraser River System". Technical Report No. 2, UBC Westwater Research Centre.
- Berger, T.R. 1977. Northern Frontier--Northern Homeland: The Report of the MacKenzie Valley Pipeline Inquiry. Vol. I. 203 pp.
- B.C. Ministry of Environment. 1980. Annual Report 1979. 134 pp.
- B.C. Pollution Control Board. 1979. "Pollution Control Objectives for the Mining, Smelting and Related Industries of British Columbia". Ministry of Environment, Victoria. 15 pp.
- B.C. Pollution Control Board. 1968. "The Policy of the Pollution Control Board of British Columbia Regarding Pollution Control on the Fraser River Below the Town of Hope". 2 pp.
- B.C. Research Council. 1972. "Water Quality Survey of the Lower Fraser River," in, Provincial Power Survey Study 3, Appendix I-A. Montreal Eng. Co. (Cited in Hoos and Packman, 1974.)
- B.C. Water Resources Service. 1975. "Pollution Control Objectives for Food-processing, Agriculturally Oriented, and Other Miscellaneous Industries of British Columbia". Dept. of Lands, Forests, and Water Resources, Victoria. 35 pp.
- B.C. Water Resources Service. 1972. "Report on Pollution Control Objectives for the Forest Products Industry of British Columbia". Dept. of Lands, Forests, and Water Resources, Victoria. 25 pp.
- B.C. Water Resources Service. 1970. "Pollution Control in British Columbia". Victoria, B.C. 11 pp.
- Cain, R.T. and L.G. Swain. 1980. FRES Water Quality Background Report - Municipal Effluents. Victoria, B.C. 101 pp.
- Chmelauskas, A.J. 1972. Closing Remarks to the Public Inquiry into Waste Discharges from the Food-processing, Agriculturally Oriented, and Other Miscellaneous Industries of B.C. Vol. III.
- Clark, M.J.R. 1980a. Personal communication.

- Clark, M.J.R. 1980b. A Compilation of Water Quality Criteria. Ministry of Environment, Victoria, B.C. 298 pp.
- Clark, M.J.R. and R.W. Drinnan. 1980. "Is the Strait of Georgia becoming more eutrophic?" Can. J. Fish. Aquatic Sci. 37:1047-1048.
- Dorcey, A.H.J. (ed.) 1976. The Uncertain Future of the Lower Fraser. Westwater Research Centre, UBC Press, Van. 202 pp.
- Dorcey, A.H.J. and K.J. Hall. 1981. "Setting Ecological Research Priorities for Management: The Art of the Impossible in the Fraser Estuary". Prepared for the Fraser River Estuary Study by the Westwater Research Centre. In press.
- Dorcey, A.H.J., T.G. Northcote and D.V. Ward. 1978. "Are the Fraser Marshes Essential to Salmon?" Westwater Lectures, No. 1. 29 pp.
- Downs, A. 1967. Inside Bureaucracy. Little, Brown and Company, Boston. 292 pp.
- Drayton, W. 1980. "Economic Law Enforcement". The Harvard Environmental Law Review. Vol. 4, No. 1, 40 pp.
- Drinnan, R.W. and M.J.R. Clark. 1980. FRES Water Quality Background Report - Water Chemistry, 1970-1978. 160 pp.
- Ferguson, K.D. and K.J. Hall. 1979. FRES Water Quality Background Report - Stormwater Discharges. 197 pp.
- Fox, I.K. 1970. "The Use of Standards in Achieving Appropriate Levels of Tolerance". Proceedings of the National Academy of Sciences. 67(2):877-886.
- Fox, I.K. and L. Wible. 1973. "Information Generation and and Communication to Establish Environmental Quality Objectives". Natural Resources J. 13(1):134-149.
- Franson, R.T., D. Blair and R. Bozzer. 1976. "The Legal Framework For Water Quality Management in the Lower Fraser River of British Columbia," pp. 54-95 in Swainson (ed.) Managing the Water Environment, UBC Press.
- Franson, R.T. and A.R. Lucas. 1974. "Environmental Decision-making in British Columbia". Unpub. paper, Westwater Research Centre Library. 44 pp.
- Fraser River Estuary Study Recreation Work Group. 1979. Recreation.
- Fraser River Estuary Study Steering Committee. 1978. "Key Findings and Recommendations". 22 pp.

- Fraser River Estuary Study Water Quality Work Group. 1981. Summary of findings and update presented to public meeting in Robson Square, Vancouver.
- Fraser River Estuary Study Water Quality Work Group. 1979. Summary Report. 176 pp.
- Goldie, C.A. 1967. Pollution and the Fraser. B.C. Water Resources Service, Pollution Control Branch, Victoria. 55 pp.
- Good, P. 1971. "Anti-Pollution Legislation and its Enforcement". UBC Law Review, 6(1):271-286.
- Gough, G.R. 1980. Personal communication.
- Gough, G.R. and B.J. Moore. 1980. "Hog Fuel as a Fill in the South Westminster Area: A Review and Water Chemistry Survey". A Waste Management Branch report. 26 pp. +app.
- Hall, K.J. 1976. "The Quality of Water in the Lower Fraser and Sources of Pollution", pp. 21-46 in Dorsey (ed.) The Uncertain Future of the Lower Fraser.
- Heberlein, T.A. 1976. "Principles of Public Involvement". U. of Wisconsin-Madison, Dept. of Rural Sociology, Staff Paper Series in Rural and Community Development. 26 pp.
- Hehn, D. 1980. Personal communication.
- Holden, M. Jr. 1966. "Pollution Control as a Bargaining Process: An Essay in Regulatory Decision-making". Cornell U. Water Resources Center, Pub. No. 9. 53 pp.
- Hoos, L.M. and G.A. Packman. 1974. The Fraser River Estuary: Status of Environmental Knowledge to 1974. Environment Can., Fisheries and Marine Service, Pacific Env. Inst., West Van., B.C. Special Estuary Series No. 1, 518 pp.
- Ince, J.G. 1976. Environmental Law: A Study of Legislation Affecting the Environment in British Columbia. UBC Centre for Continuing Education. 209 pp.
- Joy, C.S. 1974. Water Quality Monitoring in Estuaries. Unpub. UBC PhD thesis. 205 pp.
- Klassen, H.P. 1980. Personal communication.
- Kneese, A.V. and B.T. Bower. 1968. Managing Water Quality: Economics, Technology, Institutions. Resources for the Future, Johns Hopkins U. Press, Baltimore. 328 pp.
- Koch, F.A. 1976. Lower Fraser River Estuary Dissolved Oxygen Dynamics. Unpub. UBC PhD thesis. 152 pp.
- Langer, O. 1980. Personal communication.

- Mackenzie, C.J.G. 1980. "Water Quality Management in British Columbia". Canadian Water Resources Journal. 5(3):69-77.
- McPhee, M.W. 1980. "Public Involvement in Setting and Enforcing Pollution Control Standards in British Columbia", pp. 165-170 in W.R.D. Sewell and M.L. Barker (eds.) Water Problems and Policies, Cornett Occasional Papers No. 1, Dept. of Geography, U. of Victoria, B.C.
- McPhee, M.W. 1978. Water Quality Management in British Columbia: Pollution Control in the Pulp and Paper Industry. Unpub. master's thesis, Simon Fraser U. 344 pp.
- Meyer, P.A. 1978. "Updated Estimates for Recreation and Preservation Values Associated with the Salmon and Steelhead of the Fraser River". Fish. and Env. Canada. 35 pp.
- Meyer, P.A. 1974. "Recreational and Preservation Values Associated with the Salmon of the Fraser River". Env. Can. Info. Rpt. Series No. PAC74-1. 49 pp.
- Miller, D. 1980. Personal communication.
- Northcote, T.G. 1974. "Biology of the Lower Fraser River: A Review". UBC Westwater Research Centre, Tech. Rpt. No. 3. 94 pp.
- Olson, M. Jr. 1965. The Logic of Collective Action: Public Goods and the Theory of Groups. Harvard U. Press. 176 pp.
- Seneca, J.L. and M.K. Taussig. 1974. Environmental Economics. Prentice Hall, Inc. Englewood Cliffs, N.J. 354 pp.
- Sewell, W.R.D. 1971. "Environmental Perceptions and Attitudes of Engineers and Public Health Officials". Environmental Behaviour, March, pp. 23-59.
- Simon, H.A., D.W. Smithburg, and V.A. Thompson. 1950. Public Administration. Alfred A. Knopf, New York. 582 pp.
- Sproule-Jones, M.H. and K.G. Peterson. 1976. "Pollution Control in the Lower Fraser: Who's in Charge?" pp. 151-174 in Dorsey (ed.) The Uncertain Future of the Lower Fraser.
- Stancil, D.E. 1980. FRES Water Quality Background Report - Aquatic Biota and Sediments. 187 pp.
- Stockner, J.G., D.D. Cliff and K.R.S. Shortreed. 1979. "Phytoplankton ecology of the Strait of Georgia, British Columbia". J. Fish. Res. Bd. Can. 36:657-666.
- Stockner, J.G., K.R.S. Shortreed and E.A. MacIsaac. 1980. "The benevolent Strait: a reply". Can. Fish. Aquatic Sci. 37: 1048-1055.

- Swain, L.G. 1981. FRES Water Quality Background Report - Industrial Effluents. 195 pp.
- Swainson, N.A. 1976. "Defining the Problem", pp. 1-30 in Swainson (ed.) Managing the Water Environment, UBC Press. 256 pp.
- U.S. Environmental Protection Agency. 1980a. A Letter to Concerned Citizens.
- U.S. Environmental Protection Agency. 1980b. Economic Impact Analysis of Proposed Effluent Limitations Guidelines, New Source Performance Standards and Pretreatment Standards for the Pulp, Paper and Paperboard Mills, Point Source Category, Vol. I. Office of Water Regulations and Standards. EPA 4402-80-086.
- Venables, W.N. 1977. "Director's Report" in B.C. Min. of Environment Annual Report 1976. 153 pp.
- Venables, W.N. 1975. Foreward to "Pollution Control Objectives for Food-processing, Agriculturally Oriented, and Other Miscellaneous Industries of British Columbia". B.C. Water Resources Service.
- Venables, W.N. 1973. Opening Remarks to the Public Inquiry into Municipal-type Waste Discharges. Victoria, B.C. Vol. I.
- Venables, W.N. 1972. "Pollution Control Branch Director's Report", in B.C. Water Resources Service 1971 Annual Report. 137 pp.
- Venables, W.N. 1970. Opening Remarks to the Public Inquiry into Waste Management and Environmental Control in the Forest Products Industry. Vancouver. Vol. I.
- West Coast Environmental Law Research Foundation. 1980. "Guide to the Pollution Control Act (S.B.C. 1967)". Working paper, 16 pp.
- Westwater Research Centre. 1979. "The Status of Fraser Estuary Research". 14 pp.
- Wong, H.Y. 1980. Personal communication.