ASSESSING THE POLITICAL AND INSTITUTIONAL ARRANGEMENTS FOR THE BRITISH COLUMBIA COASTAL SAND AND GRAVEL INDUSTRY

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B.E.S., University of Waterloo, 1979

A THESIS SUBMITTED IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS

in the Department
of
Geography

We accept this thesis as conforming
to the required standard

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ABSTRACT

The political and institutional arrangements governing the development and use of coastal resources are characterized by a complex pattern of agencies and organizations that establish and implement a variety of laws, legislation and regulations. The form and structure by which the arrangements have evolved and function affect their operations and performance. In order to improve our understanding of the way in which the organizational structure and political processes interact, the coastal sand and gravel industry in British Columbia is examined.

The study identified thirteen federal and provincial agencies and a myriad of regional and local governments involved in the governance process. The essence of the institutional arrangements is the size of the government units, the multiplicity of agencies and laws and the interdependencies among them. In order to help explain the relationship among these variables in the process, two concepts are advanced - the traditional concept of the resource problem and the alternative concept of governance problems. The theoretical structures implicit in both concepts are isolated and a set of seven criteria are developed to assess the operations of the arrangements and consider which concept provides a relatively better explanation of the coastal sand and gravel industry.

The study examined the permit application and regulatory enforcement operations of the political and institutional arrangements, identifying the functions of the agencies and the interactions among them. Baseline data for describing and assessing the operations was collected from the appropriate agencies and local governments, the coastal sand and gravel operators and three coastal newspapers.

Although the assessment indicated three weaknesses within the arrangements, as a whole, the system was found to work quite well. The study disclosed a high degree of coordination for permit applications and resolution of violations among the agencies, flexibility within the system regarding duplicate regulations, adaptability towards jurisdictional overlap and accessibility and scrutiny by the public. Overall, the study concluded that the coastal sand and gravel industry is best explained by the theoretical structure implicit in the alternative concept of governance problems.

The implications of this study are twofold. First, the identified procedural weaknesses require further investigation into their actual effect on resource use and development before changes can be proposed. Second, in a broader sense, the study identified key variables and their interrelationships and attempted to develop and advance a conceptual framework

in order to assess and understand the complexity of political and institutional arrangements.

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ACKNOWLEDGEMENT

I am grateful to several individuals for their direction and assistance during this study. In particular, I am indebted to Dr. Bill Ross, Dr. Charles Forward and Dr. Bob Bish for their helpful comments and constructive criticisms. I appreciate the assistance of Kirk Miller, Danny Hora, Dennis Galbraith, Jon Buckle, L.B. Duke, John Lamb and Neil Chapman who took the time to answer my questions and locate pertinent information. Also, I wish to acknowledge the University of Victoria and the Geography Department for providing financial assistance during my studies.

DEDICATION

"To Everyone in the Pits"

Chapter I

INTRODUCTION

Rationale

The coastal zone represents a transitional terrestrial-freshwater-marine interface with dynamic physical processes and diverse economic and social systems. Also, it contains a complex structure of political and institutional arrangements. These arrangements refer to the mix of legislation, regulations, laws and established customs, the individuals, organizations and agencies that determine and implement the bounds of behaviour and the interdependencies among them.

In British Columbia, the coastal zone extends approximately 27,200 kilometres and includes island shores and freshwater surfaces (Ministry of Lands, Parks and Housing, 1982). The zone, its resources and related activities fall within the jurisdiction of federal, provincial, regional and municipal governments. The Ministry of Lands, Parks and Housing (1982) has identified thirty-seven federal and provincial agencies responsible for some aspect of coastal zone management. As well, there are thirteen regional districts and a myriad of municipalities located within the zone. The political and institutional arrangements establish the conditions under which coastal resources can be developed and used and provide organizations and individuals with

certain resources and authority to execute prescribed tasks (Fox, 1976). In order to improve our understanding of the role of political and institutional arrangements in the coastal zone, this thesis examines one particular resource activity - the coastal sand and gravel industry.

The coastal sand and gravel industry in British Columbia operates in a web of complex and interrelated political and institutional arrangements. Industrial sand and gravel operators are subject to laws, regulations and programs administered and enforced by the federal, provincial, regional and municipal governments. Thirteen federal and provincial agencies, two regional districts and sixteen municipal governments have some power through acts, regulations and by-laws to manage the industry. As well, the industry is influenced by zoning requirements, official land-use plans and government programs which are by-products of other policy objectives not related to the industry. Collectively and individually, the agencies, regional districts and municipalities provide the conditions under which sand and gravel resources can be developed and decide what, when and how management is carried out.

Effective management of a resource is dependent on information about past and present behaviour (Englander, Feldmann and Hershman, 1977). After management and regulatory

functions have been devised, responsibilities have been allotted and programs and regulations have been established and operationalized, the political and institutional arrangements for the resource can be studied and evaluated. The need arises to review the existing arrangement, to understand how it operates and to determine what, if any, problems have been created that adversely affect resource development and use. Information from this analysis can be used to locate weaknesses, support strong and effective programs and re-evaluate the arrangement itself.

The purpose of this thesis is twofold. The first is to identify and examine the political and institutional arrangement which governs the British Columbia coastal sand and gravel industry. This includes both the formal and informal responsibilities and interdependencies of the agencies, districts and municipalities as specified in acts, regulations, by-laws and policies. Second, the arrangement is examined to determine the relationship between the entities and their responsibilities and to identify if any weaknesses, regarding the structure and operation, are present.

Research Procedure and Structure

A number of definitions for political and institutional arrangements have been developed, particularly in water management studies (Mitchell, 1975). They have ranged from

formal statements of rules and penalties in statutes to all aspects of the laws, customs and ways of behaving in the total system (Thompson, 1981). However, established laws and regulations for the use and control of a resource do not solely make up the arrangements. The arrangements reflect the balancing of the physical environment, the economic setting in which they evolve, technological changes, the cultural climate and competition among potential users of resources (Fox, 1976). As well, the agencies and organizations that determine and implement these actions are not to be overlooked since they make the difference in what, when and how management is conducted (Sproule-Jones, 1980). This leads to the following basic components of the political and institutional arrangements:

1. the entities, legislative bodies and regulating agencies that establish the rules or laws about how resources may be developed and used;

2. the rules or laws governing the development and use of resources;

3. the entities that participate in deciding what resource development and use programs will be undertaken; and

4. the entities that implement the development and use programs decided upon.

This definition suggests that the resource management process can be conceptualized into a three component framework: actors (groups, individuals, organizations); behaviour (decision-making); and context (time-place-thing setting).

This framework requires any investigation to consider the relationships within the arrangement since decisions are seldom made by a single entity (Mitchell, 1975). The process is a consequence of the interactions between the entities. The term, political and institutional arrangements, suggests linkages or interrelationships among a range of variables with emphasize the complex interactions occurring in the resource management process (Mitchell, 1975).

Two concepts have been advanced to help explain the relationship among the components in the management process. The traditional concept of the management problem regards the multiplicity of independent agencies and laws, responsible for managing some aspect of resource use, as the problem. This creates a number of organizational process problems, such as duplicate regulations and a low degree of coordination, which would be minimized by the establishment of a lead organization (Johnson, 1977 and Johnston, 1977). The alternative concept views resource use decision-making as a problem of governance (Bish, 1982). There seldom exists a single organization capable of facilitating a variety of interests in a diverse field or region. Numerous, redundant and interdependent small organizations are more accessible, adaptive and better able to reconcile, trade off and accommodate conflicting and complementary goals (Bish, 1982).

An array of general criteria is available for evaluating political and institutional arrangements to determine which concept better fits the coastal sand and gravel industry. In order for judgements to be made, the criteria must be explicit, operational and measurable (Mitchell, 1975). The decision-making process is influenced by the functions of the entities and their means of communication with other agencies, the community and the type and scope of problems or conflicts associated with the behaviour of the agencies. In order to provide guidelines for political and institutional arrangements, the criteria should be systematically related to management functions and organizational problems (Mitchell, 1975).

Chapter II examines the theoretical structures implicit in both the traditional and alternative conceptions and organizes them in propositional form. The list of propositions has been derived from a review of the literature and case studies supporting the two concepts. They will be used to guide the research, develop the criteria used to assess the political and institutional arrangements and determine which concept better fits the coastal sand and gravel industry.

Chapter III examines the coastal sand and gravel industry in British Columbia. Part One describes the physical properties of sand and gravel and the general operation of the

industry. Part Two defines the coastal region, and the distribution of the deposits and describes the historical evolution and present structure of the industry.

Chapter IV identifies the various federal, provincial, regional and municipal organizations involved in the industry. The agency, its functions, governing statutes and mandate are described.

Chapter V examines the operational arrangements through which the functions and responsibilities of the entities are administered. These operational arrangements are the sand and gravel removal permit application, regulatory control and permit cancellation procedures.

Chapter VI assesses the political and institutional arrangements for the industry. The operations and procedures described in the previous chapter are evaluated, based on the criteria developed in Chapter II.

Chapter VII summarizes the development of the industry and reviews the structure of the political and institutional arrangements. Based on the evaluation of the arrangements, an assessment is made as to which of the two concepts previously noted best explains the management of the coastal sand and gravel industry. In conclusion, limitations of

the study and further research needs in this field are presented.

Chapter II

CONCEPTUALIZING THE INSTITUTIONAL STRUCTURE

Introduction

The political and institutional arrangements governing the development and use of resources are characterized by two variables - the size of the governmental units and their multiplicity. The form and structure by which these arrangements have developed and function affect their operations and performance (O'Riordan, 1971). In order to define the structure and explain the workings of the political and institutional arrangements, two concepts have been postulated and developed to specify the relationship between these variables - the traditional conception of the management problem and the alternative conception of governance problems.

The purpose of this chapter is to isolate the theoretical structures implicit in both concepts. A set of seven criteria, based on the propositions, are developed to assess the operations and procedures of the arrangements and to determine which concept provides a better explanation for the political and institutional arrangements which govern the coastal sand and gravel industry.

Traditional Concept of the Management Problem

In the past decade, the coastal management literature has suggested that the management problem is the number,

complexity and overlapping nature of public institutions at the federal, provincial and municipal levels which make integrated coastal management difficult, if not impossible (Pross, 1975 and Harrison and Kwamena, 1981). The coastal zone is viewed as a complex interface tied together by physical, social and economic relationships but divided by government powers and specialized administrative functions (Pross, 1975). Most resource activities often transcend fixed government boundaries. For example, a new harbour development which combines commercial, recreational and fishery support facilities may fall under the responsibilities of the departments of Transport, Environment, Fisheries and Oceans, Public Works, Regional Economic Expansion and the National Harbours Board as well as provincial agencies and municipalities. The development and use of resources may be caught between two jurisdictions, each supplying different or conflicting signals for appropriate behaviour. This may result in divided or fragmented jurisdiction over resource development and use. General criticism suggests that fragmented responsibilities reflect a poorly integrated political and institutional structure and creates several by-products (Harrison and Kwamena, 1981 and Mitchell and Sewell, 1981). The by-products include the limited recognition of the management issue, internal organizational problems and difficulties in the distribution of relevant information (Pross, 1975).

Proponents of the traditional concept generally point out organizational process problems apparent in a multi-agency arrangement in water management studies (Oullet, 1969 and Cram, 1971), as well as in coastal management studies (Pross, 1975 and Johnson, 1977). Organizational process problems are deficient procedures or characteristics that restrain an agency or organization from performing its functions and attaining its objectives (Englander, Feldmann and Hershman, 1977). Examples of process problems include conflicting regulations and laws, short-term rather than long-term management strategies and vaguely stated or conflicting goals.

In 1978 at a meeting of the First Ministers of Canada it was agreed that "the burden of government regulation on the private sector should be reduced and the burden of overlapping federal and provincial jurisdictions should be eliminated" (First Ministers' Conference, 1978). In 1979, the Economic Council of Canada identified four costly and unnecessary organizational process problems resulting from multi-agency responsibility over a specified resource activity.

Overlap/Duplication

A needless and costly overlap is created when a number of agencies of one level of government exercise similar or related administrative responsibilities. In water manage-

ment studies, overlapping jurisdictions have been cited as a major source of water management problems (Oullet, 1969 and Cram, 1971). Information exchanges and program implementations are inadequate as a result. Efforts should be made to remove institutional barriers that hinder co-ordination and overlap (Cram, 1971).

When federal and provincial jurisdictions are effectively concurrent or unclear, both governments are regulating the same activity, creating a situation of duplication. As a result, potential inefficiency in management programs and the regulation of resource development and use may arise from such jurisdictional confusion (Thompson, 1981).

Lucas and Hunt (1980) in their study of the provincial and federal functions in offshore petroleum exploration and oil and gas development projects identified a number of legislative and program duplication between the two governments. This was especially evident with environment reviews by the Arctic Waters Advisory Committee and the Federal Interdepartmental Environmental Review Committee and with environmental assessments by the Federal Environmental Assessment Review Process and the Alberta Energy Resources Conservation Board. The industry is confused over which review or assessment takes precedence and what type of information is required in each process. This lack of clarity caused

delays and unnecessary costs for the industry (Lucas and Hunt, 1980).

Lucas and Hunt (1980) also identified duplicate land use permits, under the Territorial Land Use Regulations and under the Oil and Gas Production and Conservation Act as a problem. Double permitting requirements create unreasonable delays in processing permit applications. As well, conditions in one permit may provide a defence to a breach of a condition in the other permit. In one instance, the offender was charged with a breach of the sulphur dioxide emission limits under the first permit. But under the second permit, the breach of the provision is allowed, in the case of an emergency. On this basis, the defence was accepted.

Lack of Coordination

Different agencies within a level and between levels of government often fail to coordinate their policies and programs, creating a situation of inconsistency. Coordination and cooperation difficulties between agencies may arise from legislative duplication and overlap as well as fragmented responsibilities between multiple agencies (Englander, Feldmann and Hershman, 1977). Often the reconciliation of the different interests of the agencies is difficult since there is a lack of accepted mechanisms and this leads to sporadic or unplanned coordination (Pross, 1975). Coordination between

agencies is perceived as not only a means of increasing the quality of the public service system, but also a way to improve the efficiency of the system (Whetten, 1982). The efficiency of the system refers to minimizing time delays and reducing conflicts between agencies.

Cram (1971) identified a low degree of coordination between water management agencies as a barrier to the flow of water pollution information between the agencies and the public. Sewell (1969) observed that the division of powers between federal and provincial authorities in the development of water resources in Canada calls for maximum coordination and cooperation between policies and programs. The Constitution Act of 1867 grants the ownership and development of water resources to the provinces. The federal government has jurisdiction over the use of water for navigation, fisheries and agricultural purposes and problems concerning international and interprovincial relations. However, there is often confusion as to which authority is responsible for a particular function and this results in considerable delays and conflicts in project development (Sewell, 1969). For instance, delays and conflicts in commencing pollution-control projects have been attributed to the lack of defined and coordinated responsibilities between federal and provincial authorities (Sewell, 1969).

Lucas and Hunt (1980) identified the lack of coordination between provincial and federal agencies as a significant obstacle to overall oil and gas project regulation efficiency. For example, they found six major regulatory review processes and three discretionary processes were required for the Arctic Pilot Project to transport liquified natural gas from Melville Island to southern markets. From the industry's viewpoint, this created delays and led to higher costs during the review process (Lucas and Hunt, 1980).

In certain situations, several agencies have some degree of secondary responsibility for managing a resource, but no one agency has the primary mandate. As a result, an overall policy for guiding and planning resource development and use may be lacking and piecemeal management may result (Pross, 1975). In Atlantic Canada, no agency has been designated as the overall lead agency in coastal resource management. As a result, an overall policy for resource use, with specific goals and objectives, is absent (Pross, 1975). As a consequence, the issue of coastal zone management has received limited recognition since no lead agency has the mandate or incentive to encourage interest in and coordinate coastal resource use and development (Pross, 1975).

Inconsistent Enforcement Policies

Enforcement policies include the establishment of a set of rules and procedures, backed by penalties, to support broad objectives in administrative statements concerning resource development and use. The laws and regulations provide agencies with rights and duties which specify what may or may not occur. However, it is important to note that each agency establishes and enforces its own rules, laws and regulations within the guidelines of their relevant acts. These rules, laws and regulations are enforced by each agency, depending on the availability of manpower, resources and the priority each agency places on the program. Therefore, enforcement policies are affected by legal constraints (the power to enforce) and financial constraints (the resources to enforce) (Sproule-Jones, 1980).

Lucas and Hunt (1980) point out that effective enforcement of legislation and regulations governing oil and gas projects is hampered by a small field staff who in turn are hindered by legal constraints which reflect the uncertain division of enforcement responsibilities between the various agencies. For example, the jurisdictional conflict between the departments of Environment and Indian and Northern Affairs for lead status in administering environmental legislation has led to uncertainty and inconsistency in carrying out enforcement policies for Arctic offshore exploration. As well,

there exists uncertainty between the departments of Environment and Fisheries and Oceans as to the enforcement of pollution prevention provisions.

Nemetz, et al. (1980) in their study of the regulation of toxic chemicals into the environment found that enforcement is hampered by a "shallow pool of resources" among the various regulatory agencies. Small budgets, limited manpower and restricted practical information needed for setting standards affect regulation enforcement. As a result, enforcement by the agencies is often discreet and selective. This creates an uncertain enforcement policy and leads industry to perceive that agency power is used arbitrarily (Nemetz, et al., 1980). However, the enforcement of environmental laws is often viewed as a negotiation and discussion process between government and agencies to gain voluntary compliance. This may proceed for years with only an occasional legal action undertaken for non-compliance.

Public Involvement

The Economic Council of Canada recommends that the management and regulatory process provide more opportunities for public involvement at the rule-making and adjudicating stages because it is the reasonable way to identify spill-overs (costs imposed on third parties), to provide input for value judgements and keep the process open and accountable.

When a large number of agencies are responsible for some aspect of resource use and development, the public may be confused as to when, where and how they can participate in the decision-making process and the public may not be treated fairly across the board.

Water management studies were one of the first resource sectors to address the question of public accessibility and involvement in the institutional structure (Mitchell, 1979). Cram (1971) stated that to the public, government agencies responsible for water management represent "an almost impenetrable maze" (page 161). Relevant water pollution information is not accessible and the public is not being informed about water problems and management decisions (Cram, 1971). Lucas and Hunt (1980) also acknowledged a lack of public openness and accountability as a major source of weakness with the institutional arrangements. They concluded that within the maze of reviews, boards and agencies, there remains an uncertainty as to when and where the public should become involved (Lucas and Hunt, 1980). Nemetz, et al. (1980) found that the two levels of government have operated as rivals and separate entities to meet internal perceived mandates in the regulation of toxic chemicals. This has led to a lack of communication and confusion in the general sense among the client groups and the public (Nemetz, et al., 1980). The three studies found that the multi-agency

system is ineffectual in making their system open to the public and recommend the inclusion of public consultation as a formal process within the institutional arrangements.

Propositions Derived from the Traditional Concept

The preceding review suggests there are a set of four organizational process problems associated with a multi-agency system. A multi-agency arrangement with similar or related administrative responsibilities and functions for resource development and use creates the following organizational process problems:

1. a needless and costly jurisdictional overlap;
2. a repetitive and inefficient situation of regulatory and management duplication;
3. a low degree of program and policy coordination between and among levels of government leading to a situation of inconsistency;
4. a limited recognition of resource management issues;
5. an inconsistent enforcement policy among the agencies;
6. a restricted distribution and flow of relevant information among and between agencies needed for management decision-making; and
7. a situation of confusion concerning public involvement, in terms of where, when and how they can participate in the decision-making process.

Proponents of the traditional conception of the management problem believe these problems can only be dealt with effectively in a systematic manner within a planning context (Johnston, 1977). In water management studies, such conclusions

have led to a variety of proposals for establishing a single basin-wide authority to coordinate the interdependencies of the agencies (Kneese and Bower, 1968 and MacNeil, 1971). In coastal management studies, these conclusions have led to the call, primarily from lawyers and political scientists, for better coordination and for defining lead agencies in each jurisdiction charged with the task of promoting reasonable coastal development patterns (Pross, 1975 and Harrison and Kwamena, 1981). Johnston (1977) recommends the establishment of three Coastal Zone Commissions with federal and provincial membership to monitor the coastal area and identify problems within a system of interagency coordination. Johnson (1977) recommends the creation of a Standing Committee on Ocean Affairs to provide an integrated perspective and a means for public input. Traditionalists view the promotion of a lead organization as a means for adopting coordinative structures and approaches, minimizing organizational problems and leading to a more integrated management and regulatory system (Pross, 1975, Johnson, 1977 and Johnston, 1977).

Alternative Concept of Governance Problems

The alternative approach to coastal management problems views the coastal zone as a relatively complex physical, economic and social system composed of a great number of complimentary and competitive interdependencies with a wide range of goals and objectives (Bish, et al., 1975). No

simple decision-making organization could account for all these interdependencies and implement a wide range of goals and objectives and result in efficient resource decisions. Resource use decision-making is too complex to be called management and is more accurately posed as a problem of governance (Bish, 1982).

The two concepts vary significantly because the working assumptions differ. Proponents of the alternative approach assume that individuals, making agreements among themselves, exchange goods and services so as to maximize their own welfare (Bish, et al., 1975). Some goods and services are most efficiently produced and distributed through market arrangements. Pure market economies do not always succeed because of external effects, the failure to under or not provide public goods and the over utilization of common pool resources (Bish, et al., 1975). An agreement on rules or procedures of ownership, exchange, competition, enforcement or provision of the legal system is required. Consciously or unconsciously, a political and institutional structure is created for the efficient and equitable resource use in a market economy (Bish, et al., 1975). The political and institutional arrangements provide a means for reconciling conflicting values, allow individual and group preferences to be articulated and provide citizen representation in the decision-process (Ferguson, 1977). Obtaining agreement

simple decision-making organization could account for all these interdependencies and implement a wide range of goals and objectives and result in efficient resource decisions. Resource use decision-making is too complex to be called management and is more accurately posed as a problem of governance (Bish, 1982).

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among two or more individuals or groups takes time, effort and resources in a bargaining process (Bish, et al., 1975). Consequently, the large number of public agencies involved in resource development and use enhances the possibility that decisions are based on all relevant available information and have been broadly scrutinized.

The difficulty of managing an organization increases with its size because its outputs are not easily measured or evaluated (Bish, et al., 1975). Resource development and use decisions would tend to be resolved within the organization away from the public. With numerous smaller organizations, many more decisions have to be made between and among the entities. Although this may require more time and costs, it exposes the information and the agreements to a greater scrutiny (Bish, et al., 1975). As well, larger organizations tend to view the region as a broad geographical unit. Although they are better able to undertake major scientific research studies, smaller organizations are more aware of local problems and tend to react better to time and place information (Bish, et al., 1975).

The belief that a single organization can out perform a governance system comprised of a multiplicity of limited-purpose, redundant and interdependent organizations depends on extreme assumptions about the ability to collect and

use knowledge in hierarchically ordered systems (Bish, 1982). First, public preference is more easily indicated to several small organizations. The powers of an organization depend on its function, the geographic area it operates in and its decision-making structure (Bish, et al., 1975). The fewer the functions, the more precisely the public may indicate their preferences, but they have to pay attention to more organizations. As the size of an organization increases, the public tends to be excluded and special interests play a more prominent role (Bish, et al., 1975). Second, even if the public's preference were known, the ability to predict the consequences of particular programs is difficult. Without predictive capacity, alternative policies in terms of their contribution to objectives cannot be evaluated (Bish, 1982).

Conflicting and complementary goals of different agencies and organizations must be reconciled, traded off, accommodated or restricted. Contractual arrangements and bargains between interdependent agencies can more successfully attain co-ordination than that achieved by a single organization operating through a hierarchical chain of command (Sproule-Jones, 1980). Coordinating procedures vary from formal arrangements, contracts, referrals and committees, to informal arrangements, working and tacit agreements (Sproule-Jones, 1980). Government organizations are in many ways similar to those in the private sector. They have operating costs and production constraints.

They are subject to political pressure and develop sets of expertise. In applying efficiency and productivity criteria to government operations, the conclusion is drawn that the organizational process problems, such as duplication and overlap, are not problems per se and others, such as a low degree of coordination, are not accurate.

A literature review of similar organizational process problems, as outlined in the previous section, reveals that these problems are not apparent in every field characterized by a multi-agency arrangement.

Overlap/Duplication

Nemetz, et al. (1980) in their study of the regulation of toxic chemicals identified significant legislative duplication and overlap between federal and provincial agencies. However, they concluded that this did not result in regulatory inefficiency, but is in fact, beneficial. The provincial regulations are adequately flexible to make some allowances for distinctive local conditions, while federal regulations guarantee that certain minimum standards are achieved nationwide. The authors concluded that federal regulations complement the role of the provincial agencies, although overlap is evident (Nemetz, et al., 1980).

Coordination between Agencies

Nelson, Day and Jessen (1980) in their study of the institutional arrangements for the Nanticoke Industrial Complex in Ontario identified more than twenty applicable acts which segmented regulatory responsibility between federal, provincial, regional and local organizations. They found that different agencies employed different procedures for plant construction application approval. However, there was no evidence that the different procedures caused significant delays or unnecessary costs for the industry. The study did indicate that there was industry concern for more coordination among the various agencies to provide information and assistance on regulatory requirements, since agency overlap exists. Based on the findings of the study, the authors concluded that overall, the agencies were coordinated and the complex is efficiently regulated and managed (Nelson, Day and Jessen, 1980).

Dorcey, McPhee and Sydneysmith (1980) in their study of coastal British Columbia forestry and fishery conflicts concluded that "a close and fruitful cooperation" existed between the federal and provincial regulatory agencies. Potential conflicts between the agencies are resolved by a bargaining process between the Ministry of Forests, the Fish and Wildlife Branch and the Department of Fisheries and Oceans. This has resulted in the adoption of fish pro-

tection measures as part of the standard logging practices which are part of all cutting permits. As well, detailed objectives for the protection of the fisheries are established and coordinated between the agencies and specific sites. Although a few cases turn into "unproductive confrontations" between federal, provincial and regional agencies, overall, the present system works quite well (Dorcey, McPhee and Sydneysmith, 1980).

Sproule-Jones (1980) in his study of water quality management for the Lower Fraser River Basin identified fifty-four organizations forming the institutional arrangements responsible for various aspects of water development and use. Although the study identified three technical deficiencies concerning water quality management, substantial coordination exists between the fifty-four organizations. The empirical data revealed that 781 coordinative arrangements (provision of services) existed between the members, including 396 on a frequent and planned basis, 140 on a frequent but not planned basis and 245 on an occasional and non-planned basis (Sproule-Jones, 1980). Coordination is "not sporadic or unplanned and it occurs both across and within government and privately operated sectors" (Sproule-Jones, 1980, page 72).

Enforcement Policies

Sproule-Jones (1980) found that neither legal nor financial constraints severely restricted the fifty-four organizations from carrying out their duties and enforcement procedures. Only four organizations were restricted by legal constraints, whereas eleven were restricted by financial constraints. The weakness in the enforcement policies is the uncertain effects and possible damages of the residuals which enter the waterway.

Dorcey, McPhee and Sydneysmith (1980) found that catch regulations in coastal waters do not conflict with provincial regulation of natural resources. But once federal fisheries regulation reaches into salmon enhancement and habitat protection measures, direct conflict with forestry ensues (Dorcey, McPhee and Sydneysmith, 1980). The Supreme Court of Canada ruled that federal fisheries regulation cannot override provincial forestry regulation practices unless the legislation includes a text which establishes cause and effect between the prohibited forestry practice and harm to fish. Although the most conspicuous federal/provincial enforcement conflicts occur between forestry/fishery regulations, on the whole, there is a well established procedure for consultation and coordination of regulatory effort and resolving conflicts between fish and forests (Dorcey, McPhee and Sydneysmith, 1980).

Public Involvement

Almost without exception, the literature and case studies not only support public involvement in the resource use decision-making process, but call for more public consultation at the rule-making and adjudicating stages (Thompson, 1981). However, the important considerations concerning public involvement deal with accessibility, recognization and scrutiny. Specifically, the concerns include whether the political and institutional arrangements are accessible to the public in terms of information, services and assistance; whether the public is able to identify the relevant agency and indicate their preferences to the decision-makers; and whether resource use conflicts are brought to the attention of the public (Bish, 1982).

In a multi-agency system, individuals and groups have been found to have access to agency services and have been able to identify the appropriate agency to voice their concerns (Nelson, et al., 1980 and Sproule-Jones, 1980). Bish (1982) concluded that the state and local governance system for resource use in Puget Sound, Washington represented an open system. The agencies are accessible and recognizable to the public and resource use conflicts are visible and the general level of information in the media increases (Bish, 1982). Although the Puget Sound study is an example of the American governance system, the essence of the study

is applicable. Political and institutional arrangements characterized by a multiplicity of agencies do not necessarily restrict public involvement.

Propositions Derived from the Alternative Concept

In order to compare the structure of the two concepts, a set of alternative propositions is presented. The propositions are based on the same variables, the size of government units and the multiplicity of agencies, applied in the propositions derived from the traditional concept. Political and institutional arrangements characterized by numerous redundant agencies responsible for some aspect of resource development and use have the following attributes:

1. more decisions have to be made between and among the entities due to jurisdictional overlap and duplication, exposing information and agreement to greater scrutiny;
2. duplicate regulations may complement one another and allow for flexibility for distinctive local conditions, yet guarantee certain minimum standards;
3. resource development and use decisions tend to be resolved more in the public eye;
4. agencies are more aware of local problems and tend to react better to local situations;
5. a high degree of coordination and cooperation between and among agencies through cooperation procedures, such as contracts, bargains and referrals may resolve problems such as delays and redundance;
6. a coordinated enforcement policy through bargaining and referrals among and between agencies may exist; and

7. agencies are recognizable and accessible to the public for services and indicating preferences for resource use decisions.

Assessing the Political and Institutional Arrangements

Although the study focuses primarily on how the political and institutional arrangements for the coastal sand and gravel industry function, it also assesses which of the two concepts fits the industry better. In order to specify this, the operations and procedures contained within the arrangements are assessed in terms of a set of seven evaluative criteria.

Criteria for evaluation are more descriptive and qualitative, hence involve the close observation of the operations of the arrangements (Englander, Feldmann and Hershman, 1977). Evaluative research may encounter several problems. First, causal relationships between management problems and the structure of the political and institutional arrangements are difficult to establish. Outside factors, such as environmental and economic influences, can affect the problems being scrutinized. Second, it is often difficult to obtain baseline data over the time period required to determine significant trends. Third, criteria for evaluating the arrangements may be difficult to clearly identify. Conclusions drawn about the adequacy of the arrangements depend on the selected criteria (Mitchell, 1975). One criterion may lead

to the conclusion that the arrangements are adequate, while another would indicate several weaknesses. Fourth, too often criteria are implicit, which make conclusions hard to check or verify. Fifth, the selected criteria may be difficult to operationalize and measure. It then becomes difficult to conclude that the arrangements are adequate relative to efficiency, clarity, compatibility and so forth (Mitchell, 1975). In spite of these problems, the criteria posed are specific enough so that an analysis is then applicable to the sand and gravel industry and should assess which concept provides a relatively better explanatory framework.

The operations of the political and institutional arrangements are examined from baseline data obtained from three sources - the agencies, coastal sand and gravel operators and coastal newspapers. The methodology is explained in Chapter VI. The political and institutional arrangements are assessed in terms of the following criteria adapted from Lucas and Hunt (1980) and Bish (1982).

Time Minimization

The time minimization criterion is concerned with the time-frame within which legislative requirements operate and the time involved in order to complete the task. The principal questions asked are: (1) what, if any, are the

delays? (2) in what ways can the delays be minimized? and (3) what effects do these delays have on resource use and development?

Clarity

The clarity criterion is concerned with the extent to which the purpose or intent of the specific requirements and the regulations are made clear to the affected interests. The principal questions posed are: (1) are the regulations clear to the various interests? and (2) if unclear, how can they be clarified?

Consistency

The consistency criterion is concerned with the extent to which the statutory and other guidelines are uniform and compatible within and between processes. The principal questions asked are: (1) are there points of duplication and overlap between the agencies and their operations? and (2) do these points result in the imposition of unnecessary information or reporting requirements for the various interests?

Scope of Interest Participation

The scope of interest participation criterion is concerned with the ability of the process to ensure that all affected interests are informed and involved in the system. The

principal questions include: (1) are the information requirements reasonable in terms of type, quality and timing? and (2) are the interested parties treated fairly in the procedural setting?

Flexibility

The flexibility criterion is concerned with the extent the arrangements are able to adapt to changing needs to amend the original mandate, if there is a need to do so. The principal questions include: (1) can new knowledge be introduced and used? and (2) if one agency fails or neglects to carry out its responsibilities, is it possible for another agency to step in?

Degree of Enforcement

The degree of enforcement criterion is concerned with the availability of enforcement mechanisms, as well as their effectiveness, within the process. The principal questions include: (1) are there legal or institutional difficulties associated with enforcement procedures and policies? and (2) why are these difficulties present?

Fairness of Outcome

The fairness of outcome criterion is concerned with the extent the institutional structure, its processes and outcomes, are regarded as equitable by the users. The principal

questions include: (1) are the arrangements open to the public and interested parties? (2) are the arrangements biased so that some users consistently win over others? and (3) if one works within the system, are one's expectations generally realized?

The political and institutional arrangements for the coastal sand and gravel industry are assessed in terms of the seven criteria in Chapter VI. Based on the assessment, conclusions as to whether the sand and gravel industry better fits the traditional concept of the management problem or the alternative concept of governance problems are presented in Chapter VII.

Chapter III

THE COASTAL SAND AND GRAVEL INDUSTRY

Introduction

The purpose of this chapter is to examine the structure of the coastal British Columbia sand and gravel industry. This analysis will establish the overall framework from which to address the research questions outlined in the previous chapter.

This analysis is divided into two parts. Part I defines the physical properties of sand and gravel and outlines the general characteristics of the industry, including excavation, processing and transporting methods. Part II reviews the origin and distribution of sand and gravel deposits, the evolution of the industry on the coast, the present structure of the industry and current problems faced by the industry.

PART I

Commodity Classification

Sand and gravel resources are defined as unconsolidated mineral and rock particles derived by erosion, transportation and deposition of rocks outcropping on the earth's surface (The Open University, 1974). Sand and gravel are classified by two distinct properties - the proportion of the material which falls into various grade sizes and the shape of the material.

Gravel is defined as pebbles of uniform or diverse rock types, which are usually rounded, incoherent or loosely cemented with finer material and fall within the size limits of 2 mm to 64 mm in diameter (Beaver, 1968). Particles below 2 mm in diameter are described as coarse sand and particles between 0.1 mm and 2.0 mm are described as fine sand (Beaver, 1968). Since almost all gravel deposits contain a proportion of sand, most operations require a screening process to separate the two saleable commodities. When finer particles below 0.1 mm in diameter, such as clay and silt, are present, the material is separated and removed by a washing process. When pebbles are present, the conglomerate is distinctively hard and resilient to erosion and is refined by a crushing process.

Sand and gravel is composed of a high proportion of angular grains, rounded grains or largely rounded pebbles.

Angular grains in coarser sand and rounded pebbles in gravel are used for concrete production since less water is required for mixing the concrete, resulting in a stronger and more easily workable concrete "paste". Rounded grains in finer sand are used for a variety of building purposes.

Sand and gravel are classified as structural materials which are distinguished from other minerals by certain physical and commercial properties. First, structural materials are primarily used in a relatively unchanged condition, or if changed, are used in the form of complex compounds. Although most commodities meet industrial specifications, no two deposits are identical. Each deposit may vary in terms of form and quality, depending on its origin. Second, the overall reserves of the resource can be increased by innovative technical methods and substitution by both the producer and consumer. For example, improved processing methods may permit the economical exploitation of low grade deposits. Sandstone, granite and limestone can be substituted for sand and gravel. Since these alternatives must be crushed, screened and blended to the required industrial size standards, their use is more expensive than digging and processing the natural deposit. Third, the commercial unit value of structural materials is generally very low. Prices are controlled by the quality, demand, competition and location of the resource which vary widely and rapidly within regions.

Generally, the sand and gravel market is restricted to a local scale. Fourth, the very volume of the material precludes extensive stockpiling. This means that the industry has to respond quickly to fluctuations in demand, which can be noticeable over short periods (The Open University, 1974).

Nature of the Industry

Coastal sand and gravel deposits are usually found as loose material located above and below the water table. Above the water table, deposits occur beneath an overburden of soil, subsoil or finer sedimentary debris. Below the water table, deposits are alluvial sediments of rivers and streams. The method of excavation depends on the location of the deposit.

Above the water table, five principal methods are used to recover sand and gravel, depending on the size and type of the deposit. Bulldozers are the most economical method for removing shallow overburden or where a small acreage requires annual stripping. Mobile, front-end loaders are used as a supplement for areas of heavy overburden, boulders or rough terrain. Tractor-scrapers are used for areas where large yardage is to be moved or where the hauls are too long for bulldozers. These units are capable of moving the waste material, as it is excavated, away from the edge of the pit, reducing dangerous slides. Power shovels, which

have the largest capacity per load, are used to excavate deep overburdens and high banks without leaving material hanging at the top. Draglines operate at a greater radius and are used to strip the pits at lower levels.

Below the water table, two dredging methods are employed. Mechanical methods, such as dragline scoops or clamshells, retrieve the material from under the water and load trucks or conveyors to move it to storage or to the processing plant. Hydraulic methods, such as pumps, retrieve and transport the material to the processing plant. Hydraulic methods require more power per cubic metre handled, but the power required for the combined excavating and transporting is less than that needed for excavating and then transporting by means other than flowing water.

Historically, over 60% of the excavated sand and gravel was not processed (National Academy of Sciences, 1980). Processing structures were small, washing and crushing on-site units usually adjacent to water resources. Nearly 75% of the excavated sand and gravel is now processed (National Academy of Sciences, 1980). Processing plants have been consolidated and centralized at permanent locations. Factors which influence the location of the plant include the accessibility of the location to both the deposit and the market, the availability of water for washing, space for settling

basins for the water, available space for stockpiling and a convenient downgrade for transporting loads from the deposit to the plant.

The basic unit of the processing plant consists of a crusher to reduce oversized particles and vibrating screens and classifiers to separate and recombine particles of diverse sizes. The processing is done wet, when water is available. The process water is transferred into a series of basins where silt and clay (particles under 0.1 mm in diameter) are allowed to settle. Water from the lowest basin is usually recycled into the plant for processing to prevent sediments from entering local waterways. The processed product is screened to specific sizes and stockpiled or loaded for transportation to market.

Sand and gravel are transported to market by truck or barge. On a tonnage basis, trucking is the most significant mode of transport (Canadian Transport Commission, 1978). The use of trucks depends on the length of the haul, the traffic encountered, local road restrictions and the capacity of the individual trucks. The least expensive mode of transportation is by water, although loading and unloading facilities are required. Coastal barges have a carrying capacity of 4,550 to 5,460 tonnes and the trend is towards 9,100 tonne barges (Canadian Transport Commission,

1978). A decade ago, the largest barges had a carrying capacity of 1,820 tonnes. The largest operators manage their own barges and tugs and are capable of loading in two to three hours.

PART II

The Coastal Region

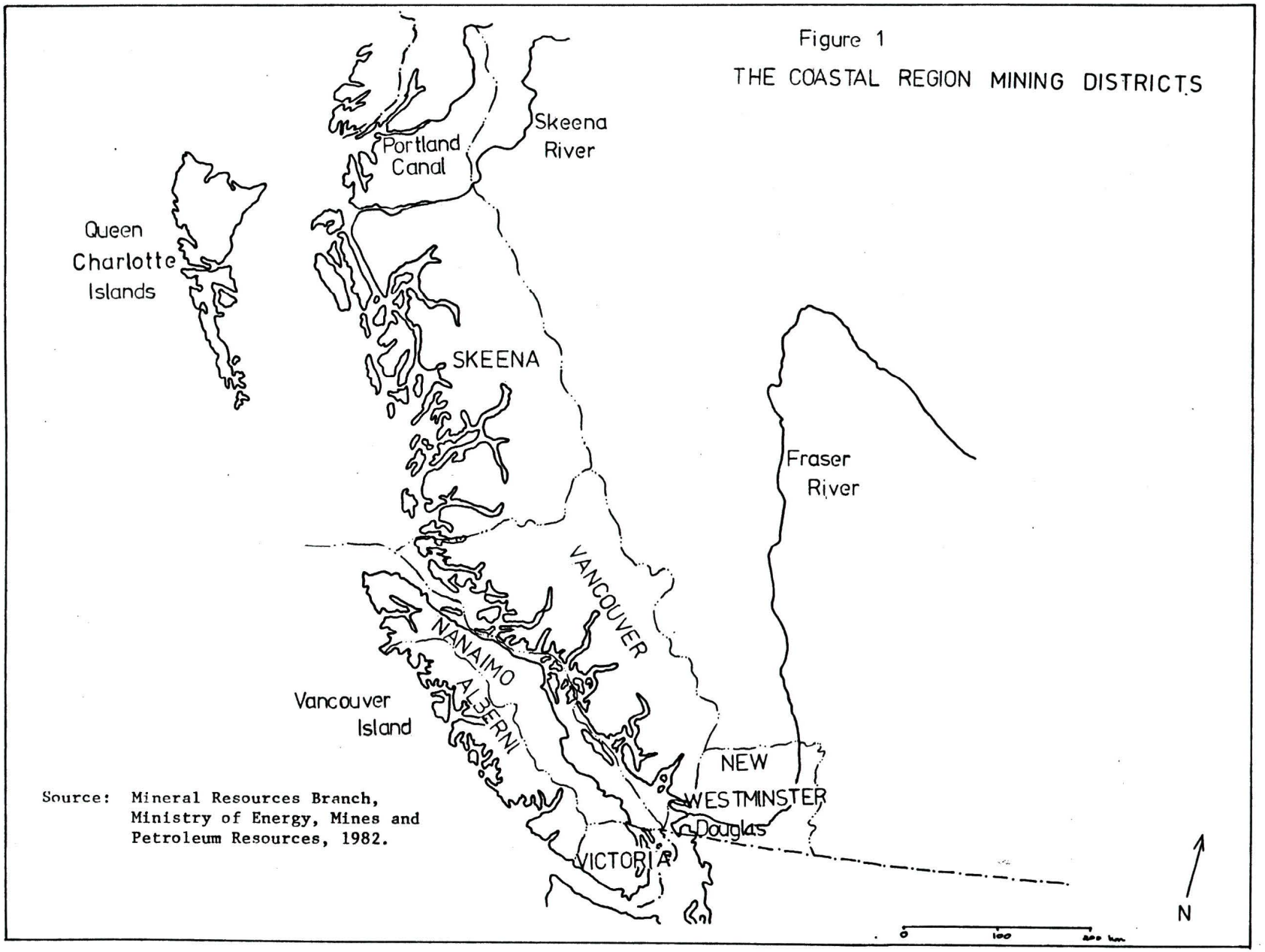
The coastal region of British Columbia extends south from the Alaska-British Columbia border at Portland Canal to the British Columbia-Washington border at Douglas and includes the numerous provincial islands along the coastal waters, particularly Vancouver Island and the Queen Charlotte Islands (Figure 1). Since 1950, this region has been divided into six mining districts - New Westminster, Vancouver, Skeena, Victoria, Nanaimo and Alberni - by the Ministry of Energy, Mines and Petroleum Resources. In this analysis, the coastal region is defined by these mining districts since a great deal of the information concerning the sand and gravel industry is categorized and available according to these districts.

Origin and Distribution of Sand and Gravel Deposits

The coastal region of British Columbia is demarcated by land masses composed of consolidated sedimentary rocks and igneous massifs which have been uplifted and arched into the Coast Mountains to the east and the Insular Mountains of Vancouver Island to the west. Between these two land masses, the coastal trough extends 4,000 km, from southeast Alaska south to the Gulf of California. It originated from a downfolding of the earth's crust along the Pacific margin in Mesozoic times, more than 150 million years ago. As the trough gently lowered, it accumulated thick deposits

Figure 1

THE COASTAL REGION MINING DISTRICTS



Source: Mineral Resources Branch, Ministry of Energy, Mines and Petroleum Resources, 1982.

of marine, non-marine and volcanic material. Mountain building, intense folding and the intrusion of igneous massifs occurred during the early Tertiary period.

About one million years ago, the coastal region was encroached by ice lobes from the Cordilleran ice sheet during the various episodes of the Wisconsin glaciation. The region experienced at least four glaciations, accompanied by isostatic and eustatic changes in the sea level, up to approximately 200 metres (Barker, 1974). The coastal lowlands were covered by the sea as far south as Seattle, Washington and the mountain ranges were covered by glaciers, which terminated in the sea.

The ice retreated about 10,000 years ago. After the weight of the ice was removed from the basin, the earth's crust rebounded. Raised beaches, deltas and glaciomarine deposits of sand and gravel, up to 140 metres above present sea level in the north and up to 75 metres in the Victoria area, remained along the coastline (Barker, 1974).

Drainage patterns have been adapting to the modified land surface since the ice retreated. Erosion continues in the mountains. Suspended material is transported and deposited in the lower reaches of rivers and streams in the coastal lowlands. The Fraser River has transported

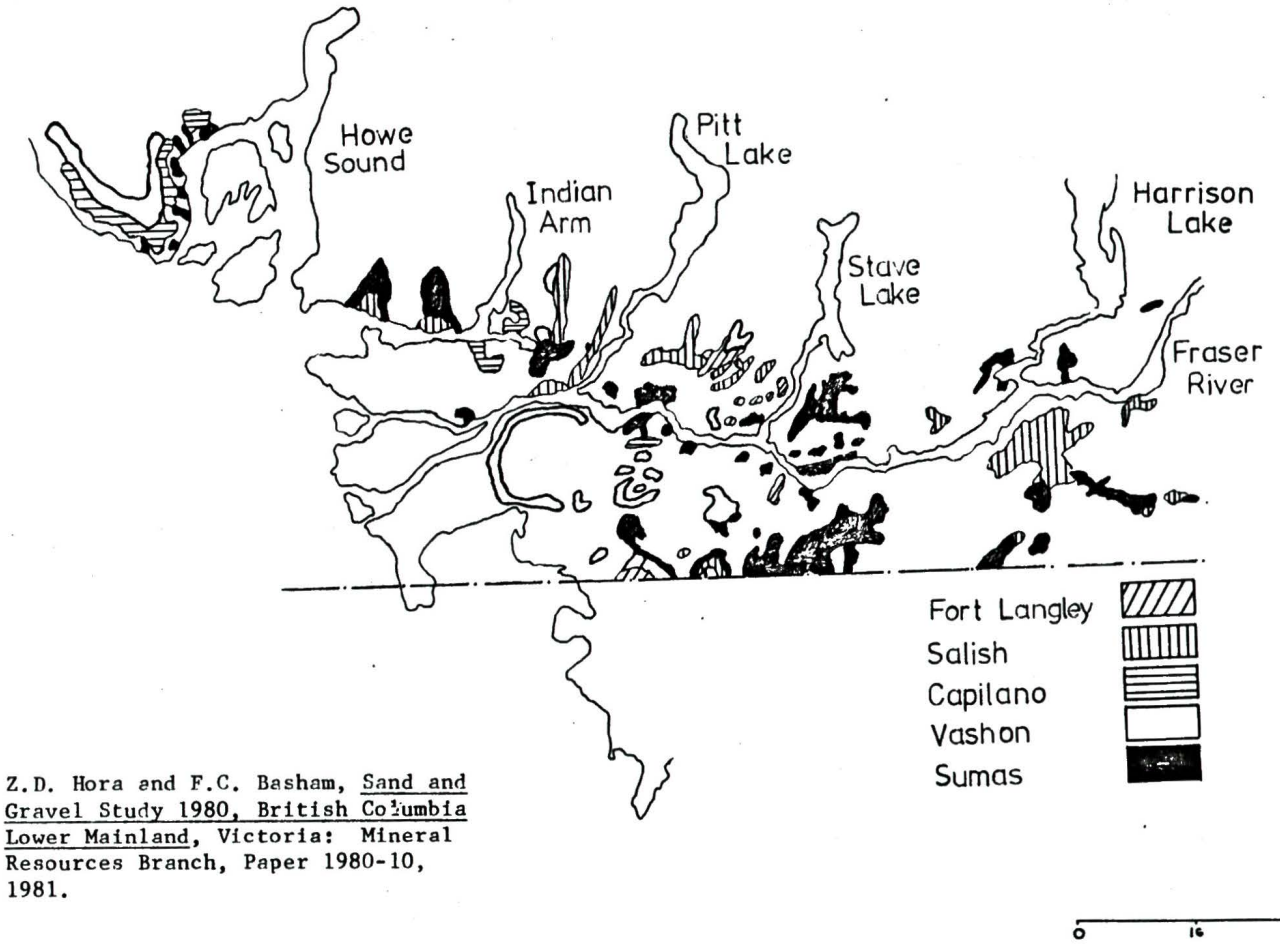
sufficient eroded material in the post-glacial period to create a delta of 24 km into the Strait of Georgia (Barker, 1974).

Armstrong (1977) identified and described the main lithostratigraphic units of the Quaternary sediments containing sand and gravel deposits in the southern coastal area, primarily the lower mainland (Figure 2). The Holocene Salish deposits are composed of beach gravels and deltaic deposits of alluvial origin, up to 40 metres above sea level and alluvial sediments of the existing watershed. Late Wisconsin Capilano deposits are alluvial fans of deltaic deposits between 40 and 200 metres above sea level. Sumas outwash and ice-contact deposits are not overlain by marine silts or younger till. The Fort Langley glaciomarine deltaic sediments contain flow tills and are underlain by marine silts. Areas of Vashon outwash have been overridden by glacier ice and are overlain by till. The Sumas, Capilano, Fort Langley and Vashon sediments are the most economical sand and gravel deposits (Hora and Basham, 1980).

As indicated in Figure 2, available surficial geological data for the coastal region is restricted to the lower mainland, the southern coast and parts of southern coastal Vancouver Island. Although the deposits vary in size, shape and granular composition, certain general patterns exist.

Figure 2

LOWER MAINLAND GRAVEL DEPOSITS



Source: Z.D. Hora and F.C. Basham, Sand and Gravel Study 1980, British Columbia Lower Mainland, Victoria: Mineral Resources Branch, Paper 1980-10, 1981.

Deposits south of the Fraser River are generally in flat terrain with gravel clasts of more regular size distribution, while deposits north of the Fraser River and along the southern mainland coast are generally on sloping terrain and contain poorly sorted fragments mixed with boulders (Hora and Basham, 1980). The large Sumas deposits are located south of the Fraser River in the lowlands and to a lesser extent north of the Fraser River (Figure 2). Gravel deposits along the southern mainland coast, and to a lesser extent on Vancouver Island, are Capilano sediments, which are mainly marine and glaciomarine deposits. The deposits are evident along Howe Sound, Jervis and Sechelt Inlets to Powell River and near Colwood and Campbell River on Vancouver Island. Small areas of Salish deposits are located at the mouths of coastal rivers and streams.

Along the northern mainland coast, available surficial geological data is limited to the Prince Rupert, Terrace and Kitimat area. Along the Skeena River, a series of deltaic outwash benches or terraces predominates (Clague and Hicock, 1976). Upstream from Terrace and from Kitimat, north to Kitsumkalum Lake, large outwash terraces of unconsolidated materials occur. In the north, the deposits are coarse in texture, while in the south along the Kitimat River, the material is fine in texture (Hunter, 1980). Downstream from Terrace, the area is devoid of outwash and kame terraces

and no sand and gravel deposits associated with deglaciation are apparent (Hunter, 1980).

Historical Review of the Industry

The establishment and growth of the coastal sand and gravel industry in British Columbia was dependent upon the distribution of the population and the growth of urban centres. These two factors influenced the demand for road and building construction, the two main uses of sand and gravel. Subsequently, the industry developed primarily in the Vancouver area near the Capilano River and along the Fraser Delta, and at Royal Oak, near Victoria on Vancouver Island.

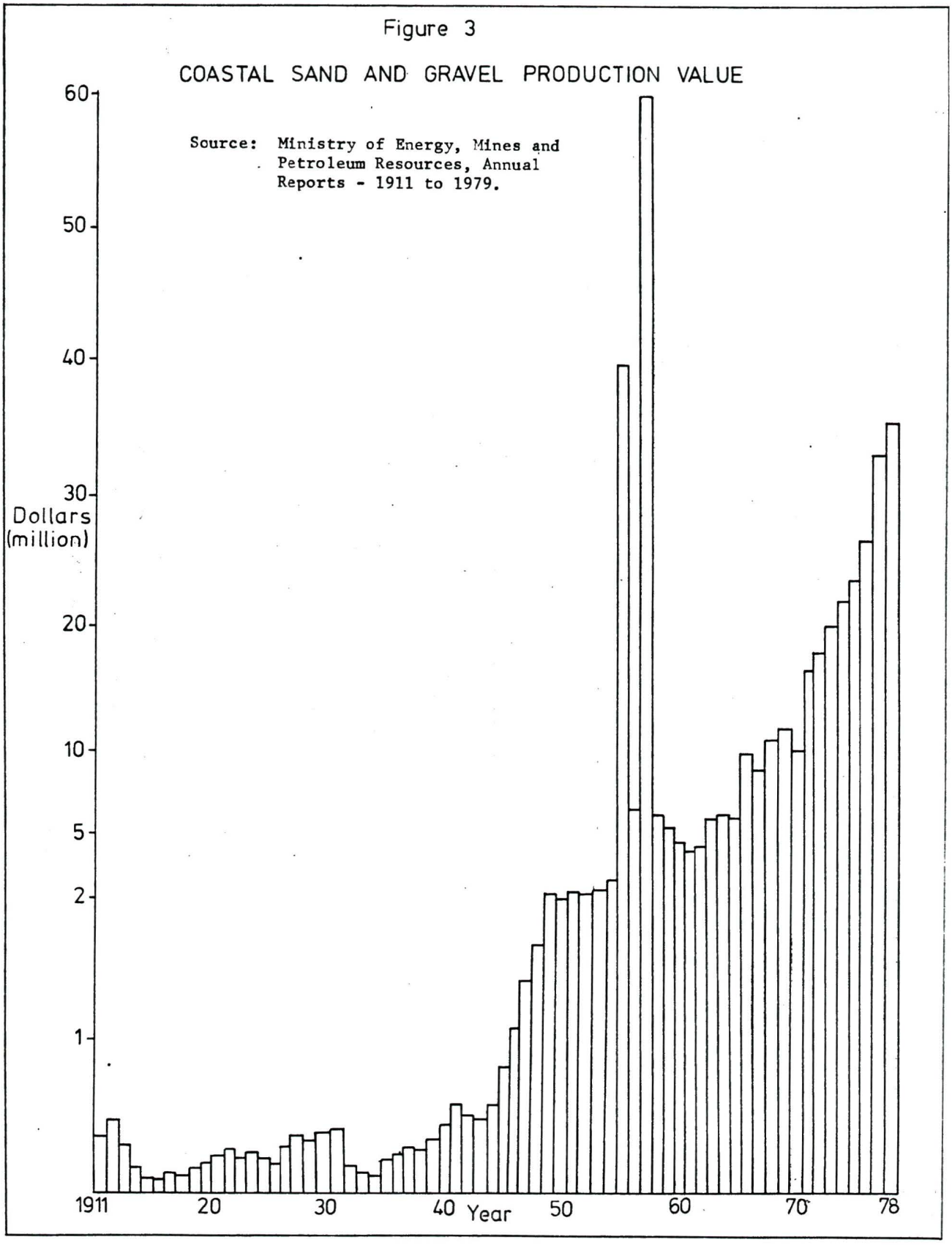
The growth of the coastal sand and gravel industry since the early 1900s has been steadily upwards, although characterized by periodic decreases and dramatic increases (Figure 3). The development of the industry is examined in three periods: the initial period of irregular growth (pre-1900 to 1940); the period of rapid growth (1941 to 1960); and the period of continuous growth (1961 to 1982).

Initial Period: Pre-1900 to 1940

By 1885, when the transcontinental railway reached Port Moody, much of the Fraser Valley was covered by a network of settlers' roads, leading from the trunk roads to New Westminster. Between 1871 and 1881, road construction was

Figure 3

COASTAL SAND AND GRAVEL PRODUCTION VALUE



the main feature of the public works program, accounting for 44.48% of British Columbia's total revenue expenditures (Gibson, 1976). Road construction was concentrated in three coastal areas - the New Westminster, Ladner and Hope area, the expanding subdivisions of the lower mainland, and between Victoria and the Nanaimo area coal fields (Gibson, 1976). Although road construction required sand and gravel, the coastal industry had not yet been firmly established by private or public operators.

Vancouver's selection as the site for the terminus of the transcontinental railway was the catalyst for the immigration of entrepreneurs and labourers, the infusion of speculative capital from Eastern Canada, Britain and the United States, and the subsequent construction of the city. Between 1901 and 1911, the population increased from nearly 30,000 to 100,000, mainly due to speculation in lands, forests, utilities, shipping and fisheries by the entrepreneurs (Gibson, 1976). Although settled since 1843 and the seat of the provincial government, Victoria's population remained smaller, totalling 31,000 by 1911. The growth of both cities warranted the use of fireproof building materials (Department of Mines Annual Report, 1911). Commercial sand and gravel operations were established on Burrard Inlet and the Fraser River in the Vancouver area and the Saanich Peninsula near Victoria. A number of small, diversified

operations were located at these sites. The gravel was excavated from the riverbed by hydraulic streams and water carried the product to screens for sorting.

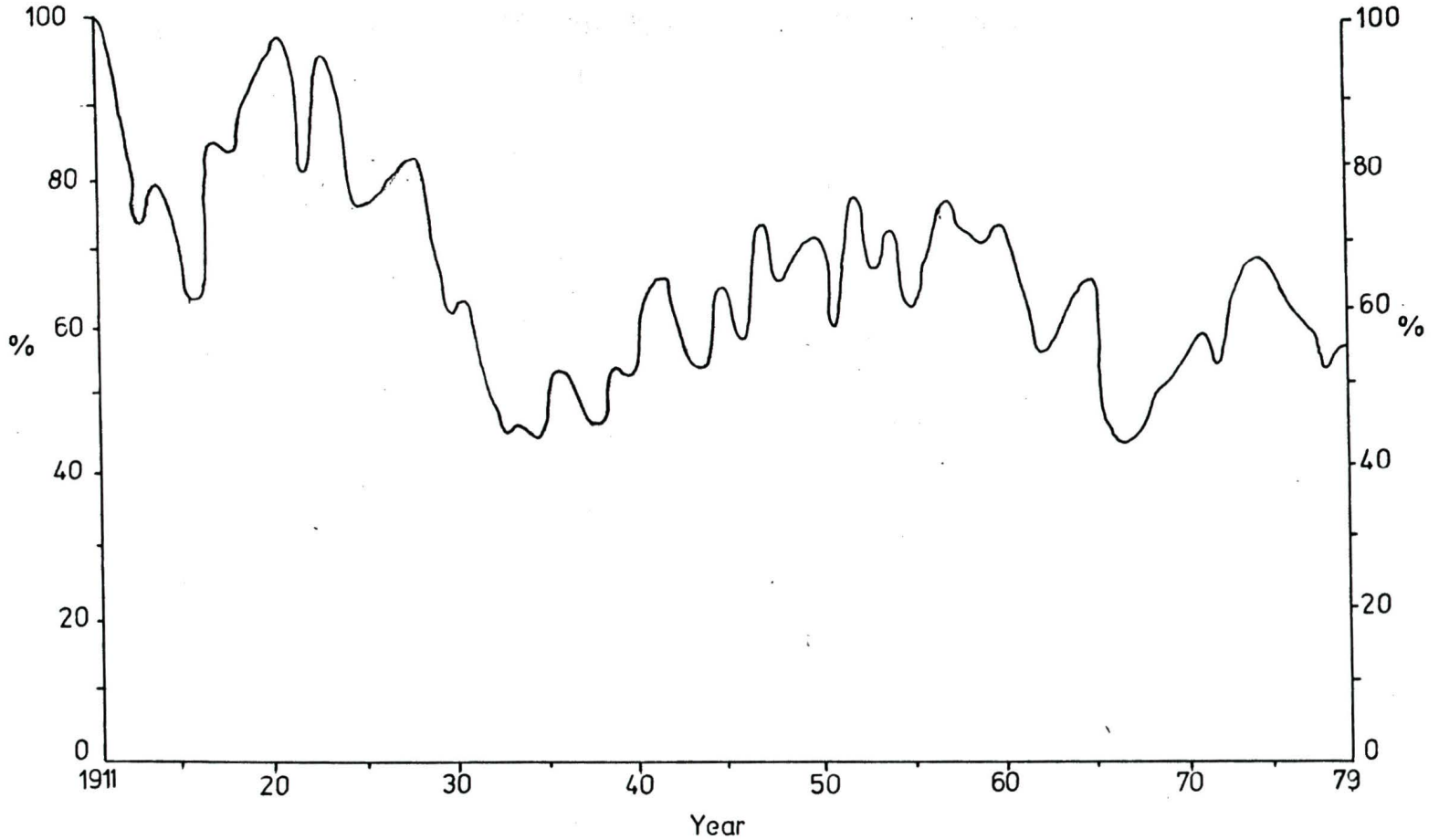
From 1910 to 1919, the industry was focused on the lower mainland, particularly along the Coquitlam River (Figure 4). During this time, the initial demand for building materials declined because of the financial depression in Vancouver, the outbreak of the First World War and the decline of the building trade (Department of Mines Annual Report, 1918). By 1916, Vancouver's population declined 21%, resulting in the closure of several sand and gravel operations (Department of Mines Annual Report, 1918).

The arrival of the automobile in the coastal urban areas in 1918 led not only to the creation of the British Columbia Public Works Department and the expansion of the road network, but also to a revival of the coastal sand and gravel production (Gibson, 1976). Prior to 1918, covered wagons and horses were prevalent and roads were built with little regard to their smoothness and maintenance. With the advent of the automobile, the construction and maintenance of improved roads renewed the industry.

Throughout the 1920s and the 1930s, the southern coastal region contained more than half the provincial population

Figure 4

COASTAL REGION'S SHARE OF THE PROVINCIAL SAND AND GRAVEL PRODUCTION



Source: Ministry of Energy, Mines and Petroleum Resources, Annual Reports - 1911 to 1980.

and dominated the urban, industrial and commercial sectors of the province. However, sand and gravel competed with other building materials, notably limestone, building stone, Portland cement and red, face and fire bricks. This accounts for the numerous fluctuations in sand and gravel production as indicated in Figure 3. As a result, small, on-site processing operations were eliminated or consolidated in order to compete in the market (Department of Mines Annual Report, 1918).

During this period, the coastal region fluctuated between 100% in 1910 and 45% in 1940 of the provincial sand and gravel production (Figure 4). The major production area was the southern coast, accounting for over 90% of the production in 1919 (Department of Mines Annual Report, 1920). Sand and gravel was mainly unprocessed - over 70% of the commodity was bank/pit-run (Department of Mines Annual Report, 1939). The major use for the commodity was for road construction and concrete, accounting for approximately 75% of the total use (Department of Mines Annual Report, 1939). The main producing sites were North Vancouver, the Fraser River and Royal Oak, near the two coastal urban centres. During the 1930s, these areas produced 80% of the total coastal production (Department of Mines Annual Report, 1939).

Rapid Growth: 1941 to 1960

The Provincial Highway Board was established after the Second World War to prepare and coordinate a road construction program and to integrate the existing road network with the Trans-Canada Highway. Major road construction occurred in the lower mainland and the Victoria area. After 1950, freeways were constructed east from Horseshoe Bay to Hope, south from Vancouver to White Rock, and north from Victoria to Swartz Bay. The northern mainland remained largely undeveloped, except for the Prince Rupert area. During this period, approximately 80% of the sand and gravel produced was used for concrete and road construction (Department of Mines and Petroleum Resources Annual Report, 1960).

The coastal region maintained its domination of the provincial sand and gravel production, accounting for 56% to 75% of the total production value (Figure 4). The Vancouver and New Westminster Mining Districts dominated the coastal production, accounting for over 66% of the total coastal production (Department of Mines and Petroleum Resources Annual Report, 1960). This pattern reflected the extensive road construction program in the lower mainland.

In 1948, the principal sand and gravel operations were located in the Vancouver area, at Seymour Creek, the Coquitlam River and on the north arm of the Fraser River (Appendix A).

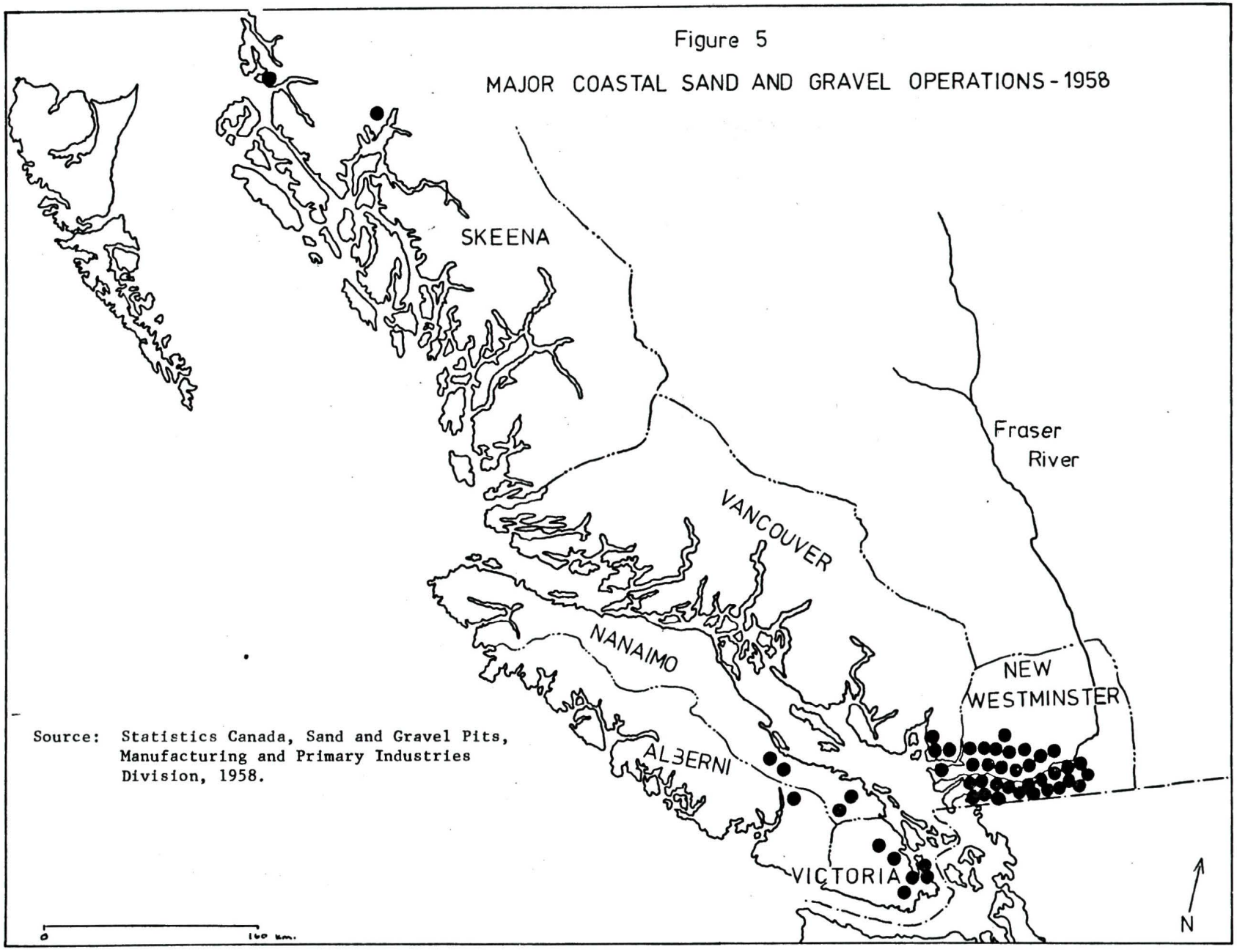
In 1953, thirty-one principal sand and gravel operators were established in the coastal region and by 1958, there were fifty-five operators (Appendix A). In the lower mainland, operations spread southeast from Vancouver to Abbotsford, White Rock, Cloverdale and New Westminster (Figure 5). On Vancouver Island, operations spread north from Victoria to the Saanich Peninsula and Cowichan Valley and to Nanaimo and Courtenay (Figure 5).

During this period, over 60% of the sand and gravel consumed was bank/pit-run (Table 1). Diesel-driven shovels and front-end loaders were the primary methods of extraction. The majority of excavation sites did not have processing plants, except for the basic washing and screening structures (Department of Mines and Petroleum Resources Annual Report, 1960). Processing plants were centralized at larger excavation sites, near markets and water resources. Sand and gravel was sold locally and deposits were sufficient to meet the market requirements. Sand and gravel imports from outside the local areas were not necessary.

By 1953, the British Columbia Department of Highways operated several sand and gravel pits as part of their construction and maintenance program (Appendix A). However, the Department of Highways purchased the majority of its sand and gravel from private operators (Department of Mines

Figure 5

MAJOR COASTAL SAND AND GRAVEL OPERATIONS - 1958



Source: Statistics Canada, Sand and Gravel Pits, Manufacturing and Primary Industries Division, 1958.

TABLE 1

TREATMENT OF SAND AND GRAVEL (%)

Year	Washed & Screened Sand	Screened Sand	Washed & Screened Gravel	Screened Gravel	Washed & Screened Crushed Gravel	Screened Crushed Gravel	Not Processed
1979	4.4	4.3	2.4	6.0	3.0	25.5	54.5
1978	8.2	1.4	3.4	35.1	8.0	22.3	21.5
1977	6.9	1.0	1.4	2.4	6.0	50.6	31.7
1976	10.7	5.2	2.3	11.2	5.0	24.9	40.7
1975	23.1	16.9	9.1	2.9	5.7	15.4	26.9
1974	23.7	17.0	12.7	11.0	2.6	7.8	25.2
1973	25.8	20.0	14.7	13.5			26.0
1972	19.0	12.2	26.0	42.8			

	Washed	Crushed	Pit-Run
1971	14.7	21.7	63.6
1970	15.1	34.9	50.0
1969	23.2	26.8	50.0
1968	18.0	32.0	50.0

	Washed/Screened	Pit-Run	Year	Washed/Screened	Pit-Run
1967	19.8	80.2	1953	29.7	70.3
1966	32.4	67.6	1952	30.8	69.2
1965	31.1	68.9	1951	32.5	67.5
1964	25.6	74.4	1950	32.2	67.8
1963	23.2	76.8	1949	21.2	78.8
1962	16.8	83.2	1948	22.8	77.2
1961	23.5	76.5	1947	20.1	79.2
1960	21.1	78.9	1946	31.3	68.7
1959	19.7	80.3	1945	20.9	79.1
1958	33.8	66.2	1944	15.8	84.2
1957	32.2	67.8	1943	26.5	73.5
1956	23.0	77.0	1942	N/A	N/A
1955	25.8	74.2	1941	28.4	71.6
1954	24.6	75.4	1940	26.7	73.3

* Percentages rounded to first decimal place

N/A - Not Available

Source: Ministry of Energy, Mines and Petroleum Resources-Annual Reports, 1941-1980.

Annual Report, 1958). As well, several municipalities in the lower mainland operated their own sand and gravel pits (Appendix A). This trend has continued and is evident in the present structure of the industry.

Continued Growth: 1961 to 1982

During this period, the coastal production value of sand and gravel rose by $5 million to $40 million (Figure 3). However, the coastal region's share of the provincial sand and gravel production fell from 70% in 1960 to 43% in 1967 and rose slightly to 50% by 1979 (Figure 4). This trend reflected the gradual maturation of the coastal urban infrastructure and the development of the provincial interior.

The New Westminster Mining District continued to dominate coastal production, accounting for nearly 50% of the total coastal production since 1961 (Ministry of Energy, Mines and Petroleum Resources Annual Report, 1980). The Vancouver and Victoria Mining Districts accounted for nearly 20% each of the total production, followed by the Nanaimo, Alberni and Skeena Mining Districts which, together, produced less than 15% of the coastal total (Ministry of Energy, Mines and Petroleum Resources Annual Report, 1980).

In 1963, the principal sand and gravel operations were located in the lower mainland, along the Central Fraser

Valley, Howe Sound and Powell River and on eastern Vancouver Island from Courtenay to Victoria (Appendix A). By 1968, the pattern was similar, except the Vancouver Island operations spread further north to Campbell River and operations on the northern mainland were established at Terrace, Kitimat and Prince Rupert (Appendix A). At present, coastal sand and gravel operations are evident along the eastern coast of Vancouver Island, throughout the lower mainland and north along the Sunshine Coast and at Kitimat and Terrace (Figure 6).

The distribution of coastal sand and gravel operations reflected three trends of development during this period. First, traditional deposits near the southern urban centres were near depletion or were being eliminated by conflicting land uses. Deposits in peripheral areas were developed or expanded to meet urban requirements. These areas included Howe Sound, Sechelt and Jervis Inlets and eastern Fraser Valley. Second, the late 1960s and early 1970s witnessed an opening up of the northern third of Vancouver Island and the creation of numerous links to west coast points (Forward, 1979). From 1966 to 1976, Nanaimo grew by 44% and Port Alberni grew by 11% (Statistics Canada, 1976). As well, small towns, such as Gold River, were created and the Island Highway was expanded from Kelsey Bay to Port Hardy. Sand and gravel operations were established as part of the development of the northern island. Third, sand

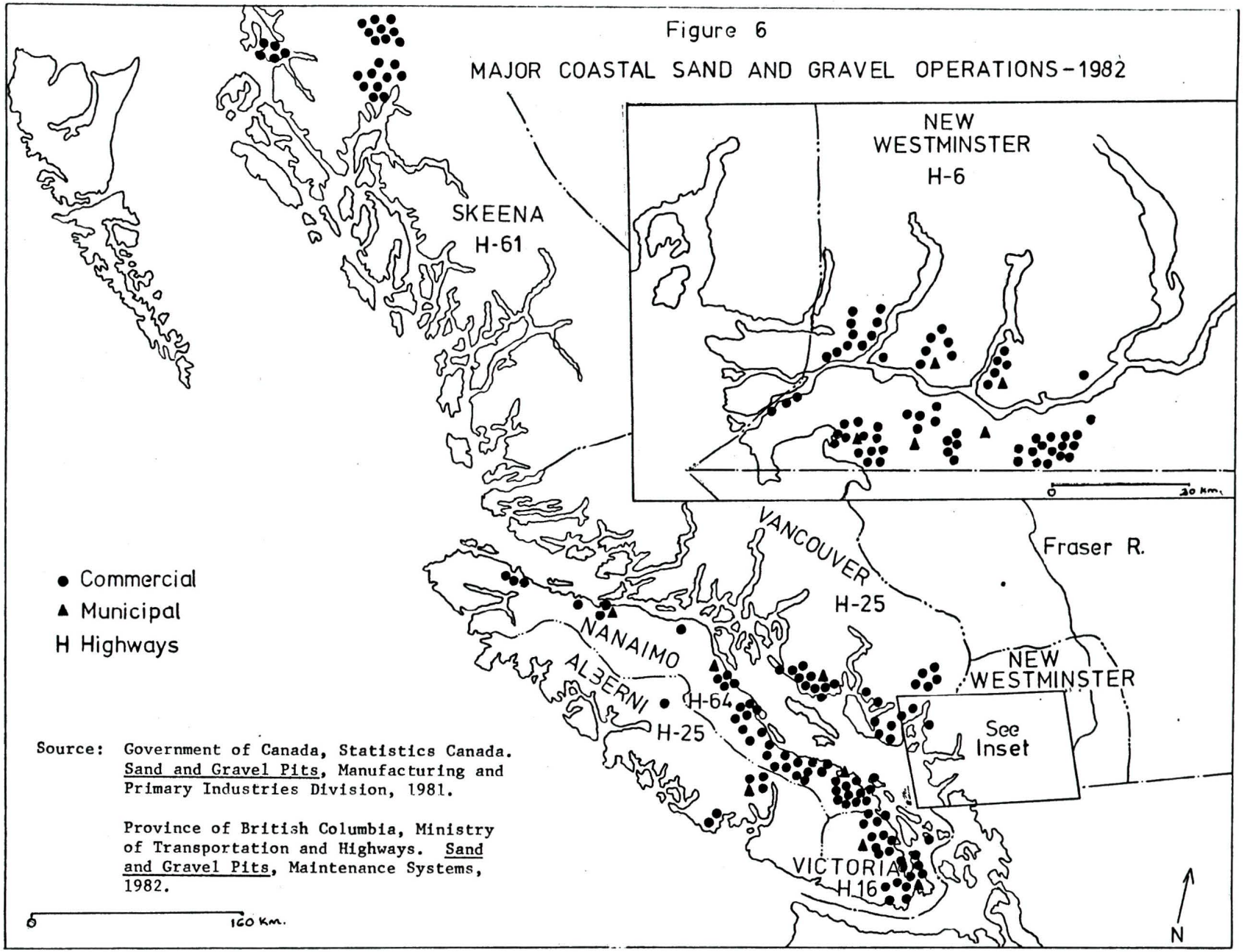


Figure 6
MAJOR COASTAL SAND AND GRAVEL OPERATIONS - 1982
NEW WESTMINSTER H-6
SKEENA H-61
VANCOUVER H-25
Fraser R.
NANAIMO
ALBERNI H-64
H-25
NEW WESTMINSTER
See Inset
VICTORIA H16
● Commercial
▲ Municipal
H Highways
Source: Government of Canada, Statistics Canada. Sand and Gravel Pits, Manufacturing and Primary Industries Division, 1981.
Province of British Columbia, Ministry of Transportation and Highways. Sand and Gravel Pits, Maintenance Systems, 1982.
0 160 Km.
0 30 Km.
N

and gravel operations increased along the northern coastal mainland. The construction of Highway 16 from Prince George to Prince Rupert was the main factor behind this expansion.

From 1960 to 1971, over 50% of the sand and gravel produced was bank/pit-run, while in the last decade, less than 50% was unprocessed (Table 1). This trend reflected the increasing demand for processed sand and gravel for special uses, such as cement and asphalt. The major processing plants are located at Britannia Beach, Port Coquitlam, Clearbrooke and Metchosin.

In the last decade, the largest consumer of sand and gravel was the road construction sector, although the amount varied on a yearly basis (Table 2). Approximately three-quarters of the provincial road system is maintained by the province, which purchases the bulk of the road material from private contractors (Canadian Transport Commission, 1978). The second largest user of sand and gravel was the cement industry (Table 2). The major cement plants are located at Lulu Island and Langley. Generally, the consumption of sand and gravel for cement and other uses varies depending on the number and nature of projects undertaken in any given year (Hora and Basham, 1981).

TABLE 2

CONSUMPTION OF SAND AND GRAVEL (BRITISH COLUMBIA)
(%) 1970-1979

Year	Fill	Roads (Surface)	Roads (Ice-Control)	Concrete Aggregate	Asphalt Aggregate	Railroad Ballast	Backfill for Mines	Motar Sand	Other	Total
1980										
1979	8.5	63.8	3.6	7.8	9.5	4.8	0.6	0.2	1.2	100.0
1978	9.7	55.1	3.2	11.1	16.1	3.0	0.6	0.2	1.1	100.0
1977	8.2	68.8	0.3	8.0	9.4	2.9	0.4	0.2	1.8	100.0
1976	12.4	57.6	2.8	11.3	10.1	1.8	0.1	0.3	3.6	100.0
1975	17.4	37.8	2.8	21.9	9.9	8.0	0.2	1.3	0.6	100.0
1974	21.5	37.3	3.2	22.1	12.3	1.9		1.3	0.4	100.0
1973	18.7	35.5	4.4	23.0	10.5	5.5		1.7	0.9	100.0
1972	10.8	65.1	2.2	11.8	6.5	2.7		0.8		100.0
1971	15.9	58.9		14.9	5.8	3.8		0.6		100.0
1970	24.9	59.9		10.5	0.9	0.3	0.2	2.1	1.2	100.0

* Percentages rounded to first decimal place

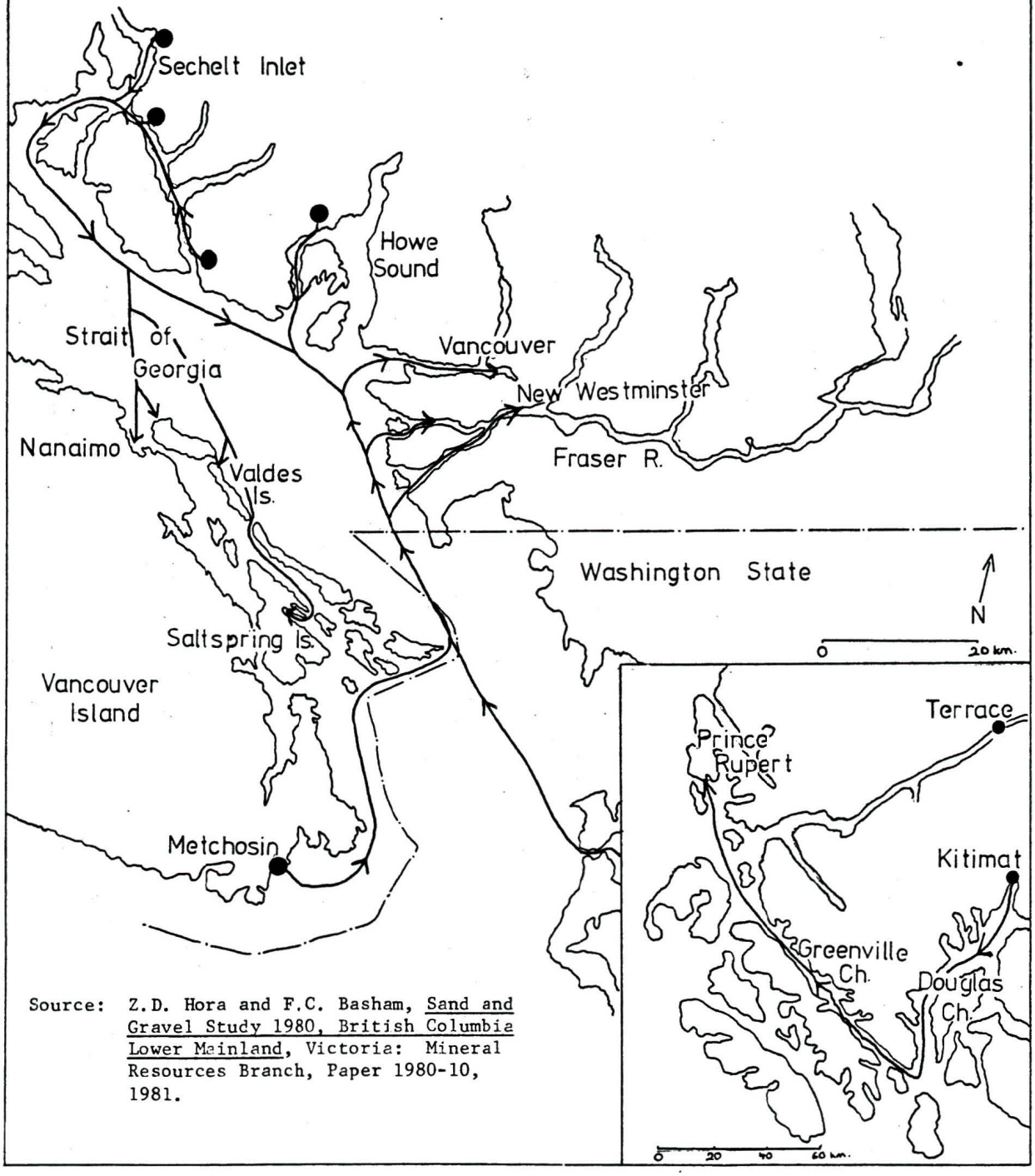
Source: Ministry of Energy, Mines and Petroleum Resources, Annual Reports, 1970-1980.

Individual municipalities continued to operate their own sand and gravel pits, primarily in the southern coastal region (Appendix A). Conversely, the Ministry of Highways operated the majority of their pits in northern Vancouver Island and the northern mainland for road construction and maintenance.

During this period, a significant development occurred in the transportation sector of the industry. Since the market can absorb costs within a 32-kilometre radius for trucks, the Coquitlam River deposits were the only local deposits within the market range for Vancouver (Hora and Basham, 1981). Coastal barges, however, can absorb costs within a 112-kilometre radius (Hora and Basham, 1981). With the continued exploitation of the Sunshine Coast deposits, barges became an important mode of transportation. In 1979, three million cubic metres of gravel was barged from Metchosin, Howe Sound, Sechelt Inlet and Washington state (Figure 7). Gravel was barged from Washington state because it was relatively inexpensive and lies within Vancouver's market range by barge (Hora and Basham, 1981). As well, many of the Gulf Islands, including Gabriola, Valdes and Saltspring, import gravel from Howe Sound and Sechelt Inlet since they do not have significant deposits (Figure 7). Coastal barging is also significant through Douglas and Greenville Channels along the northern coast (Figure 7). Since the Prince Rupert

Figure 7

COMMERCIAL SAND AND GRAVEL SHIPMENTS



Source: Z.D. Hora and F.C. Basham, Sand and Gravel Study 1980, British Columbia Lower Mainland, Victoria: Mineral Resources Branch, Paper 1980-10, 1981.

area is devoid of large gravel deposits, this route is a relatively inexpensive passage from the Kitimat-Terrace deposits.

The emerging trend indicates that the Strait of Georgia is not a barrier to the movement of sand and gravel and does not limit the southern region's hinterland. The Strait of Georgia not only facilitates interaction, but extends it over a greater distance. The same pattern has been witnessed in the coastal forest industry. Hardwick (1963) noted that logging has dispersed throughout the region with technological changes and economies in transportation and the Strait of Georgia functions as an extended central place, placing the whole coastal forest within its raw material hinterland (p. 78).

Present Structure of the Industry

The coastal region accounted for 68.4% of the provincial sand and gravel production in 1981 (Table 3). During the last decade, the coastal sand and gravel production value averaged 59.2% of the provincial total.

In 1981, the New Westminster Mining District accounted for 46.3% of the coastal sand and gravel production total, followed by Victoria with 17.6%, Vancouver with 16.5%, Nanaimo with 11.6%, Skeena with 6.1% and Alberni with 1.9% (Table 4).

TABLE 3

SAND AND GRAVEL PRODUCTION VALUE IN BRITISH COLUMBIA
(Dollars)

Year	B.C. Total	Coastal Total	Coastal %
1981	87,603,864	59,959,705	68.4
1980	98,666,100	43,898,902*	44.5
1979	71,918,633	40,276,196	56.0
1978	64,227,295	33,877,689	52.7
1977	54,809,121	31,952,141	58.3
1976	48,138,635	29,531,486	61.3
1975	39,575,457	25,945,460	65.6
1974	35,611,346	24,042,094	67.5
1973	35,119,590	22,465,520	64.0
1972	33,076,196	17,786,599	53.8
		Average	59.2

* Excluding Skeena Mining District

Source: Ministry of Energy, Mines and Petroleum Resources-Mineral Economics Division, Annual Reports 1973-1982.

TABLE 4

COASTAL SAND AND GRAVEL PRODUCTION TOTALS BY MINING DIVISION

Year	Coastal Total	Alberni	Nanaimo	N. Westminster	Skeena	Vancouver	Victoria
1981	25,877,366	480,059	3,012,530	11,982,120	1,583,592	4,267,577	4,551,488
		1.9	11.6	46.3	6.1	16.5	17.6
1980	22,618,618	1,012,120	3,576,243	9,292,095	N/A	4,036,350	4,701,810
		4.5	15.8	41.1		17.8	20.9
1979	22,888,616	877,529	1,328,556	10,838,916	1,984,972	4,194,906	3,663,737
		3.8	5.8	47.4	8.7	18.3	16.0
1978	18,943,630	568,102	1,746,913	7,934.301	1,000,440	3,749,068	3,944,806
		3.0	9.2	41.9	5.3	19.8	20.8
1977	21,660,632	595,820	2,570,023	7,900,216	2,598,794	3,817,081	4,178,698
		2.8	11.9	36.5	12.0	17.6	19.3
1976	19,801,641	670,867	1,973,456	7,993,952	1,493,402	3,680,422	3,989,542
		3.4	10.0	40.4	7.5	18.6	20.1
1975	18,523,425	559,903	2,501,639	6,998,756	2,147,301	3,586,964	2,728,862
		3.0	13.5	37.8	11.6	19.4	14.7
1974	21,703,735	575,702	1,803,098	9,103,670	1,696,445	5,651,357	2,873,463
		2.7	8.3	41.9	7.8	26.0	13.2
1973	20,605,710	342,524	1,831,585	10,187,424	1,520,378	4,444,383	2,279,416
		1.7	8.9	49.4	7.4	21.6	11.1
1972	18,990,707	279,704	1,516,706	9,260,354	1,972,552	3,672,042	2,289,322
		1.5	8.0	48.8	10.4	19.3	12.1

* Percentages rounded to first decimal place

N/A - Not Available

Source: Ministry of Energy, Mines and Petroleum Resources, Mineral Economics Division-Sand and Gravel Statistics, 1972-1981.

In the last decade, New Westminster has consistently contributed the largest share of the coastal production, averaging 43.2% of the total. The rank-order of the Mining Districts, in terms of total production, has been consistent in the past decade, except for Vancouver and Victoria alternating between second and third place. In the past decade, Vancouver has ranged from 16.5% to 26.0% of the coastal production while Victoria has ranged from 11.1% to 20.9% (Table 4). Production varied due to the expansion of pits in Sechelt Inlet and the expansion of the Metchosin gravel pit near Victoria in 1973.

The major operators in the coastal region are commercial, municipal, highway and railway organizations. As indicated in Table 5, commercial operators account for 86.4% of the total production, followed by the Ministry of Transportation and Highways with 9.0% and municipalities and railways with 4.6%. In the past decade, this structure has been consistent, except for the increase in the number of municipal operators.

The New Westminster Mining District accounts for 47.8% of the total commercial production, followed by Victoria with 18.9%, Vancouver with 17.7%, Nanaimo with 10.0%, Skeena with 5.2% and Alberni with 0.3% (Table 5). Over the past decade, this pattern has been consistent and generally reflects

TABLE 5

STRUCTURE OF THE COASTAL SAND AND GRAVEL INDUSTRY
PERCENTAGE OF TOTAL PRODUCTION BY MINING DISTRICT BY OPERATOR

Year	Operator	Coastal	Alberni	Nanaimo	N. Westminster	Skeena	Vancouver	Victoria
1981	Commercial	86.4	0.3	10.0	47.8	5.2	17.7	18.9
	Municipal/RW	4.6	6.7	3.3	84.0	0.0	5.1	4.6
	Highway	9.0	14.1	31.9	12.6	17.8	12.5	11.1
	Total	100.0	1.9	11.6	46.3	6.1	16.5	17.6
1971	Commercial	86.51	3.4	5.5	51.7	3.7	24.3	11.4
	Railway	0.04		100.0				
	Highway	13.45	1.7	22.4	11.9	55.4		8.6
	Total	100.00	3.2	7.8	46.3	10.6	21.0	11.0

Source: Ministry of Energy, Mines and Petroleum Resources - Mineral Economics Division, Annual Reports 1972 and 1982.

the urban hierarchy in the coastal region. The largest commercial producers are the southern populated districts.

Individual municipalities have established gravel pits since 1971. In 1981, the New Westminster Mining District accounted for 84.0% of the total municipal production, followed by Alberni with 6.7%, Victoria with 5.1%, Nanaimo with 3.3% and Vancouver with 1.0% (Table 6). There are no municipal sand and gravel operations in Skeena. The dominance of New Westminster is due to the large number of municipalities located in this Mining District.

In 1981, the Nanaimo Mining District accounted for 31.9% of the Ministry of Transportation and Highways production total, followed by Skeena with 17.8%, Alberni with 14.1%, New Westminster with 12.6%, Vancouver with 12.5% and Victoria with 11.1% (Table 6). This structure reflects the Ministry's road construction and maintenance programs, which are most active in the northern mainland and Vancouver Island. In 1971, Skeena accounted for 55.4% of the total highways production. This was due to the reconstruction of Highway 16 from Prince George to Prince Rupert.

The majority of the sand and gravel pits are located in the southern coastal region in the New Westminster, Vancouver and Victoria Mining Districts (Appendix B). The

TABLE 6

STRUCTURE OF THE COASTAL SAND AND GRAVEL INDUSTRY WITHIN MINING DISTRICT - PERCENTAGE OF TOTAL PRODUCTION

(Tonnes)

Year	Operator Type	Coastal Total	Alberni	Nanaimo	N. Westminster	Skeena	Vancouver	Victoria
1981	Commercial	22,355,843	70,844 14.8	2,229,873 74.0	10,691,936 89.2	1,167,173 73.7	3,963,669 92.9	4,232,348 93.0
	Municipal/RW	1,187,156	79,086 16.5	38,849 1.3	997,135 8.3		11,809 0.3	60,277 1.3
	Highway	2,334,367	330,129 68.8	743,808 24.7	293,049 2.4	416,419 26.3	292,099 6.8	258,863 5.7
	Total	25,877,366	480,059	3,012,530	11,982,120	1,583,592	4,267,577	4,551,488
1971	Commercial	14,993,766	510,115 92.8	828,982 61.0	7,754,847 96.6	549,166 29.8	3,638,111 100.0	1,712,545 89.5
	Railway	7,425		7,425 0.6				
	Highway	2,331,685	39,785 7.2	522,423 38.4	276,480 3.4	1,292,903 70.2		200,094 10.5
	Total	17,332,876	549,900	1,358,830	8,031,327	1,842,069	3,638,111	1,912,639

Source: Ministry of Energy, Mines and Petroleum Resources-Mineral Economic Division, Sand and Gravel Production Statistics, 1971 and 1981.

three Districts produce over 80% of the total coastal volume (Table 6). There are more than 75 pits, producing nearly 21 million tonnes annually (Hora and Basham, 1981). Commercial sand and gravel operations account for 89.2% of the total production in New Westminster and 92.9% in Vancouver (Table 6). The commercial domination is attributed to the large Vancouver market. Production is concentrated in the municipalities of Matsqui, Coquitlam and Langley and in Howe Sound, Sechelt Inlet and Jervis Inlet. Alluvial deposits of the Fraser River are dredged in Delta and Richmond. There are no sand and gravel operations in the municipalities of Vancouver, Burnaby, West and North Vancouver and New Westminster.

On Vancouver Island, commercial operations account for 93.0% of the total production in Victoria Mining District, followed by Nanaimo with 74.0% and Alberni with 14.8% (Table 6). The large commercial share in Victoria and Nanaimo is attributed to the urban markets in both districts. Highway operations account for 68.8% of the total production in Alberni Mining District, followed by Nanaimo with 24.7% and Victoria with 5.7% (Table 6). The large highway production in Alberni is attributed to the relatively low total volume production in the district. Municipal operations account for 16.5% of the total production in Alberni and 1.3% in both Victoria and Nanaimo (Table 6). Sand and gravel operations on Vancouver Island primarily serve their local

markets, except for Metchosin. Metchosin exports gravel across the Strait of Georgia to Vancouver. Other operations are centered in the Cowichan Valley, Nanaimo, Courtenay, Campbell River and Alberni.

Commercial operations account for 73.7% and highways account for 26.3% of the total production in the Skeena Mining District (Table 6). In 1971, the production share between commercial and highway operations was almost reversed (Table 6). This was primarily due to the construction of Highway 16 at that time. Sand and gravel operations are concentrated at Kitimat along the Kitimat River and Terrace. Although almost 500,000 tonnes of sand is annually dredged from Prince Rupert Harbour, Prince Rupert imports barged sand and gravel from Kitimat (Canadian Transport Commission, 1978).

Influential Factors for Reserves

In the coastal region, there appears to be a discrepancy concerning the size of sand and gravel reserves. In 1964, the British Columbia Natural Resources Conference concluded that the province had large reserves of basic raw materials, including sand and gravel. In 1978, the Canadian Transport Commission reported that nearly 250 million cubic metres plus hundreds of millions of tonnes in tidewater was available in the Greater Vancouver Regional District. While

these estimates may represent resources, they do not represent reserves (Hora and Basham, 1981). Reserves are the resource which is available for production.

The Ministry of Energy, Mines and Petroleum Resources determined in its 1981 Sand and Gravel Study that approximately 29 million cubic metres of sand and gravel was available in the lower mainland. In the Squamish-Howe Sound area, reserves total approximately 62 million cubic metres (Mineral Economics Division, 1981). In the Kitimat-Terrace area, reserves total 20 million cubic metres (Mineral Economics Division, 1981). The size of reserves on Vancouver Island and the Queen Charlotte Islands have not been determined. As well, the volume of gravel on the bottom of the Strait of Georgia and at the mouths of coastal rivers has not been considered.

The exploitation of the resource is influenced by a number of physical, economic, political and social factors. First, the availability is influenced by the distribution and the knowledge of the existence of the resource. Reserves along the northern coast, Vancouver Island and Jervis and Sechelt inlets have not been adequately explored (Hora and Basham, 1981). Surficial geological surveys have been completed recently and the mapping of sand and gravel deposits has just begun in these areas. Although it is possible

that significant deposits exist, estimates of the size of these deposits are either unavailable or incomplete. If operators are unaware of the size, composition and location of deposits, their productivity is restricted.

Second, the availability of the resource is influenced by its market, size and location. Due to the low intrinsic value of sand and gravel, the economics of the industry are extremely sensitive to location (Bronitsky and Wallace, 1974). Large deposits along the central and northern coasts may be available for exploitation, but not for southern markets at current prices.

Third, conflicting land interests may exclude deposits from production, particularly in the urban municipalities in the lower mainland and the Saanich Peninsula. While urban development generates demand for sand and gravel, it also contributes to land use conflicts with the industry (Bronitsky and Wallace, 1974). Residential development favours sites underlain by gravel for good drainage and percolation. Development may encroach onto deposits in peripheral areas. This has occurred in North Vancouver, Richmond, Delta, Pitt Meadows and Burnaby.

In the lower mainland and southeastern Vancouver Island, a number of sand and gravel deposits are located within

the Agricultural Land Reserve. The reserve was created in 1973 to preserve agricultural land for farm use. Sand and gravel operations which existed prior to 1973 were allowed to continue production on existing leases. However, applications to expand the existing lease and to open a gravel pit within the reserve come under the Soil Conservation Act, RSBC 1979, Chapter 391 and must be approved by local authorities (District Municipalities/Regional Districts) and the Provincial Land Commission. A number of deposits in Abbotsford and Langley have not been exploited because operations would degrade valuable agricultural land.

Fourth, environmental impacts, such as noise and dust, are associated with the industry. These impacts tend to be more visible when the industry is situated near urban areas (Bronitsky and Wallace, 1974). Direct impacts, such as noise levels and sedimentation, are measurable to a certain extent. Indirect impacts do not threaten man's physical person or property, but diminish the quality of life or disrupt normal human activity. Indirect impacts are difficult to measure and monitor and are usually long-term (National Academy of Sciences, 1980).

Excessive noise is the most frequent environmental related problem. Noise is emitted from the crushing units of processing plants and from the hauling of sand and gravel

by truck. Generally, areas in front of the excavation site receive more noise than areas to the rear. Excessive dust is a pollutant associated with the excavation, processing and transportation of sand and gravel. Monetary losses are unavoidable if it repeatedly covers newly painted or cleaned materials and structures. If the pollutant contains mineral particles in harmful concentrations, health hazards may result. The most susceptible locations to dust pollution are those downwind from the excavation sites.

Sand and gravel dredging in coastal waters not only alters channels and sand bars, but releases bottom sediments and changes the habitat of benthic organisms and fish. Sand and gravel operations do not generally release acid or toxic products into water bodies. However, suspended sediment may affect water quality. As well, large quantities of water are required for washing sand and gravel. If the water returns to the streams, the suspended sediment may affect water quality and aquatic life.

In 1971, the silt from three gravel washing operations was allowed to flow into the Coquitlam River instead of settling ponds. In 1973, the Department of Fisheries and Oceans found that 800 parts per million of sediment was in the river below the operations, while above the gravel pits they found 40 parts per million of sediment (Vancouver

Sun, January 27, 1973, p. 31). The accumulation of silt reduced the food supply to fish eggs, resulting in a decrease in the number of spawning chum and pink salmon.

Since water is lost by pumping and evaporation, the excavation pit can be a discharge point for groundwater and may result in the lowering of groundwater level in adjacent areas (National Academy of Sciences, 1980). The recovery of normal water levels is not possible until mining is completed. Groundwater levels may also be altered if sand and gravel substitute as aquifer materials beneath flood and outwash plains.

Other environmental concerns include the erosion of topsoil, a change in the drainage patterns and the instability of steep slopes. Sand and gravel pits are often viewed as visual nuisances and eyesores. When abandoned, they pose safety hazards to trespassers.

In some instances, environmental and safety concerns may lead to municipalities and regional districts imposing zoning regulations. Zoning regulations may restrict or prohibit excavation sites. They may also forbid the trucks from certain transportation routes. Together, these factors may influence the availability of deposits for excavation.

Summary

In the coastal region, the sand and gravel industry developed and continues to be concentrated near the southern populated areas. Industry expansion along the northern coastline closely paralleled highway construction and urban expansion. The industry is characterized by provincial, municipal and commercial operators owning or leasing and developing the pits. Although deposits are widespread, several social, economic, physical and environmental factors influence development. Consequently, the industry is largely restricted to peripheral urban areas.

Overall, the use and development of the resource is affected by the several agencies and organizations which control and regulate it. Each agency has its own legal powers, objectives and concerns to administer. Collectively, these agencies are the "political and institutional arrangements" which manage the resource. The political and institutional arrangements should take into account and integrate individual factors and interests and effectively and efficiently control and regulate the development and growth of the industry. The specific responsibilities for each agency are discussed in Chapter IV. Chapter V examines the permit approval, regulatory and permit cancellation processes within the political and institutional arrangements.

Chapter IV

AGENCY RESPONSIBILITY IN THE COASTAL SAND AND GRAVEL INDUSTRY

Introduction

In coastal British Columbia, several government agencies share the regulatory and administrative responsibilities for the sand and gravel industry. Agency responsibility involves government departments at the federal, provincial, regional and local levels. Each agency has statutory authority and/or conventional jurisdiction to regulate, supervise or review some aspect of the industry. The purpose of this chapter is to identify these agencies and to describe the formal and informal controls exercised by these agencies.

Since the sand and gravel industry itself is multi-faceted, it is nearly impossible to identify and catalogue every statute and law that may be applicable. Also, in the parliamentary system, the statutory powers granted by Parliament and the Provincial Legislature confer broad discretion to executive authorities to implement a range of policies through a series of broad priorities and mandates (Civil Service Commission, 1964). Although the presumed behaviour of the system may be easily identified, the actual behaviour of the system may be quite different. In this outline, only those laws, regulations and administrative arrangements which are of practical significance to governing the industry are noted.

The identification of the agencies was based on findings from the Sand and Gravel Study, 1981 by the Ministry of Energy, Mines and Petroleum Resources and an analysis of specific acts and regulations. Their activities and responsibilities were determined through personal consultation with these agencies, augmented by documentary evidence.

Four points should be clarified concerning the identification of the applicable agencies. First, many of the agencies are involved in a number of resource activities, some overlapping with the sand and gravel industry. Despite their importance to the agency in question, these other responsibilities are not included. Second, the outline is descriptive in nature. An overall analysis of the functioning of the system is presented in Chapter V. Evaluations of the system are presented in Chapter VI. Third, only the individual responsibilities of each agency are described. It is emphasized that given the nature and spatial distribution of the industry, agency jurisdictions do overlap and no one agency functions in isolation. Fourth, the information is accurate for the period ending December, 1982. Any changes or amendments occurring after this period have not been included. Fifth, the findings are categorized by federal, provincial, regional and local government organizations. The format does not illustrate any particular rank order or measure concerning responsibilities or activities. Finally, the findings are

summarized in Table 9 at the end of the chapter.

Federal Organizations

Fisheries and Oceans: Fisheries Service

As directed by the British Columbia Gravel Removal Order, under the Fisheries Act, C.R.C., 1978, c. 841, the agency is responsible for the protection of fish and fish habitat in coastal waters. "The removal or displacement of gravel from the high water wetted perimeter of any portion of a body of water that is a spawning ground frequented by fish is prohibited", unless a permit has been issued by a fishery officer (British Columbia Gravel Removal Order, 1978, Section 2). The agency also enforces the provisions of the British Columbia Gravel Order and the Fisheries Act.

Other responsibilities of the agency include locating and suggesting alternate sources of gravel to operators and identifying the locations, quantities and boundaries of gravel deposits (L.B. Duke, Victoria District Supervisor, October 4, 1982).

Department of Indian and Northern Affairs

The Department is responsible for supervising and regulating sand and gravel operations on Indian Reserve Land.

Under the Indian Act, R.S., 1978, c. 149, the Minister, with the consent of the council of the band, issues and renews removal permits (Section 58(4)) and enforces permit regulations (Section 93).

Under the Indian Mining Regulations, 1978, c. 956, other responsibilities of the Department include the inspection and planning of operations (Sections 42 and 43), the collection and distribution of taxes (Section 31) and the mediation of subsequent appeals by operators (Section 46).

Provincial Organizations

Ministry of Lands, Parks and Housing

The Lands and Housing Regional Operations Division allocates Crown Land and Foreshore Areas for quarry purposes among private operators and government agencies. The jurisdiction covers all vacant land within the province, including all non-forest uses located in Provincial Forests.

Under the provisions of the Land Act, R.S.B.C., 1979, Chapter 214, the agency issues leases (tenure) for the mining of sand and gravel (Sections 5 and 27), cancels the lease if the covenant is not followed (Section 40) and collects royalties for sand and gravel removed from Crown Land and Foreshore Areas (Section 24).

The informal responsibilities of the agency include identifying potential sand and gravel deposits on Crown Lands and ensuring that all operations are undertaken in a manner which minimizes adverse environmental impacts.

Ministry of Environment

The Ministry of Environment is responsible for the management and protection of land, water, air and living resources under the authority of the Ministry of Environment Act, R.S.B.C., 1980, Chapter 30. Under this mandate, four agencies are involved in the sand and gravel industry.

The Pollution Control Branch implements the provisions of both the Pollution Control Act, R.S.B.C., 1979, Chapter 332 and the Litter Act, R.S.B.C., 1979, Chapter 239 with regard to sand and gravel excavations. Also, the agency implements guidelines for the general control of air and water pollution for industrial plants as outlined in the Pollution Control Objectives for Food-Processing, Agriculturally Oriented and Other Miscellaneous Industries of British Columbia, 1980. Specific effluent objectives for cement manufacturing and ready-mix concrete batch plants for particulate emissions and effluent discharges are presented in Table 7. The agency establishes the standards and monitors the operations.

TABLE 7

Objectives for Particulate Emissions

Operation	Level Parameter	A	B	C	Monitoring Methods
Cement Manufacturing Plant	Total particulates, lb/ton of clinker	2.0	3.0	5.0	Isokinetic sampling followed by gravimetric analysis
Asphalt Paving	Total particulates, lb/ton of product	0.40	0.60	1.0	As above
Stone Quarrying and Processing	Total particulates, lb/ton of raw materials	1.0	2.0	3.0	As above
Lime Production Plant	Total particulates, lb/ton of product	1.0	2.0	3.0	As above

Objectives for the Discharge of Effluent to Marine and Fresh Waters

Operation	Level Parameter	A	B	C	Monitoring Frequency
Cement Manufacturing Plants	Suspended solids, lb/short ton of cement produced	0.07	0.5	1.8	Four times a year
	Total solids[1], lb/short ton of cement produced	2.3	3.2	6.8	As above
	pH range	6.5-8.5	6.5-8.5	6.5-8.5	As above
Ready-mix Concrete Batch Plants	Suspended solids, lb/100 cu. yd. product	0.6	4.2	14.5	As above
	Total solids[1], lb/100 cu. yd. product	21	29	62	As above
	pH range	6.5-8.5	6.5-8.5	6.5-8.5	As above

[1] Not applicable to discharges to marine water

A - All new or proposed discharges meet level A.
B - Existing discharges should be upgraded to interim level B and ultimately to A.
C - All existing discharges should meet level C immediately or shortest possible time.

Source: Pollution Control Objectives for Food-Processing, Agriculturally Orientated, and Other Miscellaneous Industries of British Columbia, Ministry of Environment, Water Resources Service, Victoria, 1980.

The Fish and Wildlife Branch, in cooperation with Fisheries Service, reviews applications for gravel dredging operations from coastal water bodies and implements provisions under the Fisheries Act.

The Water Management Branch reviews gravel removal applications from sites where aquifers may be affected by extraction, if requested by Lands and Housing Regional Operations Division. Also, the Branch reviews applications for dredging sand and gravel from below the groundwater table, if requested by Fisheries Service or the Fish and Wildlife Branch.

The Resource Analysis Branch prepares surficial geological resource maps which include locations of sand and gravel deposits.

Ministry of Forests

The Forest Service is one of the principal users of sand and gravel for forest-related construction purposes. Under the provisions of the Forest Act, R.S.B.C., 1978, Chapter 23, the Forest Service manages and operates sand and gravel sites for forest industries, including camp sites and primary and secondary roads (Section 102).

Up until October 1979, the Forest Service issued Special Use Permits (SUP) for the non-commercial production of sand and gravel on Crown Land. This function was transferred to the Ministry of Lands, Parks and Housing, by mutual agreement, to be administered under the Land Act. This agreement is valid until December 31, 1982.

Ministry of Energy, Mines and Petroleum Resources

Under the provisions of the Ministry of Energy, Mines and Petroleum Resources Act, R.S.B.C., 1979, Chapter 270, the Ministry is responsible for regulating significant provincial mineral resources, including the sand and gravel industry. As part of this mandate, the Ministry prepares and develops comprehensive mineral resource policies, investigates, researches, studies and inventories mineral resources, collects and circulates information and regulates all mining activity (Section 5).

The Mineral Resources Branch is responsible for regulating the exploration, development and production of the coastal sand and gravel industry under the Mining Regulation Act, R.S.B.C., 1981, Chapter 265. Its functions include the implementation of safety standards and reclamation programs for most privately operated gravel pits that are not integrated with cement or other manufacturing plants.

Also, the agency is responsible for taxing gravel operations on private land under the provisions of the Mineral Land Tax Act, R.S.B.C., 1981, Chapter 260.

As part of the mineral resources management mandate, the agency is currently preparing a three-phase examination of the provincial sand and gravel industry. The agency is developing an integrated mineral aggregate resource policy for the province.

Ministry of Finance

Under the provisions of the Mining Tax Act, R.S.B.C., 1960, Chapter 267, the Logging and Mining Tax Branch is responsible for the taxation of profits from sand and gravel operations, including the British Columbia income tax and mining tax.

Ministry of Transportation and Highways

The Ministry is a principal user of sand and gravel and is directly responsible for exploring, developing and producing the deposits. Under the provisions of the Ministry of Transportation and Highways Act, R.S.B.C., 1981, Chapter 280, the Minister and his agents may enter any land and remove sand and gravel for the construction, maintenance and repair of government highways and public works (Section 22). The Ministry is not required to compensate for

gravel removed from unimproved lands, but may compensate for gravel removed from improved lands.

The Equipment Services Branch locates sites and co-ordinates the sand and gravel removal program. The District offices are responsible for appraising and estimating reserves and for clearing and stripping sites prior to operations. The management of the pit and the implementation of safety standards are equally shared between the District and Regional offices of the Ministry. The Regional offices are responsible for the rehabilitation and reclamation of the pits. In the coastal region, there are three regions and ten districts.

The Geotechnical Branch prepares evaluations of sand and gravel deposits for use by the Ministry.

Ministry of Municipal Affairs

The Planning Service Branch provides aid to local governments which carry out the actual regulating of municipal lands. Under the provisions of the Municipal Act, R.S.B.C., 1979, Chapter 290, municipalities and regional districts may establish regulatory bylaws, including plans, zoning, subdivision and soil removal bylaws applicable to the sand and gravel industry.

The Islands Trust Committee recommend the use, acquisition and disposal of lands, excluding Indian Reserves, on all islands in the Strait of Georgia, Howe Sound and Haro Strait, under the provisions of the Islands Trust Act, R.S.B.C., 1979, Chapter 206. The agency prepares regional plans and zoning and subdivision controls which may influence the development of sand and gravel deposits within the Trust (Section 4). Land use projects on Crown Land and the siting of a processing plant are recommended by the Trust Committee to the Lieutenant Governor in Council (Section 9).

Ministry of Agriculture

The Provincial Land Commission is responsible for regulating sand and gravel sites on Agricultural Land Reserves. Under the provisions of the Agricultural Land Commission Act, R.S.B.C., 1973, Chapter 9, reserves will only be used for farm purposes and no soil will be removed from the land (Section 15). Exemptions were obtained automatically for gravel pits if a separate title certificate under the Land Registry Act was held for less than 0.809 hectares of land on December 21, 1972 (Section 11). These existing gravel pits may be enlarged provided the total land area does not exceed 0.809 hectares (Section B-1). The Land Commission may authorize gravel pits over 0.809 hectares if the use and development does not diminish the future agricultural potential of the land, the use is in the public interest,

and rehabilitation and reclamation is possible (Section B-2).

Under the provisions of the Soil Conservation Act, R.S.B.C., 1979, Chapter 391, the Land Commission grants and renews sand and gravel removal permits, subject to the prescribed terms and conditions (Sections 2 and 3). The Commission may cancel or suspend permits (Section 5), order the land rehabilitated (Section 5) and administer and enforce all regulations pertaining to agricultural land reserves (Section 8).

Workers' Compensation Board

The Board has exclusive jurisdiction for safety requirements for non-commercial sand and gravel pits and pits integrated with other industrial and manufacturing installations, such as ready-mix plants. Under the provisions of the Workers' Compensation Act, R.S.B.C., 1981, Chapter 437, the Board may inquire into and determine all matters concerning the inspection, and accident investigation of the excavation site (Section 71). The Board also implements the Industrial Health and Safety Regulations made pursuant to Section 71 of the Act.

Regional Districts

Regional districts can influence the location of sand and gravel sites by the policies and standards incorporated

in their zoning bylaws, official settlement plans, subdivision regulations and building permits. Seven of the fourteen coastal regional districts have been granted the prerogative to establish soil removal bylaws by the Minister of the Ministry of Municipal Affairs. Only two regional districts have established soil removal bylaws.

The Alberni-Clayoquot Regional District, Bylaw #10, grants removal permits in conjunction with building permits, for sand and gravel operations within its boundaries.

The Capital Regional District, Bylaw #151, grants sand and gravel removal permits for operations within its boundaries. It also establishes and enforces specific requirements for public safety and reclamation and rehabilitation of the site.

Municipalities

Municipalities in the coastal region may be involved in the sand and gravel industry in three forms. First, many municipalities own and operate their own sand and gravel pits. Second, municipalities have official community plans, zoning and subdivision controls. These controls cover gravel processing, including screening, washing, sorting and crushing. They do not include the extraction phase, since the gravel being removed is part of the land itself. An area zoned

"residential" in the Official Settlement Plan does not prevent the owner of the land from removing gravel. Third, several district municipalities have established soil removal bylaws, which include specific tenure, public safety and/or reclamation and rehabilitation requirements (Table 8). These bylaws control the removal of soil, including gravel, within the electoral areas. The soil removal bylaw must make reference to the applicability of certain zones as defined in the zoning bylaw. Soil removal bylaws are approved by the Minister of Municipal Affairs.

Tenure requirements enable municipalities to grant a sand and gravel removal permit, to receive a bond or letter of credit as a deposit from the applicant, to receive a detailed plan covering the operations or to charge a permit fee on each cubic metre of sand and gravel excavated. Public safety requirements include the placement of fences or warning signs at the excavations. Reclamation and rehabilitation requirements include the grading, sloping or revegetation of surfaces to specific standards or the restoration of damages to the surrounding area and waterways.

Summary

In the coastal region of British Columbia, two federal departments, fourteen provincial agencies, the regional districts and the municipalities form the political and

TABLE 8

MUNICIPAL SOIL REMOVAL BYLAWS

Municipality	Bylaw #	Tenure	Public Safety	Rehabilitation/ Reclamation
1. Kent	589-1970	x	x	x
2. Chilliwack	1977	x		x
3. Abbotsford	71-1974, 584-1970	x		x
4. Matsqui	1617-1978	x	x	x
5. Mission	475-1976	x	x	x
6. Maple Ridge	988-1970	x	x	x
7. Langley	1029-1971	x	x	x
8. Surrey	4982	x		x
9. Coquitlam	190-1973, 737-1977	x	x	x
10. North Saanich	255-1977	x	x	x
11. Saanich	4046-1978	x	x	x
12. Central Saanich	278-1968	x	x	x
13. Campbell River	692-1978	x		
14. North Cowichan	662-1958	x		
15. Terrace	909-1980	x		x
16. Squamish	605-1977	x		x
17. Oak Bay	None			
18. Port Hardy	None			
19. Kitimat	None			

Source: Compiled from the Municipal District Soil Removal Bylaws, listed by bylaw #.

institutional structure which manages the sand and gravel industry (Table 9). Each organization shares regulatory and administrative responsibilities over various aspects of the industry. Their activities and priorities have been described insofar as they directly and indirectly influence the industry. No one organization has a primary mandate regarding sand and gravel management, although the Mineral Resource Branch of the Ministry of Energy, Mines and Petroleum Resources is currently preparing a sand and gravel management policy, under their mineral resource management mandate.

The next step in the analysis is to investigate the regulatory process itself and how the individual agencies fit into the process. The permit issuing arrangements, safety and reclamation regulatory arrangements and the permit suspension/cancellation and prosecution arrangements will be described.

TABLE 9

RESPONSIBILITIES FOR THE COASTAL SAND AND GRAVEL INDUSTRY

Department/Ministry	Agency	Legislation	Intent of Mandate	Function
Fisheries & Oceans	Fisheries Service	Fisheries Act B.C. Gravel Removal Order	Protect fish and fish habitat from alteration, disruption and destruction from gravel removal operations.	Issue and renew removal removal permits. Enforce permit provisions. Inspect operations.
Indian Affairs & Northern Development	Indian Affairs District Offices	Indian Act Indian Mining Regulations	Control land use on Reserves	Issue and renew removal permits. Enforce permit regulations. Inspect and plan operations. Collect and distribute taxes. Mediate appeals.
Lands, Parks and Housing	Lands & Housing Regional Operations Division	Land Act	Allocate and manage Crown Land and Foreshore Areas. Supervise non-forest uses in Provincial Forests.	Issue and cancel leases for sand and gravel mining to private operators and government agencies. Identify sand and gravel deposits on Crown Land and Foreshore Areas. Collect royalties for sand and gravel removed from Crown Land and Foreshore Areas.
Environment	Fish and Wildlife Branch	Fisheries Act (Canada)	Manage and protect freshwater fish and fish habitat.	Reviews dredging applications for freshwater coastal rivers and streams.
	Water Management Branch	Upon request from Lands, Parks and Housing		Reviews gravel removal applications from sites where aquifers may be affected and from sites

Department/Ministry	Agency	Legislation	Intent of Mandate	Function
Environment				below the groundwater table.
	Pollution Control Branch	Ministry of Environment Act Pollution Control Act Litter Act Pollution Control Objectives for Food-Processing, Agriculturally Orientated and Other Miscellaneous Industries of British Columbia	Manage and protect land, water, air and living resources	Monitor particulate emissions into the air and effluent discharges to marine and freshwater.
	Resource Analysis Branch			Prepare surficial geological resource maps.
Forests	Forest Service	Forest Act	Manage sand and gravel pits operated by the Forest Service	Uses sand and gravel for forest-related construction. Removes trees of commercial value on Crown or private land.
Energy, Mines and Petroleum Resources	Mineral Resources Branch	Ministry of Energy, Mines and Petroleum Act Mining Regulation Act Mineral Land Tax Act	Manage, develop and regulate mineral resources	Regulate safety standards and reclamation programs for privately owned gravel pits. Tax gravel operations on private land.
Finance	Logging and Mining Tax	Mining Tax Act	Taxation of profits from sand and gravel operations	B.C. Income Tax B.C. Mining Tax B.C. Corporation Capital Tax

Department/Ministry	Agency	Legislation	Intent of Mandate	Function
Transportation and Highways	Equipment Services Branch	Ministry of Transportation and Highways Act	Location and use of sites for sand and gravel removal	Estimate and appraise reserves. Manage gravel pits. Implement safety standards and reclamation of pits.
	Geotechnical Branch			Evaluate sand and gravel deposits.
Municipal Affairs	Planning Service	Municipal Act	Provide aid to local governments	
	Islands Trust	Islands Trust Act	Recommend the use, acquisition and disposition of lands in Trust area	Prepare regional plans, zoning and subdivision controls. Approve land use projects on Crown land and processing plant sitings.
Agriculture	Provincial Land Commission	Soil Conservation Act Agricultural Land Commission Act	Regulate sand and gravel sites on Agricultural Land Reserve	Grant and renew sand and gravel removal permits. Cancel and suspend permits. Order land to be rehabilitated. Enforce all Agricultural Land Reserve Regulations.
Workers' Compensation Board		Workers' Compensation Act Industrial Health and Safety Regulations	Regulate safety requirements at non-commercial pits and pits integrated with other industrial installations	Regulate, inspect and investigate all safety procedures.
Regional Districts/ Municipalities		Soil Removal Bylaws Planning, Zoning and Subdivision Controls Building Permits	Regulate regional/district/municipal land use	Grant tenure and enforce public safety/reclamation and rehabilitation requirements.

Source: Compiled from Acts and Regulations listed under Legislation.

Chapter V

OPERATIONAL ARRANGEMENTS FOR THE COASTAL SAND AND GRAVEL INDUSTRY

Introduction

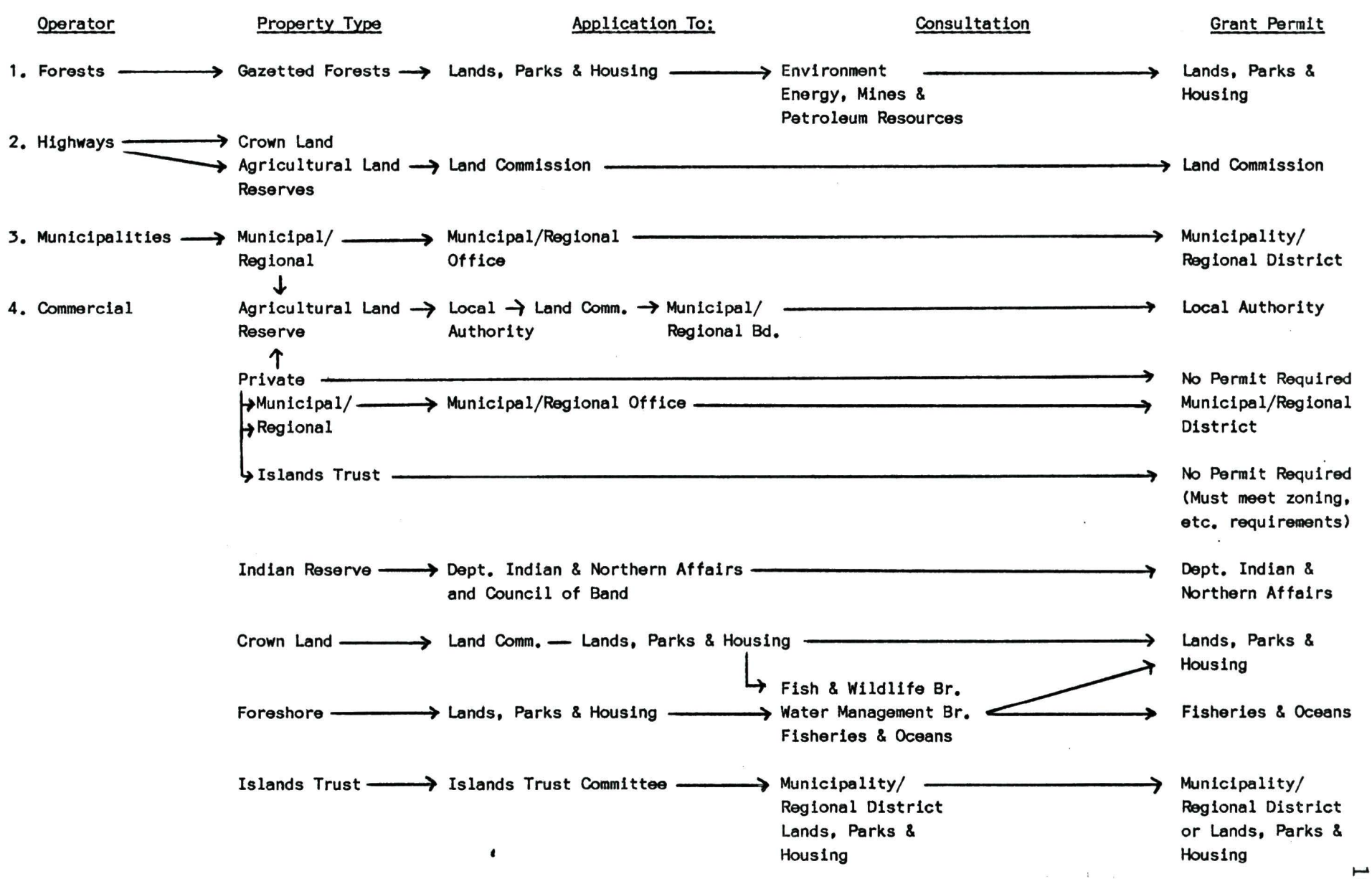
The purpose of this chapter is to examine the operational arrangements through which the legal powers and responsibilities of the agencies are administered. The operations are divided into three functions - tenure application, regulatory responsibilities and tenure cancellation. The operational arrangements differ depending on the type of operator - commercial or non-commercial, the site of the operation - public or private, and the type of operation - integrated or non-integrated. In examining the operational arrangements, the procedures and administrative authority of the various agencies, as well as the procedural relationships among the agencies that administer the operations, are described.

Tenure Application Arrangements

The permit application process for operating a sand and gravel pit varies depending on the status of the operator (the applicant) and the site of the proposed pit. Generally, there are four categories of operators - Ministry of Forests, Ministry of Transportation and Highways, individual municipalities and private operators/companies. The permit application process is described for each operator category (Table 10).

TABLE 10

PERMIT APPLICATION ARRANGEMENTS



Source: Compiled from applicable statutes and legislation as outlined in this Chapter.

Ministry of Forests

The Ministry of Forests operates sand and gravel pits for the construction and maintenance of camp sites and roads on gazetted forest land. Under the provision of the Forest Act, R.S.B.C., 1978, Chapter 23, the Ministry may remove sand and gravel for its own non-commercial use. A Special Use Permit is granted by the Ministry of Lands, Parks and Housing, under the provisions of the Land Act, R.S.B.C., 1981, Chapter 214. Prior to its issuance, the ministries of Environment, and Energy, Mines and Petroleum Resources are both contacted to inspect the application. The permit fee is $0.39 per cubic metre removed and the permit is renewed every year.

Ministry of Transportation and Highways

The Ministry of Transportation and Highways owns and operates sand and gravel pits for road construction and maintenance. The Minister and his agents may enter any property to remove sand and gravel for these purposes. A Special Use Permit is required for Crown Land and is processed under guidelines similar to those for the Ministry of Forests. The District Highway Office determines the size and location of the resource and refers the data to the Regional Highway Office which applies for the permit.

Regional Property Negotiators of the Ministry of Highways negotiate the arrangements with the individual property owners. The Ministry may provide compensation for sand and gravel removed from improved lands, but are not legally required to compensate for sand and gravel removed from unimproved lands.

The Ministry of Highways requires a separate permit for the removal of sand and gravel from the Agricultural Land Reserve. The Ministry applies directly to the Provincial Land Commission for an exemption under the Agricultural Land Reserve Procedure Regulation, B.C., 1978, Regulation 313 (Section 44). The Land Commission may refer the exemption to the Ministry of Agriculture for inspection prior to the issuance of a permit.

Municipalities

Permits are granted by the municipalities under the individual municipal soil removal bylaws. Exemptions to remove sand and gravel from the Agricultural Land Reserve are approved by the municipal council and/or regional district board and the Provincial Land Commission. A detailed account of this procedure is outlined under the next sub-heading.

Commercial Operators

Crown Lands/Foreshore Areas

The Ministry of Lands, Parks and Housing issues permits for sand and gravel removal to private operators on Crown Land and foreshore areas. Initially, the applicant applies to the British Columbia Land Commission, which passes the application to the Ministry of Lands, Parks and Housing. The Ministry may consult with the Fish and Wildlife and Water Management branches of the Ministry of Environment and the Department of Fisheries and Oceans. Dredging leases must respect the regulations of the British Columbia Gravel Removal Order and the Canada Fisheries Act. If there are no conflicts, the Ministry of Lands, Parks and Housing issues the permit. In the case of coastal waters which are spawning grounds, permits are issued by the Regional Director or a fishery officer of Fisheries and Oceans. Leases are issued for five, ten or fifteen year periods and the permit fee is $0.52 per cubic metre removed.

Agricultural Land Reserve

Under the provisions of the Soil Conservation Act, R.S.B.C., 1977, Chapter 391, Agricultural Land Reserve will not be used for any purpose other than farm use and no one shall remove soil from the land. Exemptions must be approved by the municipal council, the regional board and the Provincial Land Commission. Permits for sand and gravel operations

are granted under the provisions of both the Soil Conservation Act and the Agricultural Land Commission Act, R.S.B.C., 1980, Chapter 9.

An exemption for sand and gravel operators on Agricultural Land Reserve was automatic if it was less than 0.8 hectares in area and was certified under the Land Registry Act on December 21, 1972. Existing sand and gravel operations may be extended, providing the total acres already excavated and currently being worked do not exceed 0.8 hectares.

Permits for sand and gravel operations over 0.8 hectares in area are granted by the local authority after the application is approved by the Provincial Land Commission. However, the local municipality or regional board can refuse a permit even after the Land Commission has approved the application. Permits vary from one to five years in duration and the performance bonds vary from $5,000 to $80,000, depending on the size of the proposed excavation.

Municipal Property

Sand and gravel removal permits for any lands within a municipality are granted by the individual municipalities. The districts of Saanich and Central Saanich and the District Municipality of Chilliwack stipulate zones in their soil removal bylaws, where sand and gravel removal is permitted.

The districts of Terrace and North Saanich and the district municipalities of Kent, Abbotsford and Maple Ridge do not designate zones for gravel removal in their bylaws. However, the bylaws list prohibitions for the use of land. These prohibitions include lands where removal would endanger public utilities, adversely affect waterways, and endanger soil stability of any adjacent property. The procedures and requirements differ in terms of the duration of the permit, the permit fee and the deposit bond (Table 11).

Most permits are valid for one year, except in the municipal districts of Kent, Matsqui, Mission and Maple Ridge where they are valid for five years. Performance bonds or irrevocable letters of credit are required by all the municipalities except North Cowichan. The amount ranges from $500 per hectare in Squamish to $5,000 per hectare in Matsqui. Coquitlam requires a flat rate of $10,000, while Surrey and Campbell River assess a sum for each operation. Permit fees are required by all the municipalities, except North Cowichan. Permit fees range from $0.10 per cubic metre in Mission to $0.28 per cubic metre in Matsqui. Central Saanich, Campbell River and North Saanich assess a flat fee of $20 to $25. Terrace charges $10 per month of operation and Saanich charges $600 per hectare. The emerging pattern indicates that municipalities in the southern urbanized coastal region assess higher rates for performance

TABLE 11

SUMMARY OF MUNICIPAL LEASES, PERFORMANCE BONDS AND PERMIT FEES

Municipality	Permit Duration	Performance Bond	Permit Fee
Kent	5 years	$2,470 per hectare ($10,000 max.)	$0.13 per m^3
Chilliwack*		Unspecified	
Abbotsford	1 year	$2,470 per hectare	$0.20 per m^3
Matsqui	5 years	$5,000 per hectare plus $3,000-$20,000	$0.28 per m^3
Mission	5 years	$3,087 per hectare	$0.10 per m^3
Maple Ridge	5 years	$50 per 380 cubic metres	$0.20 per m^3 plus $300
Langley	2 years	$3,750 per hectare	$0.26 per m^3
Surrey	1 year	Assessed for each operation	$0.26 per m^3
Coquitlam	1 year	$10,000	$0.26 per m^3
Terrace	1 year	$2,000 per hectare	$10 per month
North Cowichan	Unspecified	None	None
Central Saanich	1 year	$1,250 per hectare for first four	$25
Campbell River	1 year	Unspecified	$20
Saanich	1 year	$2,000 per hectare	$600 per hectare
North Saanich	Unspecified	$1,250 per hectare	$25
Squamish	1 year	$500 per hectare	$25/1st 250 tonnes; $0.10/tonne
Nanaimo	Unspecified	$4,940 per hectare	
Kitimat**			
Regional Dist.			
Alberni-Clayoquot***			
Capital	1 year	$2,500 per hectare	$25 per hectare

* Perspective Operator must first apply to the municipality for a permit and then to the Provincial Land Commission under the terms of the Soil Conservation Act since the land in Chilliwack is in the Agricultural Land Reserve.

** Grant permit based on each application's merit and passes responsibility to Ministry of Energy, Mines and Petroleum Resources.

*** The permit is granted and subject to terms outlined in Building Permits.

Source: Compiled from listed municipal soil removal bylaws.

bonds and permit fees than the northern coastal municipalities.

Indian Reserve Land

Permits for sand and gravel removal from Indian Reserve lands are administered by the Department of Indian and Northern Affairs. Permits are issued by the Department with the consent of the Council of the Band. Permits are granted for one year, security deposits are assessed per individual operation and the fee is established at 5% of the gross revenue or market value of the output.

Regulatory Arrangements

After the sand and gravel removal permit has been granted by the appropriate agency, the operator must comply with the specific regulations outlined in the permit. As well, safety and reclamation requirements are separately regulated by several agencies in conjunction with the terms outlined in the individual permits (Table 12). These procedures are described in terms of safety and reclamation/rehabilitation requirements for each type of operator.

Safety Regulatory Arrangements

Commercial Operations

Commercial sand and gravel operations which market the product are subject to safety regulations under the Mining Regulation Act, R.S.B.C., 1979, Chapter 265 administered

TABLE 12

REGULATORY ARRANGEMENTS

	Operator	Safety Standards	Reclamation/Rehabilitation
1.	Commercial Non-integrated	Energy, Mines & Petroleum Resources + Municipalities/Regional Districts	Energy, Mines and Petroleum Resources (Mining Regulation Act) Exempted if under - Other Act - Other Regulation - Municipal Bylaw
	Integrated	Workers' Compensation Board Municipalities/Regional Districts ↓ Environment (cement, asphalt & ready-mix plants)	
2.	Highways	Workers' Compensation Board District Highway Rules Municipalities/Regional Districts	Regional Highway Office
3.	Municipalities	Workers' Compensation Board Municipal Bylaws	Municipal Bylaws

Source: Compiled from listed Acts, Regulations and Soil Removal Bylaws in this Chapter.

by the Ministry of Energy, Mines and Petroleum Resources. These regulations apply to excavations on both Crown and private land. Inspectors are responsible for enforcing regulations concerning the safety of personnel (Section 11), the safety of the general public (Section 6) and the implementation of safety procedures once the site has been mined-out (Section 10).

Commercial sand and gravel pits which are integrated with industrial and manufacturing operations are subject to the Industrial Health and Safety Regulations administered by the Workers' Compensation Board. These regulations cover safety requirements with respect to access to and activities at the excavations (Sections 38, 42 and 46). As well, cement manufacturing, asphalt paving and ready-mix concrete batch plants must adhere to the specific particulate emission standards administered by the Ministry of Environment as outlined in Chapter IV.

Commercial sand and gravel operations located within municipal boundaries must also meet municipal bylaws governing safety requirements. Bylaws which deal with safety requirements are generally similar. They require the site to be free of hazards and restricted to access by the general public.

Ministry of Transportation and Highways

The Ministry of Transportation and Highways' sand and gravel pits are subject to the Industrial Health and Safety Regulations administered by the Workers' Compensation Board. As well, if the pit is located within municipal boundaries, the municipal safety bylaw requirements must be followed.

The District Highway Offices have also established safety requirements for the pits and the individual pit managers are responsile for maintaining the standards. There are four highway districts on Vancouver Island, four on the southern mainland and two on the northern mainland. Although the safety requirements are administered by ten District Highway Offices, the standards are similar in nature.

Municipal Operations

Municipal sand and gravel pits are subject to the Industrial Health and Safety Regulations administered by the Workers' Compensation Board. As well, the pits must also meet the safety requirements established in the municipal soil removal bylaws.

Reclamation/Rehabilitation Regulatory Arrangements

Commercial Operations

Reclamation and rehabilitation requirements are subject to the provisions of the Mining Regulation Act administered

by the Ministry of Energy, Mines and Petroleum Resources. It is the responsibility of every operator to institute and conduct a program for the protection and reclamation of the land surface and watercourses affected by the operation (Section 10). Before operations commence, the operator must file a report containing the environmental protection and land reclamation program during and after operations of the pit with the Ministry (Section 10). As well, a performance bond, not greater than $1,000, must be deposited with the Ministry, to ensure compliance with the program. Programs are approved by the Chief Inspector, on behalf of the Minister.

Commercial operations may be excluded from the reclamation and rehabilitation provisions established in the Mining Regulation Act if these requirements are adequately secured and controlled under another Act, regulations or municipal bylaws (Section 10). Other Acts and regulations which deal with reclamation and rehabilitation requirements include the Ministry of Transportation and Highways Act, the Soil Conservation Act, the British Columbia Gravel Removal Order under the Fisheries Act and the Indian Mining Regulations, as well as several Municipal Removal Bylaws and the Capital Regional District Soil Removal Bylaw. Exclusion from the Mining Regulation Act is granted by the Chief Inspector, on behalf of the Minister (Section 10). As well, non-commercial

pits are also excluded.

Ministry of Transportation and Highways

Ministry of Highways' pits must meet the reclamation and rehabilitation requirements of the Regional Highway Offices. There are three regional offices in the coastal region - Vancouver Island, the southern mainland and the northern mainland. Although the specific requirements may vary in each region, the general requirements include standards for the recontouring of the pit after excavation, the seeding of grass and reforestation if the pit is visible from a road. These reclamation rules apply to Ministry pits operated on Crown land.

Municipal Operations

Municipal sand and gravel operations must meet the reclamation and rehabilitation requirements specified by the Mining Regulation Act and administered by the Ministry of Energy, Mines and Petroleum Resources unless the requirements are specified under Municipal Soil Removal Bylaws. The municipal bylaws vary from broad descriptions covering the requirements to very specific standards, citing gradients for slopes, depths for topsoil and the number of grass seeds per hectare. For example, the District Municipality of Matsqui Bylaw No. 1617 (Section 8L) states ..."All surfaces of the excavation growth of grass or some other suitable

rooted groundcover, either by seeding or sodding." The District Municipality of Abbotsford Bylaw No 71 (Section 91b and c) states ..."After excavation has been completed, all surfaces must be graded or sloped so that no gradient shall be steeper than 1.5 to 1. Also, all surfaces will be covered with no less than 15.24 cm of topsoil and sewn with grass in quantities of no less than 22.5 kilograms per hectare."

Permit Suspension or Cancellation Arrangements

During the course of the sand and gravel operation, the permit may be suspended or cancelled for non-compliance with permit conditions by the issuing agency or the regulating agency. The terms of cancellation and subsequent appeal process vary, depending on the provisions in the governing acts, regulations and the permits. The stipulations and procedures are outlined below, in terms of the permit issuing agencies and regulating agencies.

Issuing Agencies

Ministry of Lands, Parks and Housing

Under the provisions of the Land Act, R.S.B.C., 1981, Chapter 214, if an operator breaches a term in the permit or defaults in payment of money due, a notice is mailed requiring the operator to comply with the terms within sixty days (Section 40). If the default continues past sixty days, the Minister may cancel the permit. If cancelled,

money paid for the permit and the interest in the Crown land is forfeited.

The Minister may order an appeal, if the operator requests one, to be decided by a commissioner (Section 59). The Minister, however, confirms the decision. Within thirty days of the decision, the operator may appeal, on a question of law only, to the Supreme Court.

If the operator is found guilty of an act or default by which the lease may be terminated, the operator may be required to restore the land, pay for the restoration of the land or forfeit all machinery and equipment on the Crown land (Section 57). As well, if the operator is found guilty, he is liable, upon summary conviction, to a fine not exceeding $300 or imprisonment up to sixty days, or both (Section 63). All commercial operators granted permits on Crown land and foreshore areas are subject to these procedures.

Special Use Permits, granted to the Ministries of Forests and Highways, are also administered by Lands, Parks and Housing. Under specified permit terms, if maintenance and rehabilitation measures for the site are not followed, the Regional Manager may assess the operator the costs to carry out these measures to be paid forthwith (Sections 8 and 9).

Provincial Land Commission

Under the provisions of the Soil Conservation Act, R.S.B.C, 1979, Chapter 391, if a permit term or order from an enforcement officer has been contravened, the permit may be suspended or cancelled without a hearing (Section 5). This procedure pertains to all sand and gravel operations on agricultural land reserve.

Appeals are made to the Environment and Land Use Committee. If the appeal is allowed, the Committee may reinstate the permit on terms decided by the local authority or land commission. If the appeal is not allowed, the commission may order the land rehabilitated for agricultural purposes and the operator may be fined up to $500 for each day the offence continues (Section 9).

Department of Fisheries and Oceans

Sand and gravel operations in coastal waters and foreshore areas are subject to permit terms issued under the British Columbia Gravel Removal Order and provisions in the Fisheries Act. Contraventions are subject, on summary conviction, to a first offence fine not exceeding $5,000 and subsequent fines not exceeding $10,000 or imprisonment not exceeding two years (Section 31(3)).

Prior to the laying of any charges, contraventions are reviewed by the Ministries of Lands, Parks and Housing, Environment and Energy, Mines and Petroleum Resources. The operator may also be subject to penalties under Acts and regulations administered by these agencies.

Municipalities and Regional Districts

Municipalities and regional districts which issue sand and gravel permits generally stipulate procedures for dealing with contraventions to terms in the permit and the soil removal bylaws (Table 13.). Failure to adhere to terms in the permit or bylaw is an offence and every day the offence continues, a new offence arises. If found guilty, the operator is punishable under the provisions of the Summary Conviction Act, R.S.B.C., 1960, Chapter 23. As well, the permit may be immediately suspended and upon conviction, the performance bond may be forfeited (Table 13).

Department of Indian and Northern Affairs

If the operator fails to comply with conditions stipulated in the permit or the Indian Mining Regulations, a notice is sent to the operator, who has thirty days to remedy the situation before the permit is cancelled (Section 36). The operator has thirty days to appeal to the Minister. The Minister is responsible for the final decision, with or without a hearing. If the permit is cancelled, the operator

TABLE 13

SUMMARY OF PERMIT CANCELLATION FOR MUNICIPALITIES

Municipality	Summary Conviction (max.)	Suspension of Permit	P. Bond Forfeit
Capital Reg. Dist.	$500 per day 6 months	Yes	$2,500
Squamish	Unspecified	Yes	$500
North Saanich	$500 per day 6 months	Yes	
Central Saanich	$300 per day		$1,250 per hectare
Saanich	$1,000 per day 6 months		
Terrace	$1,000	Yes	$2,000 per hectare
North Cowichan	$100		
Campbell River	$2,000		
Kent		Yes	$1,000

Source: Compiled from listed municipal soil removal bylaws.

is liable to a penalty of 5% of the operation's rental amount (established in each permit). As well, every operator on Indian Reserve Land is subject to the provincial laws which relate to the development, production, treatment and marketing of sand and gravel (Section 4).

Regulating Agencies

Ministry of Energy, Mines and Petroleum Resources

Safety and health regulations, applicable to commercial, non-integrated pits, are administered by the Ministry under the provisions of the Mining Regulation Act, R.S.B.C., 1980, Chapter 265. If a Ministry inspector feels the excavation is dangerous to the public or pit personnel, written notice ordering remedies or closure of the site will be made (Section 6).

Failure to comply with any rule or order made in regard to the Act is an offence. Upon conviction, the operator is liable to a fine not exceeding $1,000 for each offence (Section 339). If written notice had been given, the operator is liable to a further penalty not exceeding $1,000 and not less than $100 for every day the offence continues (Section 339).

The Ministry also enforces reclamation and rehabilitation provisions under this Act. These are applicable to all

commercial operations unless they have been exempted. If the operator fails to complete the scheduled reclamation program, all or part of the environmental security bond is forfeited. As well, the operator is liable to the penalties outlined in Section 339. The operator may appeal, in writing, to the Minister (Section 10). If the matter is not resolved, the appeal is heard by a committee appointed by the Lieutenant Governor in Council, whose decision is final.

Ministry of Environment

The Ministry may inspect any works relating to land, air and water and order the repair, alteration, improvement or removal of the works under the Pollution Control Act, R.S.B.C., 1979, Chapter 332. Appeals to the tribunal must be made within fifteen days, if the order is obtained from an officer and within thirty days if the order is obtained from the Pollution Control Board. All tribunal decisions are final.

Contraventions of the Act or orders are liable on conviction to a fine not exceeding $10,000 or up to one year in prison or both (Section 25). If the offence is continuing in nature, the fine shall not exceed $500 for each day the offence continues (Section 25). All sand and gravel operations, commercial or non-commercial, are subject to these regulations.

Workers' Compensation Board

Integrated commercial and non-commercial sand and gravel pits are subject to safety provisions under the Workers' Compensation Act, R.S.B.C., 1979, Chapter 437, administered by the Workers' Compensation Board. When an officer of the Board considers that working conditions are unsafe, he may issue orders to adjust the inadequacies and levy the employer a percentage of the amount of the assessment for the preceding year (Section 73). Failure to comply with the orders is an offence and is liable, on conviction, to a fine not exceeding $10,000 or up to three months imprisonment or both (Section 73). Also, failure to comply with the regulations in the Act and the Industrial Health and Safety Regulations is an offence and is liable, on conviction, to a fine prescribed in the regulations (Section 75).

Also, the Board or an officer of the Board may order the immediate closure of a site if dangerous conditions exist (Section 74). These orders are to be confirmed in writing within twenty-four hours (Section 74). Failure to comply with the order is an offence and is liable, on conviction, to a fine not exceeding $50,000 or imprisonment not exeeding six months, or both (Section 96). In all cases, appeals are first presented to the Board of Review and then to the commissioners of the Board (Sections 90 and 91). However, neither body is authorized to reverse the original

decision. They are only authorized to return the case back to the Board for reconsideration.

Summary

The operational procedures for granting sand and gravel permits, regulating safety and reclamation concerns and suspending permits are characterized by the involvement of numerous agencies. Based on the examination of the organizational procedures for these functions, four significant points emerge regarding the nature of the procedures. First, specific controls and processes vary, depending on the location and type of sand and gravel operation and the regulating agency. However, important interests, such as environmental, ecological, public safety and conflicting land use issues, are taken into account within the process. Second, the responsible agencies have statutory mandates with regard to regulating the industry and enforcing their responsibilities. Concerned interests are addressed under the provision of several Acts and regulations enabling the agencies to maintain legislative control. Third, the process is dominated by rules and regulations concerning the control of sand and gravel operations before production commences. The required information, rules and procedures must be fulfilled by the operator before the removal permit is granted. The major advantage of this type of system is that all parties are well informed of their situation and are realistic about

their subsequent performance and activities. However, after the permit is granted, sand and gravel operators may become less accountable for the actions of their operations. Long-term concerns may become neglected if the enforcement of the regulations is curtailed. Fourth, within the process itself, most regulations involve the granting of sand and gravel removal permits and the enforcement of the prescribed standards. Violations of the regulations and the subsequent conviction process are the responsibility of the Attorney General.

The scope and number of regulations do not necessarily imply the efficiency of the operational procedures. Conversely, sand and gravel operators may face numerous and costly levels of accountability, resulting in reduced levels of output (production). The system may have created problems for sand and gravel operators, affecting their production. This question is addressed in the next step of the analysis.

Chapter VI

ASSESSING THE POLITICAL AND INSTITUTIONAL ARRANGEMENTS

Introduction

In this chapter, the political and institutional arrangements administering the coastal sand and gravel industry in British Columbia are appraised in terms of the seven criteria developed in Chapter II. The operational arrangements comprise the three functions - tenure application, regulatory control and tenure cancellation - as outlined in Chapter V. The evidence is based on evidence collected from three sources - the applicable agencies, private sand and gravel operators and four coastal newspapers - to ensure the findings are both valid and reliable. The methodology for collecting the evidence from each source is outlined below.

Methodology

Government Agencies

Evidence from the relevant governmental agencies was obtained in two ways. First, the files for sand and gravel permit applications were examined for the past one to five years, noting the total number of applications, the total number granted, reasons for denial, the length of the process time, application requirements and steps taken for renewing gravel removal permits. Second, the files for permit suspensions, cancellations and prosecutions were examined for

the same period, noting the total number of suspensions and prosecutions and the final outcome.

Interviews with key individuals at the agencies were conducted after the files were examined. The interviews were used to elaborate on evidence obtained from the files, discuss procedures and responsibilities that are not included in the files and to gain insights into the problems encountered by the agencies in administrating their operations. This approach was used to obtain the tenure information from all the agencies except the municipalities.

In the coastal region, there are fourteen districts and district municipalities and two regional districts with soil removal bylaws. A questionnaire covering tenure applications, permit suspensions, cancellations and prosecutions, inspection practices and problems encountered was mailed to the districts, district municipalities and regional districts (Appendix C). Four of the fourteen district municipalities returned their completed questionnaires.

Sand and Gravel Operators

A survey of the private sand and gravel operators in the coastal region was undertaken in February, 1983. The survey consisted of a questionnaire dealing with the procedures of tenure applications, the administration of regulatory

requirements and reasons for problems faced by the operators in any of these areas (Appendix D).

The coastal region was divided into six districts - Alberni, Nanaimo, Victoria, Vancouver, New Westminster and Skeena. These districts were used to describe the coastal industry in Chapter III and are currently used by the Ministry of Energy, Mines and Petroleum Resources. A list of operators for each district was compiled based on names listed in the current telephone directory and names obtained from the Ministry of Energy, Mines and Petroleum Resources Operator's Survey, 1978. The questionnaire was mailed to one-third of the randomly selected companies in each sub-region. The breakdown was as follows: Alberni-2; Nanaimo-17; Victoria-7; Skeena-8; Vancouver-8; and New Westminster-25. A total of 67 questionnaires were mailed.

Fourteen or 20.9% of the questionnaires were returned, marked "Company Unknown" or "No Such Address". Only twelve or 17.9% of the questionnaires were completed and returned. Forty-one or 61.2% of the operators surveyed did not respond.

Coastal Newspapers

A content analysis of four coastal newspapers, the Vancouver Sun, the Vancouver Province, the Victoria Times

and the Victoria Colonist*, was conducted. Articles, pertaining to all aspects of coastal sand and gravel operations, were examined for the period from 1971 to 1982. Articles dealing with development proposals, legal infractions and public controversies were particularly singled out.

Permit Issuing Arrangements

Within the political and institutional arrangements, there are five different agencies responsible for issuing sand and gravel removal permits. As described in Chapter V, each agency issues a permit to a sand and gravel operation, based on either the type of operation or the location of the proposed operation, or both. Although each agency adheres to its own procedures, the process, as a whole, will be evaluated in terms of the following criteria: time-minimization, clarity, consistency/duplication, flexibility, fairness of outcome, and public involvement.

Time-Minimization

The time-minimization criterion focuses upon the length of time taken for a decision to be made. The emphasis is not only on the matter of delays, but also the reasons for them.

* In September 1980, the Victoria Times and the Victoria Colonist merged to become the Victoria Times-Colonist.

The length of time to process a permit application varies among the agencies. The Department of Indian and Northern Affairs takes from three to six months to process the permit application. Delays in the process are generally attributed to disagreements over royalty and ground rental rates between the applicant and the department. As well, the local band is sometimes unwilling to accept the application as being in their best interest.

The Ministry of Lands, Parks and Housing normally takes three months to process an application. This includes the referrals to the Ministry of Energy, Mines and Petroleum Resources, the British Columbia Fish and Wildlife Branch and the Water Management Branch. Delays in the process are usually due to the applicant's failure to complete the application and supply all relevant information, a failure to submit the required performance bond or a possible land use conflict.

The time required by the Department of Fisheries and Oceans to process a permit application varies. Temporary or prescribed limit permits are issued immediately on site by a fisheries officer. Usually, there are no delays in issuing these permits since the inspection is carried out immediately and a written application is not required. If the river is a spawning ground, permits are denied, with

no exceptions. Long-term permits (up to ten years) are normally issued by the Ministry of Lands, Parks and Housing. The Department of Fisheries reviews the application and issues its recommendation. The process takes about three months. Delays occur if the site is a possible spawning ground and if dredging would create changes in or about the watercourse.

The British Columbia Land Commission takes from one to six months to review and process a permit application. On average, the process takes between three and four months. Also, the process is noticeably longer for applications for the lower mainland, particularly the Central Fraser Valley. Delays within the process are the result of the failure by the applicant to provide a bond of credit or an incomplete rehabilitation program proposal. This includes a failure to designate a stockpiling site, a failure to provide the grade of the slopes and an incomplete inventory of existing surface soil material. Delays also occur if the detailed agricultural capability rating of the property is omitted. Then, the application is referred to the Soils Branch, Ministry of Agriculture where an on-site inspection is undertaken before a rating is assigned to the property.

Among the district municipalities, the process varies from two weeks to three months. On average, the process

takes four weeks. Delays occur if the application is incomplete or the applicant fails to provide the performance bond. If the property is located on Agricultural Reserve Land, the process takes up to four months since the British Columbia Land Commission is required to approve all applications.

Although the processing time varies between the agencies, the delays generally occur because the applicant fails to supply the performance bond or submits an incomplete application. The delays are not the result of the permit application being reviewed by a number of referral agencies. Ten of the twelve respondents stated that they did not encounter delays with their permit applications. Two respondents stated that they encountered delays. It took two years to receive a permit from the Ministry of Lands, Parks and Housing and nine months from the Land Commission. Neither respondent indicated the pertinent details of the application nor the reasons for these delays.

Clarity

The major emphasis of the clarity criterion focuses on whether the application requirements are clear and made available to the applicant. If they are complex or confusing, to what extent is it the result of the number of different requirements needed to satisfy the different agencies?

Guidelines for completing and filing the applications are supplied by the permit issuing agency, in most cases. District municipalities supply a standard application form along with a copy of their district soil removal bylaw, stipulating bond requirements and fee assessments. The Department of Indian and Northern Affairs also supplies a basic standard form and proposal requirements. However, the structure of the final proposal may vary, depending on the individual requirements of the local band. The British Columbia Land Commission provides a standard application and specific guidelines for satisfying reclamation requirements. The Ministry of Lands, Parks and Housing also provides a standard application form and a reclamation program form for the Ministry of Energy, Mines and Petroleum Resources, if applicable. Since the Department of Fisheries and Oceans issues permits on-the-spot, application forms are not provided.

The application files for the Ministry of Lands, Parks and Housing disclose that during 1982 and the first quarter of 1983, seven of twenty-two applications or 32% were disallowed due to a failure to complete the application, meet the application requirements or the application was abandoned (Ministry of Lands, Parks and Housing, 1983). The application files for the British Columbia Land Commission, for 1982, disclose that five out of thirty-three applications or 15% were abandoned by the applicants after they were informed

more information was required for their application (B.C. Land Commission, 1983). Application files for the four District Municipalities - Surrey, Abbotsford, North Saanich and Squamish - and the Department of Indian and Northern Affairs reveal that in the last ten years, no applications were disallowed due to their incompleteness. No evidence is available from the Department of Fisheries and Oceans.

Only two of the twelve respondents indicated that the application requirements were too confusing and "bogged down" the application. Both applicants specified the reclamation program proposals for the Ministry of Energy, Mines and Petroleum Resources and felt the reasons for it was bureaucracy and these requirements were unnecessary.

However, the permit application procedure is defined and formalized in the legislation. The requirements for all the applications are stipulated in the applicable statutes and application guidelines are made available. The reclamation requirements are statutory and not left to the discretion of the issuing agency.

Consistency/Duplication

Consistency is closely related to clarity. If the requirements and procedures for issuing sand and gravel removal permits are inconsistent or duplicate, the applicant

is confused and unnecessary time and costs result for both the applicant and the issuing agency. Duplication can exist both in the legislation and the informal requirements of the permit application procedures.

Although there are five agencies which issue sand and gravel removal permits, an applicant applies to only one agency per permit, depending on the location of the proposed operation. For example, for Crown Land locations, the application is made to the Ministry of Lands, Parks and Housing, under the Lands Act, R.S.B.C., 1979, Chapter 214. Applications for municipal property sites are filed with the district municipality or regional district under the appropriate soil removal bylaw. Applications for dredging watercourses are made with the Department of Fisheries and Oceans under the British Columbia Gravel Removal Order. For foreshore locations, applications are filed with the Ministry of Lands, Parks and Housing under the Lands Act and reviewed by the Water Management Branch or the Department of Fisheries and Oceans.

Applications for Agricultural Land Reserve within a municipal district are filed with the municipality and reviewed by the British Columbia Land Commission for exemption under the Soil Conservation Act, R.S.B.C., 1979, Chapter 391 and the Agricultural Land Commission Act, R.S.B.C., 1973, Chap-

ter 9. The permit is issued by the municipality. Although legislative duplication for exemption for Agricultural Land Reserve exists, the Land Commission only uses the Soil Conservation Act.

Although only one permit is issued per operation, it is possible, under statutory requirements, to submit two or three performance bonds per operation. A performance bond is charged before the operation commences as a security deposit to be used if property damages occur during the operation or reclamation programs are not implemented after the operation.

All district municipalities with soil removal bylaws require performance bonds. The amount varies considerably among the municipal districts. For example, the District Municipality of Squamish requires a $500 bond per hectare, while the District Municipality of Matsqui requires a $5,000 bond per hectare.

As well, the British Columbia Land Commission requires a performance bond for all operations on Agricultural Land Reserve. This amount varies considerably, as well. For example, in 1982, performance bonds for the removal of 50,000 cubic metres of sand and gravel were $1,000 and $2,500. The rates were higher and more inconsistent in the Central

Fraser Valley. The performance bonds for the removal of 50,000 cubic metres of sand and gravel were $10,000, $3,750, $9,210 and $20,000.

If the operation is on Agricultural Land Reserve and within the municipal boundary, the operator may be expected to submit two bonds, one under the district municipality soil removal bylaw and one under the Soil Conservation Act. From 1978 to 1982, nine out of twenty-four applicants submitted two bonds (B.C. Land Commission, 1983). There was one application for a location in Matsqui where the district municipality required $20,000 for a bond and the Land Commission decided on $80,000. The applicant protested and eventually did not carry through with the application. There was also one instance where the applicant was required to submit three performance bonds - for the district municipality, the B.C. Land Commission and the Ministry of Energy, Mines and Petroleum Resources - under the reclamation program (Interview with Kirk Miller, 1983). Again, the applicant was unable to fulfil these requirements and forced to abandon his application.

Performance bonds are posted as security by the operator to ensure compliance with permit provisions and reclamation/rehabilitation requirements under the Soil Conservation Act and local bylaws. Double and triple bonding results

in unnecessary costs for the operator and may result in the abandonment of his application. Although it affects all operators, it is especially difficult for the small, independent operator who simply cannot meet the financial requirements.

Flexibility

The permit application procedure is clearly an adaptive process. Each application is examined individually and reviewed by the appropriate agencies. If a particular site is not covered by a local soil removal bylaw or is not in the agricultural land reserve, the application is made to the Mineral Resources Branch of the Ministry of Energy, Mines and Petroleum Resources where it is reviewed by the appropriate agencies. The overlapping capacities of the agencies provide some assurance that if there is a void or uncertainty as to which agency the application is made or if there is a failure to carry out responsibilities, other agencies are capable of assuming responsibilities.

The permit application procedure allows for the creation of new agencies and new jurisdictions. In 1973, the agricultural land reserve was created. Sand and gravel pits located in the reserve, as well as future excavation sites, were incorporated into the reserve. The institutional structure permitted the British Columbia Land Commission to assume

responsibility for permit applications for sand and gravel within the overall process. The adoption of soil removal bylaws by various district municipalities and regional districts has also been adapted into the institutional structure. Permit applications for sand and gravel pits, which are located within local boundaries and the agricultural land reserve are reviewed and approved by government entities, generally within a three month period. Clearly, no agency has had to forfeit its previous responsibilities and the process, itself, has not encountered time delays.

Public Involvement

The public involvement criterion focuses upon both the formal and informal methods available for the public within the process. Two aspects of the process are examined. First, what methods are available for the public to become involved in the establishing of legislation, and second, how can the public be heard in the decision-making process concerning the issuance of sand and gravel removal permits?

A review of the legislation indicates that there are no mandatory requirements or formal techniques for including the public in developing the legislation or influencing the decisions made within the process itself. The legislation does not require public hearings for sand and gravel removal permit applications. Hearings or other forms of public parti-

cipation are not normally undertaken as a matter of policy by any federal or provincial agencies, in this matter. Public participation is limited to the registering of opinions or objections with the appropriate issuing agency.

However, the public has access to the decisions made at the local level. District and municipal council meetings are open to the public. Individuals and citizen or community groups are able to present briefs voicing their concerns about a number of issues. A review of the four newspapers indicates two instances where the public not only was heard, but played an important role in the final decision concerning the development of the municipal soil removal bylaws.

In 1971, during the debates over the proposed soil removal bylaw for Maple Ridge, individuals and concerned residents presented briefs to council. The public was concerned over the hours of operation and proposed truck routes past schools and residences. Both concerns were covered in the final draft of the bylaw (Vancouver Sun, 10 February, 1971).

Since sand and gravel operations are site specific and very localized in nature, the operations usually affect a limited, but well-defined group. However, although there are no formal methods for involvement available, individuals and groups are able to consolidate and register their opinions

at the local level. As well, the public can and has registered objections concerning the issuing of sand and gravel removal permits.

A review of the four coastal newspapers, since 1971, discloses six instances where the public registered objections over proposed sand and gravel developments. These included a proposal to develop a gravel pit at Buntzen Bay on Indian Arm in 1972; a proposal to develop gravel deposits at Sechelt on the Sunshine Coast in 1972; a proposal to construct an underground gravel conveyor through a public park in Burnaby on Burrard Inlet in 1975; a proposal, in 1978, to operate an asphalt plant in Nanaimo; a proposal, in 1978, to develop a gravel pit at Cobble Hill in the Cowichan Valley; and, in 1979, a planned expansion of Trio-Ready Mix on Cordova Bay in Victoria. In the Indian Arm, Sechelt, Nanaimo and Cordova Bay proposals, the public was able to prevent development. The Sechelt and Cobble Hill cases, both involving different government agencies, are summarized below.

In 1971, Construction Aggregates Ltd. of North Vancouver proposed a 208-hectare quarry development on Crown land, east of Sechelt on the Sunshine Coast. The Sechelt Indian Band agreed to lease 28 hectares of its reserve to the company for a processing plant and associated shipment facilities. The Sunshine Coast Regional District received more than 400 ob-

jections from residents over a three-month period (Vancouver Sun, 26 May, 1971). The objections raised included the incompatibility of the operation with present land uses and noise hazards to the community. As a result, the Sunshine Coast Regional Board turned down the proposal. Since the proposed site is the responsibility of the provincial government, the Department of Lands, legally, had the final decision in the matter. Mr. W.C. Fry, on behalf of the Provincial Director of Lands, Mr. R.H. Goodchild, informed the Regional District ..."If the Regional District were strongly opposed to a particular application because it did not conform to zoning regulations or was against the public interest, or whatever good reason, this department would feel obliged to back them up and consider disallowance"... (Vancouver Sun, 22 June, 1971). In this case, the public was able to register their objections with the proposal to the Regional District, who in turn, registered their objections with the Department of Lands. The proposal was defeated.

In June 1978, the British Columbia Land Commission received an application from the Cowichan Regional District for the removal of 48,000 cubic metres of gravel on three hectares of property on Cobble Hill in the Cowichan Valley (British Columbia Land Commission, 1983). Within one month, the Commission received numerous objections from residents and community organizations of Cobble Hill. The residents

protested the planned operations because of excessive noise and dust pollution to the community. Against the wishes of the residents and the recommendation of the director of the Cowichan Valley Regional District, the Commission approved the application (Victoria Colonist, 26 August, 1978). However, terms in the original application were altered. The site was to be reduced to 0.8 hectares, the permit was to be valid for three months and reclamation was to be carried out under the standards and specifications of the Mining Regulation Act. Inspections would take place twice a week for one month after the permit expired. In this case, the public was again able to register their objections with the issuing agency. Although the permit was allowed, the terms were changed and stricter provisions adopted for the permit.

These controversies also illustrate the openness of the process in terms of making conflicts visible and increasing the general level of information available in the news media. All these cases were reported in at least one of the coastal newspapers. The proposed development east of Sechelt was initially reported in the Vancouver Sun in January 1971. Follow-up articles appeared twice in May and in June 1971, covering further information and progress in the dispute, before the proposal was rejected on June 17, 1971.

Fairness of Outcome

The fairness of outcome criterion focuses on whether the process itself, is biased so that some users consistently win over other users. There was no indication of dissatisfaction by the operators concerning the permit application process. A survey of the application files did not uncover any patterns or irregularities concerning application rejections. A review of the applications filed at the British Columbia Land Commission since 1973 did not indicate any preferences for some applications over others. For example, excavation sites of fifteen and sixteen hectares were approved in Langley while sites of three, six and eight hectares were rejected not because of the size of the proposed development but because the site itself would be permanently unsuited for agriculture.

Regulatory Arrangements

The regulatory process involves the establishment and enforcement of safety and reclamation requirements. Safety requirements are concerned with both public and workers' safety. Three statutes administered by three different agencies are responsible for public and workers' safety standards and procedures. Three statutes dealing with reclamation/rehabilitation requirements are administered by three different agencies, as well. The concern is first, whether the legislation and procedures present any difficulties or problems to the operators and second, what the reasons

are for these problems. Both regulatory processes will be examined by the following criteria: clarity, flexibility, duplication/consistency, degree of enforcement, fairness of outcome and public involvement.

Public Safety Regulatory Procedures

Public and workers' safety procedures are established and administered by the Workers' Compensation Board, under the Industrial Health and Safety Regulations, the Ministry of Energy, Mines and Petroleum Resources, under the Mining Regulation Act and district municipalities, under municipal soil removal bylaws.

Clarity/Flexibility

Although all nine respondents indicated their operations fell under the requirements of at least two statutes administered by two different agencies, none disclosed any problems or confusions between specific requirements or procedures (Table 14). Only one of the twelve respondents stated difficulties with understanding the requirements. The respondent felt that the Mining Regulation Act was not flexible to accommodate special and localized characteristics of sand and gravel operations since it was devised to deal with large-scale mining operations, such as copper or coal mining. However, the respondent indicated that the pit was also covered by a district municipality soil removal bylaw which

TABLE 14

FINDINGS FROM OPERATORS' SURVEY -FEBRUARY 1983

Public and Workers' Safety Regulations - Number of Applicable Statutes

Statutes	Respondents											
	1	2	3	4	5	6	7	8	9	10	11	12
Mining Regulation Act	x	x	x	x	x	x	x		x	x	x	
Industrial Health and Safety Regulations	x	x	x	x		x		x				x
Municipal Bylaws		x			x		x	x				x
Other												

Reclamation/Rehabilitation Requirements - Number of Applicable Statutes

Statutes	Respondents											
	1	2	3	4	5	6	7	8	9	10	11	12
Mining Regulation Act	x	x	x	x		x	x		x	x	x	
Soil Conservation Act				x		x						
Municipal Bylaws	x	x			x			x				
Other*								x				x

* Other British Columbia Forest Service (1)
Leased property from private owner who establishes requirements

Source: Compiled from returned questionnaires from 1983 Sand and Gravel Operators' Survey.

deals with site specific safety requirements. In this case, the legislation appears quite flexible to adapt to local conditions. Overall, none of the respondents had any difficulties meeting the requirements of two different statutes.

Duplication/Consistency

Nine of the twelve respondents disclosed their operations fell under two statutes (Table 14). The respondents did not indicate any difficulties with this arrangement. A review of the legislation reveals a close similarity between the issues covered and the standards established. Whereas the Mining Regulation Act and Industrial Health and Safety Regulations cover general safety aspects which apply to all operations, regardless of location, individual municipal bylaws deal with specific locational concerns, such as the hours of operation and controlling truck routes through residential areas. In this instance, the two pieces of legislation are seen as complementary to one another.

Reclamation/Rehabilitation Regulatory Arrangements

Reclamation/rehabilitation procedures are established and administered by the Ministry of Energy, Mines and Petroleum Resources under the Mining Regulation Act, the British Columbia Land Commission, under the Soil Conservation Act and municipal districts, under municipal soil removal bylaws.

Clarity

Two of the twelve respondents disclosed difficulties complying with the environmental program requirements under the Mining Regulation Act. Specifically, they felt the requirements for the annual report were too complex and confusing and the Ministry has never really outlined what it specifically requires in the reports. However, this is a problem with one statute and one agency and exists regardless of the number of statutes and agencies involved.

Duplication/Consistency

Five of the twelve respondents disclosed that their operations fell under the reclamation/rehabilitation requirements of at least two different agencies (Table 14). However, the respondents did not encounter any difficulties following two sets of regulations. One respondent indicated a problem with regard to locating available space for stockpiling. The site has to be approved by both the Ministry of Environment and the Department of Fisheries and Oceans. In the past, there have been constant delays since the two agencies have failed to agree on an appropriate site.

Flexibility

As indicated in Chapter V, sand and gravel operations can be exempted from the reclamation/rehabilitation program under the Mining Regulation Act, if the operations are covered

under another applicable Act. The requirements under the Mining Regulation Act include detailed maps of the site and excavation and specific grade, grasscover, stockpiling, slope and buffer zone standards in the proposed program. The program under the Soil Conservation Act is similar. However, the specific requirements are left to the discretion of the Land Commission. Several municipal bylaws appear quite inadequate in their reclamation/rehabilitation requirements. Most simply require a contour map of the area beforehand (Squamish and North Saanich) and prescribe general standards for grades, seeding and topsoil. A comparison of the legislation indicates inconsistency between the requirements. Although a survey has not been undertaken to compare the final reclamation/rehabilitation conditions of abandoned pits, the Ministry of Energy, Mines and Petroleum Resources has indicated major concerns because of inconsistent legislative requirements among the applicable Acts and bylaws (Hora and Basham, 1980).

Degree of Enforcement

Effective enforcement of the regulations governing sand and gravel operations is difficult to establish. The operators in the survey did not disclose any difficulties or problems they encountered in the enforcement procedures for one, let alone several agencies. It then becomes necessary to determine if the enforcement process is affected by finan-

cial or legal constraints (Sproule-Jones, 1980).

Small field staffs and small budgets have been cited as factors affecting the sand and gravel enforcement process (Hora and Basham, 1980). The enforcement of sand and gravel extraction regulations is not a primary concern for the agencies. It is a secondary function and, consequently, the agencies do not react to the situation unless necessary (Hora and Basham, 1980). A survey of the agency schedules for inspection indicates that enforcement is irregular and affected by financial constraints.

For example, the inspection schedule for gravel operations varies for the British Columbia Land Commission, the Department of Indian and Northern Affairs' district offices and most district municipalities and regional districts. The District Municipalities of North Saanich, Squamish, Abbotsford and Surrey employ one or two inspectors each and have no regular inspection schedules due to limited budgets. The inspection schedule for the Land Commission is more consistent along the Central Fraser Valley, but consistency decreases in peripheral areas due to manpower and budget constraints (Interview with Kirk Miller, Provincial Agriculture Land Commission, March 1983). The Department of Fisheries and Oceans does not follow a regular inspection schedule either. Officers, however, are regularly in the field where they

can better discover any infractions or irregularities with particular operations and conduct periodic inspections.

Not only are there no regular inspection schedules for the regulatory agencies, there are no identifiable co-ordinated inspection approaches undertaken by the agencies. The enforcement methods are taken singularly by each agency, usually after an infraction occurs. Consultations and referrals, with other agencies, take place after an infraction occurs. This is usually to determine the best course of action. Therefore, from the viewpoint of the agencies, financial constraints hinder a coordinated approach to the inspection aspect of the regulatory enforcement process.

The legal framework of rights, duties, liabilities and exposures for the agencies can determine or constrain their behaviour towards the enforcement process. The main enforcement technique used by the agencies is the quasi-criminal sanction. This normally involves a fine and/or imprisonment upon conviction, as outlined in Chapter V. Maximum fines for infractions vary among the agencies. As outlined in Chapter V, they range from $300 to $1,000 per day for summary convictions under the several municipal soil removal bylaws to $10,000 under both the Pollution Control Act and the Industrial Health and Safety Regulations. However, most infractions seldom are prosecuted.

The quasi-criminal sanctions are used as a compliance technique of the last resort. In most cases, infractions are drawn to the attention of those responsible by the field offices and public complaints and restoration is requested, within a certain time frame. The first step is to explain the violation of the permit or regulation terms to the operator. If the operator does not comply, the second step is to close the operation, collect evidence to be used in legal proceedings and consult with the head office over possible options open to the agency. As well, other agencies are consulted if the infractions warrant their involvement. If the gathered evidence is marginal the agency would negotiate with the operator for a satisfactory compromise to remedy the situation. Only as a last resort would the agency seize the equipment and prosecute the operator. This is essentially the enforcement policy of all the regulatory agencies.

There have been no prosecutions for the past ten years reported under the Indian Mining Regulations for the Department of Indian and Northern Affairs. The district municipalities of Surrey, Abbotsford, Squamish and North Saanich, as well, reported no prosecutions or convictions under their soil removal bylaws for the past five to ten years.

The Department of Fisheries and Oceans has reported only one prosecution and subsequent conviction in the past

five years. The defendant, Whonnock Industries Ltd., was charged under Section 61(1) of the Fisheries Act with removing gravel from the normal high water perimeter of a watercourse in the Port Hardy area. The defendants were found guilty and fined $3,500.

However, in most cases, it is difficult for the agency to proceed with prosecution against the operator. First, the agency prefers to remedy the situation by negotiation and save the time and cost of court cases. Second, it takes a great deal of time and manpower to gather the evidence and prove the correlation between cause and effect. And third, often there may be underlying factors which, in effect, absolve the operator.

An example of the step-by-step enforcement procedure of the agencies is the Coquitlam River controversy during the 1970s. Three sand and gravel operators were granted permits to excavate creek beds and adjacent areas near the Coquitlam River, north of Port Coquitlam. Their excavations created vast seas of mud flowing into the river, and silt from their gravel washing operations was being allowed to flow into the river instead of settling ponds (Vancouver Sun, 2 November, 1971). Steelhead were virtually destroyed due to the accumulation of silt and mud. In 1970, the district ratepayers' group and the Coquitlam Hunting and Fishing

Club presented a report to the district council outlining these problems. In the fall of 1971, the same groups presented a second report to the Pollution Control Branch recommending charges be laid against the three operators (Vancouver Sun, 14 December, 1971).

From 1970 to 1973, the Department of Fisheries and Oceans monitored the silt concentrations in the river. They discovered that the survival rate of salmon eggs was only 1% below the gravel pit location on the Coquitlam River and the sediment in the river above the gravel pits was 40 parts per million, while below the gravel pits it was 800 parts per million (Vancouver Sun, 27 January, 1973). As a result, the pink salmon run was extinct and only an estimated few hundred spawning chum remained.

During the three-year monitoring period, the Department of Fisheries and Oceans requested the construction of settling ponds by the operators. The operators complied with the request. Under existing regulations, the operators were required to construct settling ponds, but not required to maintain them (Vancouver Sun, 27 June, 1973). Therefore, although the operators had done everything legally required by them, the problem still remained and the Department of Fisheries and Oceans had no other course of action to take except continued negotiation.

In March 1977, the Coquitlam Council approved a proposal to restore the Coquitlam River, to seek financial aid from the provincial government and the gravel operators and not to renew existing gravel permits (Vancouver Sun, 29 March, 1977). However, the Council discovered that 30 of the 100 hectares, including the river bed, had been granted to the companies, in perpetuity, by the province. Not only could none of the agencies prosecute, since the operators were not breaking existing laws, but they also could not revoke existing permits. Although the gravel companies still continue to operate, the Department of Fisheries and Oceans, the British Columbia Fish and Wildlife Branch and conservation groups continue to monitor the river and operations.

This case demonstrates a number of points dealing with the enforcement procedures. First, most agencies would rather negotiate with operators for remedial action than to prosecute. Second, it takes considerable time to gather evidence for prosecution - in this case, three years before conducive results were attained. Therefore, coordinated monitoring and negotiation methods with the operators are taken to resolve the situation. Third, although permit issuing agencies and regulatory enforcement agencies in the past have not coordinated their actions, they have now joined forces to try to remedy the situation. Fourth, legal actions may be restricted by current legislation, but not

by the number of Acts or regulations or the number of enforcement agencies.

Fairness of Outcome

The majority of the responding operators did not express any frustrations with any part of the regulatory process. Three of the twelve respondents indicated that the reclamation requirements under the Mining Regulation Act are impractical and unfair. One respondent specified that the number of trees to be planted at the excavation site was foolish since they would only be dug up again for the construction of roads and houses. Two respondents stipulated that the time required to prepare the annual reports and the technical data for these reports, such as grade/slope cross-sections, were impractical and often required the expertise of a professional. They have had to re-submit their reports a number of times before they have been accepted by the Mineral Resources Branch.

As revealed in the agency files and newspaper articles, most regulatory infractions are resolved before prosecution. Infractions are negotiated and resolved by mutual agreement by the operators and the enforcement agencies. Very few prosecutions for sand and gravel operation violations have occurred. Very few cases, such as the Coquitlam River controversy, have occurred where one of the interested parties

(the operator, public or government agency) is not satisfied with the final outcome.

Public Involvement

Public involvement in the regulatory process is evident at two levels, both informal. First, the public has been involved through council meetings in designing municipal soil removal bylaws. Through citizen groups and the presentation of briefs, issues dealing with public safety, noise and dust control and hours of operation have been incorporated into the final draft, as outlined in the previous section.

Second, the public is involved through the lodging of complaints to the appropriate agencies concerning current operations. Since the operations are very localized, most complaints initially are made to municipalities or regional districts, which pass them to the appropriate provincial or federal agencies.

For example, in 1971, the Municipality of Saanich received complaints from residents concerning the use of property on Santa Clara at Cordova Bay Road for stockpiling gravel by the Department of Highways (Victoria Times, 30 June, 1971). Although the complaints were numerous and an alternative site was offered by the municipality, the stockpiling continued during the construction of the Patricia Bay Highway.

In this instance, the public found an outlet to register their complaints and action was taken to inform the appropriate agencies, even though the final result remained the same.

A second aspect to consider is whether the system itself is open, in terms of public visibility and increasing the level of information available in the news media. A survey of the coastal newspapers since 1971 disclosed that several conflicts have been reported in the press. The Coquitlam River controversy was initially reported in the Vancouver Sun, November 1971, with follow-up articles in December 1971, January 1973, March 1977 and April 1977. As new information on the progress of the monitoring and negotiating stages was revealed, it was reported. This indicates the openness of the system.

Summary

In summation, the evidence presented in this chapter suggests the institutional arrangements for the coastal sand and gravel industry may be deficient in two areas. First, an evaluation of the tenure arrangements indicates that duplication exists in the posting of performance bonds by the operators. For sand and gravel operations on Agricultural Land Reserve within municipal boundaries, two performance bonds for one operation are required. Performance bonds are required by municipal districts and regional districts

to ensure that the specified work in the application, such as maintenance of slopes, and erosion and drainage control, is carried out and that land restoration requirements, such as planting trees, seeding and damages to drainage facilities are satisfied. Performance bonds are required by the Agriculture Land Commission to ensure compliance with specified orders for activities on Agriculture Land Reserve and for land restoration. These orders include maintenance of slopes, location of stockpiles, drainage control and land restored to its former condition. The two reasons for posting bonds with the local government and the Land Commission are identical, although specific maintenance and restoration requirements may vary. This duplicate requirement affects all operators, but is a heavier burden on smaller, independent operators. Otherwise, the responding operators in the survey do not indicate problems with the length of time to issue permits and the clarity of the requirements for each permit.

The permit issuing arrangements are coordinated among the agencies. The issuing agencies send applications to other agencies for review on a formal and regular basis. The Ministry of Lands, Parks and Housing regularly sends applications to the Ministry of Energy, Mines and Petroleum Resources, the British Columbia Fish and Wildlife Branch and Fisheries and Oceans. There is no indication that these arrangements cause undue delays in processing applications.

Second, the examination of the regulatory arrangements reveals two possible problem areas within the process. The legislative requirements for the reclamation/rehabilitation of completed pits are inconsistent. Generally, the requirements for the reclamation program under the Mining Regulation Act and the Soil Conservation Act are more concise and thorough than the requirements in municipal soil removal bylaws. The Ministry of Energy, Mines and Petroleum Resources also has trained inspectors on regular inspection and also requires an annual reclamation report from each operation. The British Columbia Land Commission does not have a regular inspection schedule and does not require updates on reclamation progress.

As well, the overall degree of enforcement by all regulatory agencies is inconsistent. Most surveyed agencies do not have a regular schedule for inspection. Infractions are usually discovered after complaints have been registered. Although agencies coordinate their actions to resolve infractions, there is little coordination among the agencies to regularly inspect the sand and gravel sites. This is primarily due to financial constraints within each agency.

The analysis has located three areas of problems in the political and institutional arrangements. Chapter VII will assess the overall system and determine whether the traditional concept of the resource problem or the alternative

concept of governance problems better fits the political and institutional arrangements of the coastal sand and gravel industry.

Chapter VII

CONCLUDING OBSERVATIONS

Summary

The coastal sand and gravel industry has followed the pattern of urban growth and related development. Historically, the industry developed at Burrard Inlet near Vancouver and Royal Oak on Vancouver Island. As urban development increased and original deposits became depleted, the industry spread along the central Fraser Valley, along the southeast coast of Vancouver Island and, to a lesser extent, at Terrace, on the northern mainland. Initially, the industry had two requirements - proximity to urban markets and available water for washing operations. These two requirements influenced the distribution of the industry on the coast.

At present, the industry is predominantly centered in the same general areas where it originally started. On the lower mainland, excavations have spread east along the central Fraser Valley and north along the Sunshine Coast. On Vancouver Island, the industry is located along the eastern coast, near Sooke, Duncan, Nanaimo, Campbell River and Port McNeill. Along the northern mainland coast, the industry is located between Terrace and Kitimat.

The primary mode of transporting sand and gravel continues to be by truck. But, as traditional deposits near urban

areas have been depleted and deposits along the coast are developed, the use of coastal barges has increased. The coastal deposits are not inaccessible nor do they present a transportation barrier. As in the forest industry, the coastal waters facilitate interaction between resources, use and development.

Up until the late 1960s, the general pattern of sand and gravel management in coastal British Columbia had become largely routine. The political and institutional arrangements focused on meeting demands by developing and using the nearest deposits. Sand and gravel was perceived as a resource, available in vast quantities. It was inexpensive and easy to excavate and as long as it was out of public sight, it was out of public mind. The departments of Highways and Forests managed and supervised their own excavations for their own use. Commercial operations were supervised by the Department of Mines, the Workmen's Compensation Board and permits, for operations on Crown land, were issued by the Department of Lands.

However, in the late 1960s and early 1970s, three changes occurred within the political and institutional arrangements. Although these changes significantly affected the industry, they were not originally created to specifically alter the sand and gravel industry.

First, during the 1960s, the focus on environmental concerns by the public and media led to the establishment of the Ministry of Environment. Concerns over environmental quality, noise, dust and water pollution and hazards to fish were part of the overall movement for environmental protection. The Water Management Branch, Pollution Control Branch and Fish and Wildlife Branch of the Ministry of Environment were given responsibilities to regulate air, water and wildlife quality. Included in this area of concern were sand and gravel operations. Also, the Department of Fisheries and Wildlife took on a more active role in water management. Together, this placed new requirements for more agencies in the political and institutional arrangements for sand and gravel operations.

Second, during this same period, public and government concerns over the development and urbanization of agricultural and island lands were raised. The concern to preserve and protect these lands led to the establishment of the Agricultural Land Reserve in 1973 and Islands Trust in 1974. The Agricultural Land Reserve and Islands Trust were created to protect and preserve these types of land and to control their development. Both affected the sand and gravel industry, as well. Not only were two more agencies added to the growing list of regulators, but new regulations, procedures and requirements were also introduced for operators and managers

to follow.

Third, up until the late 1960s, sand and gravel excavations were relatively hidden from the public in peripheral urban areas. But, as urban and residential development spread outward and traditional sources were depleted, the two land uses merged into conflict. Residents raised objections to the proximity of the excavations and municipal districts established regulations governing sand and gravel operations within their boundaries. Soil removal bylaws were established in Langley, Surrey, Abbotsford, Matsqui, Coquitlam and Maple Ridge on the lower mainland, and Saanich and North Saanich on southern Vancouver Island and the regional district of Alberni-Clayoquot and the Capital Regional District to regulate the use of sand and gravel.

Thus, the present political and institutional arrangements for the sand and gravel industry have emerged over the past fifteen years. Thirteen federal and provincial agencies and several local governments have been identified as making up the political and institutional arrangements. The proliferation of agencies and regulations led to a multiplicity of controls looking after specific needs and requirements. Although the areas and degree of responsibility vary among the entities, theoretically, all play a role in the overall system. For example, the Island Trust reviews and approves

any proposed sand and gravel project on Crown or private land within the Trust territory. At present, there are no active pits within the Trust area and the agency's role is minimal. Since the industry is site specific, agency involvement depends on the number of active or non-active pits within its jurisdiction.

Observations and Conclusions

Two concepts were developed in Chapter II which specified the relationship between the size of government units and the multiplicty of agencies in the political and institutional arrangements. Several issues, including overlap, duplication, coordination, degree of enforcement and public involvement, were raised and discussed, in terms of scope and degree within the system. By focusing on these issues for the entire system, it is possible to assess which concept better fits the political and institutional arrangements for the coastal sand and gravel industry.

Overlap

The study did not indicate any significant areas of jurisdictional overlap among the agencies. The federal and provincial agencies have well defined jurisdictions for issuing sand and gravel removal permits and enforcing regulatory requirements. Jurisdictional overlap exists for sand and gravel pits located within regional/municipal

boundaries and the agricultural land reserves. However, the operator submits only one application to the local government which refers it to the Land Commission. Both entities must approve the application. There was no indication by the operators that this caused unnecessary delays in the process or the final decisions were unfair or biased in any manner.

Duplication

Three areas of legislative duplication within the system were disclosed. First, the Soil Conservation Act and the Agricultural Land Commission Act cover exemptions for sand and gravel pits on agricultural land reserves. However, in practice, the Land Commission only uses the Soil Conservation Act. Second, two performance bonds are required for sand and gravel pits located on agricultural land reserves within district municipal boundaries. The legislative purposes for the bonds are generally similar - to ensure compliance with permit procedures during operation and reclamation/rehabilitation requirements after operation. Although the amount for the bonds varies among the entities, double bonding may be unfair for small, independent operators. Third, duplicate legislation for reclamation/rehabilitation requirements exists under the Mining Regulation Act, the Soil Conservation Act and several local soil removal bylaws. The Mining Regulation Act, administered by the Ministry of Energy,

Mines and Petroleum Resources takes precedence unless the requirements are adequately covered in the other legislation.

Coordination

The study revealed a high degree of coordination among the agencies during the permit application process. The Ministry of Lands, Parks and Housing regularly refers applications for Crown land and foreshore areas to the Ministry of Energy, Mines and Petroleum Resources, the Fish and Wildlife Branch and the Water Management Branch. As well, the district municipalities, regional districts and the Land Commission have a coordinated review and approval process for permit applications on agricultural land reserves. There was no indication that these arrangements result in time delays, outcome bias or specific problems for the operators.

Enforcement

The study examined two areas of the enforcement process - inspecting the operations and dealing with infractions. The examination of the inspection process for the regulatory agencies indicated that the inspection schedules are irregular and sporadic, there is little coordination among the various entities and the regional districts and municipalities have one or two inspectors on staff. This has prompted a concern that the regional districts and district municipalities are restricted to adequately supervise and enforce reclamation/

rehabilitation requirements for operations exempted from the Mining Regulation Act. However, there is no evidence available to support or refute this matter.

After an infraction or violation occurs, there is a high level of coordination among the federal and provincial agencies, including the Department of Fisheries and Oceans, the Fish and Wildlife Branch and the Ministry of Energy, Mines and Petroleum Resources to negotiate with the operator and resolve the situation. It is the policy of these agencies to work with the operators to reach an equitable solution. This policy appears to be fair and successful since there have been very few prosecutions for permit or regulatory violations.

Public Involvement

Observing the system as a whole, the study indicates that it is an open system, in terms of public recognition, accessibility and scrutiny. Conflicts and controversies in the permit application and regulation enforcement processes have been visible in the news media. The public has been able to identify and voice their preferences to the appropriate agencies, especially at the local government levels. The public has been involved in the decision-making process concerning the composition and adoption of district municipal soil removal bylaws, the routing of sand and gravel trucks

through residential areas and proposed sand and gravel excavation sites within municipal boundaries.

Concluding Assessment

At the outset, most political and institutional structures characterized by a multiplicity of agencies, organizations and laws appear complex, confusing and incomprehensible. A step-by-step examination into the operations, processes and relationship of the unit in the structure often reveals a framework which provides a relatively clear delineation of jurisdictions, responsibilities and interdependencies among the units. However, it should not be construed that the system itself is simple, because it is not simple in the sense it can be manipulated in a simple manner (Bish, 1982). Rather, as the user or investigator becomes familiar with the system, the purpose and functions of the units and the structure itself, become more meaningful and easier to understand.

Although three weaknesses or problem areas were disclosed in the political and institutional arrangements for the coastal sand and gravel industry, as a whole, the system is fairly adaptive and works quite well. Where jurisdictional overlap is present in the permit application process, the decisions are made among the agencies exposing the information and agreement to more decision-makers with no unnecessary

delays. Where duplicate regulations or acts exist, as for reclamation/rehabilitation requirements, the system is quite flexible and adaptive in that the operations are exempt from the other, except in the matter of duplicate performance bonds. There is concern that local government soil removal bylaws may not adequately cover reclamation/rehabilitation requirements but there is no conclusive evidence. There is a high degree of coordination among the agencies through referrals and reviews for permit applications and consultations for permit and regulatory infractions. The inspection schedules of the agencies are recognizable and accessible to the public for services and assistance and for indicating preferences for resource use decisions, especially at local levels. Therefore, the assessment indicates that the political and institutional arrangements for the coastal sand and gravel industry best fit the theoretical structure of the alternative concept of governance problems.

Limitations and Implications of the Study

Specific limitations or problems arose during the research which are reflected in the scope and content of the study. However, they were taken into consideration during the actual analysis and assessment of the study itself.

First, data concerning the issuing of permits, permit infractions, violations and prosecutions were scattered

not only among several agencies, but within each agency itself. Although the information exists within an agency, it is often difficult to retrieve. A great deal, such as number of inactive pits, is not known. As well, the data is summarized per year for the province as a whole and not summarized into specific regions. Each agency has its own district boundaries, which makes it difficult to compare data among agencies.

Second, the low rate of response for the operators' survey influences the observations and conclusions. However, when used as a preliminary, fact-finding search to indicate possible weaknesses, the survey complements data in agency files and confirms suspicions held by agency personnel.

Third, when studying an industry within a region as large and diverse as coastal British Columbia it is difficult to become aware of local problems. There is a tendency to generalize and only identify problems common to the area as a whole. Studies, involving smaller regions, such as southern Vancouver Island or the Sunshine Coast may identify other, more local problems that have not been dealt with.

With regard to these limitations, this analysis does provide insight into the political and institutional arrangements of the coastal sand and gravel industry. Although

three weaknesses or deficiencies within the system were identified, as a whole, the system does work fairly well. For the most part, the responding operators did not encounter major problems. In fact, most problems were directed at specific regulations or agencies. By understanding the manner in which the political and institutional arrangements function, insights are provided as to how the arrangements can act as constraints or create opportunities for management decisions. New regulations and new responsibilities are not needed. An important requirement for agencies is how well they can adapt and accommodate to changing needs and priorities. Small changes and improvements within the established system can draw upon the advantage of observed strengths. By treating the assessment of institutional arrangements as a means to an end rather than an end in itself, insights regarding proposed reforms or redistributions can be gained.

In this regard, the three weaknesses identified in the assessment require further investigation before any modifications or reforms in the institutional arrangements are proposed. Specifically, how often are double performance bonds required and what effect does this have on the operator? Is it possible to coordinate inspection schedules among the appropriate agencies, in terms of financial and administrative realities, and will it make a difference in reducing

the number of infractions and violations? And, is there a significant difference between reclamation/rehabilitation requirements between the Mining Regulation Act and local soil removal bylaws as witnessed in past restorations of non-active pits?

Research on political and institutional arrangements is in an early stage of development and is characterized by descriptive, exploratory and process-oriented case studies (Mitchell, 1979). The difficulties faced by the researcher include the lack of agreement over basic operational definitions, the identification of key variables, the explicit recognition of criteria and the overall lack of a theoretical structure. This study has attempted to deal with these issues and develop a conceptual framework to guide the analysis. However, the need remains for the clarification of terms of reference and consensus over the nature of problems. Further research and insights into the institutional arrangements and management or governance process will enable results to be compared, findings to be confirmed and generalizations to be drawn.

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APPENDIX A

MAJOR COASTAL SAND AND GRAVEL OPERATORS, 1938 to 1973

Appendix A

MAJOR COASTAL SAND AND GRAVEL OPERATORS, 1938 to 1973

1938

1. Deeks Sand and Gravel Limited (N. Vancouver)
2. Cascade Sand and Gravel Company (N. Vancouver)
3. British Columbia Sand and Quarry (N. Vancouver)
4. Maryhill Sand and Gravel Quarry (Fraser River Delta)
5. British Columbia Department of Highways (Various Lower Mainland locations)

1943

1. Deeks Sand and Gravel Limited (N. Vancouver)
2. Cascade Rock and Gravel Company (N. Vancouver)
3. Maryhill Sand and Quarry (Coquitlam)
4. Cassidy Gravel Pit (Coquitlam)

1948

1. Deeks-McBride Limited (Seymour Creek)
2. Highland Sand and Gravel Company Limited (Seymour Creek)
3. Maryhill Sand and Gravel Co. Ltd. (Coquitlam)
4. Road Materials Ltd. (Seymour Creek)

1953

1. Abbotsford Gravel Sales Ltd. (Abbotsford)
2. Britannia Mining and Smelting Co. Ltd. (Britannia Beach)
3. Border Sand and Gravel (White Rock)
4. British Columbia Department of Highways (Various)
5. Burquitlam Lumber Yard Ltd. (New Westminster)
6. Butler Bros. (Royal Oak)
7. Cassidy Sand and Gravel Ltd. (Cassidy)
8. Columbia Bithulithic Ltd. (Granville Island)
9. Capilano Crushing Co. Ltd. (West Vancouver)
10. Colebrook Sand and Gravel Co. Ltd. (Cloverdale)
11. Duek's Gravel Pit (Clearbrook)
12. Courtenay Sand and Gravel Co. Ltd. (Courtenay)
13. City of Chilliwack (Chilliwack)
14. Delta, Corporation of (New Westminster)
15. Evans, Coleman and Johnson Bros. Ltd. (Royal Bay)
16. Giley Bros. Limited (New Westminster)
17. E.R. Taylor Construction Co. Ltd. (Burnaby)
18. Fresh Water Sand and Gravel Co. Ltd. (Coquitlam)
19. Highland Sand and Gravel Company Ltd. (Lynnmour)

20. Hillside Sand and Gravel (Hillside)
21. Hassel's Sand and Gravel Pit (Whalley)
22. Lynn Gravel Co. Ltd. (Lynn Creek)
23. Langley, Township of (Langley)
24. McIntyre and Harding Gravel Co. Ltd. (Saanich)
25. Mortar Less Tile (Nanaimo)
26. Marriott, S.H. (Courtenay)
27. McGarrigle Sand and Gravel (Nanaimo-Northfield)
28. Norrish Bros. Builders Supplies (Chilliwack)
29. Pitkethly Brothers Limited (Vancouver)
30. Port Alberni, City of (Port Alberni)
31. Saanich, Corporation of (Saanich)
32. Surrey, Corporation of (Cloverdale)
33. Vancouver and Districts (Coquitlam)

1958

1. Abbotsford Gravel Sales Ltd. (Abbotsford)
2. Barker Construction Co. Ltd. (Ladner)
3. Border Sand and Gravel (White Rock)
4. Britannia Mining and Smelting Co. Ltd. (Britannia Beach)
5. British Columbia Department of Highways (Various)
6. Brookfalls Gravel Ltd. (North Surrey)
7. Burquitlam Sand and Gravel Ltd. (New Westminster)
8. Butler Bros. Supplies Ltd. (Royal Oak)
9. Capilano Crushing Co. Ltd. (West Vancouver)
10. Cassidy Sand and Gravel Ltd. (Cassidy)
11. Colebrook Sand and Gravel Co. Ltd. (Cloverdale)
12. Columbia Bithulithic Ltd. (Granville Island)
13. Construction Aggregates Ltd. (Britannia Beach)
14. Courtenay Sand and Gravel Co. Ltd. (Courtenay)
15. Creekside Gravel Ltd. (North Vancouver)
16. Deeks-McBride Ltd. (Seymour Creek)
17. Dueck Ready Mix Ltd. (North Clearbrook)
18. Evans, Coleman and Johnson Bros. Ltd. (Royal Bay)
19. Gilley Bros. Limited (New Westminster)
20. Foster's Gravel Pit (Aldergrove)
21. Elderkin's Excavating Ltd. (Port Mann)
22. Enemark Construction Ltd. (Indian Arm)
23. Highland Sand and Gravel Company Ltd. (Lynnmour)
24. Hillside Sand and Gravel (Hillside)
25. Hornby's General Machinery (Surrey)
26. Jack Cewe Blacktop Ltd. (Coquitlam)
27. Kitimat Concrete Products Ltd. (Kitimat)
28. Kitsul Bros. Gravel Sales Ltd. (Langley)
29. Langley, Township of (Langley)
30. Linton Construction Co. Ltd. (North Surrey)
31. Livesey, E.S. and Co. Ltd. (Seymour River)
32. MacLynn Gravel Company Ltd. (Lynnmour)
33. McGarrigle Sand and Gravel (Nanaimo)

34. McIntyre and Harding Gravel Co. Ltd. (Saanich)
35. Midland Construction Co. Ltd. (Langford)
36. S.H. Marriott Sand and Gravel (Courtenay)
37. Nanaimo, City of (Nanaimo)
38. North Cowichan, District of (Duncan)
39. Pipeline Sand and Gravel Ltd. (New Westminster)
40. Pitkethly Brothers Limited (Vancouver)
41. Port Alberni, City of (Port Alberni)
42. Richardson, A.V. Ltd. (Duncan)
43. Routledge Gravel Ltd. (North Vancouver)
44. S.U.B. Quarries Ltd. (New Westminster)
45. Salvador, L. and Son Ltd. (New Westminster)
46. Scott Bros. Gravel Co. Ltd. (Port Coquitlam)
47. Seymour River Gravel Ltd. (North Vancouver)
48. S. and S. Gravel Pit (Coquitlam)
49. Sunshine Properties Ltd. (Newton)
50. Surrey, Corporation of (Cloverdale)
51. Taylor, E.R. Construction Co. Ltd. (New Westminster)
52. Troutan Excavating Ltd. (New Westminster)
53. Coquitlam, Corporation of (Coquitlam)
54. Burnaby, Corporation of (Burnaby)

1963

1. Abbotsford Gravel Sales Ltd. (Abbotsford)
2. Armour Salvage Ltd. (Prince Rupert)
3. B & B Trucking Ltd. (Langley)
4. Beardsley, D. (Cloverdale)
5. Blackham's Construction Ltd. (Abbotsford)
6. British Columbia Department of Highways (Various)
7. Burquitlam Sand and Gravel Ltd. (New Westminster)
8. Butler Bros. Supplies Ltd. (Royal Oak)
9. Butler Brothers Supplies (Duncan) Ltd. (Duncan)
10. Capilano Crushing Co. Ltd. (West Vancouver)
11. Cewe, Jack Ltd. (Coquitlam)
12. Chilliwack, City of (Chilliwack)
13. Clark, H.G. Gravel and Contracting (Langley)
14. Columbia Bithulithic Ltd. (Vancouver)
15. Construction Aggregates Ltd. (Britannia Beach)
16. Creekside Gravel Ltd. (Vancouver)
17. Deeks-McBride Ltd. (Coquitlam)
18. Delta Corporation (Delta)
19. Dolan's Ltd. (Alberni)
20. Evans, Coleman and Evans Ltd. (Coquitlam)
21. G. & H. Sand and Gravel Co. Ltd. (Powell River)
22. Gibsons Building Supplies Ltd. (Gibsons)
23. Gregory Sand and Gravel (Fraser River)
24. Highland Creek Sand and Gravel Co. Ltd. (Langley)
25. Holmes, L. (Delta)
26. Hornby's H. General Machinery (Cloverdale)

27. Island Ready Mix Ltd. (Courtenay)
28. Kent, Corporation of (Cemetery Mountain)
29. Keystone Concrete Ltd. (Saanich)
30. Kiewit, Peter and Sons Co. of Canada Ltd. (Vancouver)
31. Kitimat Concrete Products (1961) Ltd. (Kitimat)
32. Kitsul Bros. Gravel Sales Ltd. (Langley)
33. Knight Gravel Ltd. (North Surrey)
34. Langley, Township of (Langley)
35. Lepp Trucking Co. Ltd. (Abbotsford)
36. Linton's Construction Co. Ltd. (North Surrey)
37. Matsqui, District of (Abbotsford)
38. McGarrigle Sand and Gravel (Nanaimo)
39. Mission City, Town of (Mission City)
40. Nanaimo, City of (Nanaimo)
41. North Cowichan, District of (Duncan)
42. Ocean Cement Ltd. (Cassidy and Royal Bay)
43. Pete's Transfer (Powell River)
44. Pitkethly Brothers Limited (Vancouver)
45. Port Alberni, City of (Port Alberni)
46. Rees, Oscar (Langley)
47. Routledge Gravel Ltd. (Furry Creek)
48. Sunnyside Gravel (White Rock)
49. Surrey, District of (Surrey)
50. Surrey Well Drillers (Cloverdale)
51. Taylor, E.R. Construction Co. (North Vancouver)
52. United Contractors Ltd. (New Westminster)
53. Valley Rite-Mix Ltd. (Clearbrook)
54. Weins, J.C. Contracting Co. Ltd. (New Westminster)
55. White Rock Sand and Gravel (New Westminster)
56. Scott Bros. Gravel Co. Ltd. (Port Moody)
57. Corporation of the District of Coquitlam (Coquitlam)
58. G.H. Philips Contracting Co. Ltd. (Coquitlam)
59. S. & S. Sand and Gravel Ltd. (Coquitlam)
60. Central Gravel Co. Ltd. (Coquitlam)
61. Haney Brick and Tile Ltd. (Pitt Meadows)
62. Lasser Trucking Co. (Pitt Meadows)
63. Corporation of the District of Maple Ridge (Maple Ridge)
64. McIntosh Sand and Gravel (Maple Ridge)
65. Henry Van Boeyen (Maple Ridge)
66. Fred Worfolk (Maple Ridge)
67. Valley Ready Mix (Maple Ridge)
68. Kirkpatrick Sand and Gravel Ltd. (Maple Ridge)
69. Ralph E. George (Maple Ridge)
70. Cannon Contracting Ltd. (Mission)
71. Dannielson Contractors Ltd. (Kent)
72. Aldergrove Cement Tile Product (Langley)
73. J. Craig (Langley)
74. Border Sand and Gravel Ltd. (Langley)
75. C.E. Shuler (Surrey)
76. Colebrook Sand and Gravel Company, Limited (Surrey)
77. Richmond Sand and Gravel Ltd. (Surrey)

78. United Sand and Gravel Ltd. (Surrey)
79. Dawson Construction Co. (Surrey)
80. Express Ready-Mix Co. Ltd. (Shannon Falls)
81. PaCo Cement Products Ltd. (Mamquam River)
82. P. Nassichuk (Powell River)

1968

1. Abbotsford Gravel Sales Ltd. (Abbotsford)
2. Butler Bros. Supplies Ltd. (Royal Oak)
3. Construction Aggregates Ltd. (New Westminster)
4. Highland Sand and Gravel Co. Ltd. (Royal Bay)
5. Johnson Aggregates Ltd. (Powell River)
6. Kitsul Bros. Gravel Sales Ltd. (Langley)
7. M. & W. Sand and Gravel (North Delta)
8. Marriott, S.H. (Courtenay)
9. McIntosh Sand and Gravel Co. Ltd. (Maple Ridge)
10. Ocean Cement Ltd. (Royal Bay, Cassidy and Port Coquitlam)
11. Pete's Transfer (Powell River)
12. Scott and Strongen Gravel Ltd. (New Westminster)
13. Valley Rite-Mix Ltd. (Clearbrook)
14. Rupert Cement Products (Prince Rupert)
15. L.G. Scott and Sons Construction (Kitimat)
16. Corporation of the District of Coquitlam (Coquitlam)
17. Jack Cewe Ltd. (Coquitlam)
18. S. & S. Sand and Gravel Limited (Coquitlam)
19. Columbia Bitulithic Limited (Coquitlam)
20. British Columbia Department of Highways (Various)
21. Allard Concrete Construction Co. (Coquitlam)
22. Deeks-LaFarge Limited (Coquitlam)
23. Lasser Trucking Co. (Pitt Meadows)
24. S. Berto (Maple Ridge)
25. Corporation of the District of Maple Ridge (Maple Ridge)
26. Henry Van Boeyen (Maple Ridge)
27. Walske Ready Mix Ltd. (Maple Ridge)
28. Kirkpatrick Sand and Gravel Ltd. (Maple Ridge)
29. Ralph E. George (Maple Ridge)
30. Cannon Contracting Ltd. (Mission)
31. Corporation of the District of Kent (Kent)
32. Dannielson Contractors Ltd. (Kent)
33. George Beamin (Cheam)
34. Blackham's Construction Ltd. (Abbotsford)
35. Braun Excavating Ltd. (Matsqui)
36. Ernie's Trucking (Matsqui)
37. Corporation of the District of Matsqui (Matsqui)
38. Corporation of the Township of Langley (Langley)
39. Aldergrove Cement Tile Products (Langley)
40. J. Craig (Langley)
41. Fort Langley Aggregates (Langley)
42. B. & B. Trucking (Cloverdale)

43. Oscar W. Rees (Langley)
44. Border Sand and Gravel Ltd. (Langley)
45. White Rock Sand and Gravel (Cloverdale)
46. A. & B. Gravel Sales Limited (Surrey)
47. Corporation of the District of Surrey (Surrey)
48. Western Paving Ltd. (Delta)
49. Century Manufacturing Co. Ltd. (Delta)
50. Ed Fiedler (Howe Sound)
51. Gibsons Building Supply (Gibsons)
52. P. & W. Development Co. Ltd. (Gibsons)
53. L. & H. Swanson Ltd. (Sechelt)
54. P. Nassichuk (Powell River)
55. Island Readimix Limited (Port McNeill)
56. G. & A. Trucking Ltd. (Campbell River)
57. Fouty Bros. (Parksville)
58. Dolan's Limited (Alberni)
59. Doman Industries Limited (Duncan)

1973

1. Abbotsford Gravel Sales Ltd. (Matsqui)
2. Border Sand and Gravel Ltd. (Langley)
3. Columbia Bitulithic Ltd. (Coquitlam)
4. Dolan's Limited (Alberni)
5. Butler Bros. Supplies Ltd. (Saanich)
6. Construction Aggregates Ltd. (New Westminster)
7. Kitsul Bros. Gravel Sales Ltd. (Langley)
8. Ocean Cement Ltd. (Royal Bay and Cassidy)
9. Pete's Transfer (Powell River)
10. Rupert Cement Products (Prince Rupert)
11. L.G. Scott and Sons Construction (Kitimat)
12. Jack Cewe Ltd. (Coquitlam)
13. British Columbia Department of Highways (Various)
14. Allard Concrete Construction Co. (Coquitlam)
15. Deeks-LaFarge Limited (Coquitlam)
16. B. & B. Services (Langley)
17. Delta Rock Ltd. (New Westminster)
18. Oscar Rees Gravel Sales Ltd. (Langley)
19. Corporation District of Maple Ridge (Maple Ridge)
20. Kirkpatrick Sand and Gravel Ltd. (Maple Ridge)
21. Ralph E. George (Maple Ridge)
22. Cannon Contracting Ltd. (Mission)
23. Blackham's Construction Ltd. (Abbotsford)
24. Braun Excavating Ltd. (Matsqui)
25. District of Matsqui (Matsqui)
26. Township of Langley (Langley)
27. Fort Langley Aggregates (Langley)
28. White Rock Sand and Gravel (Cloverdale)
29. A. & B. Gravel Sales Limited (Surrey)
30. District of Surrey (Surrey)

31. Western Paving Ltd. (Delta)
32. Gibsons Building Supply (Gibsons)
33. L. & H. Swanson Ltd. (Sechelt)
34. Doman Industries Limited (Duncan)
35. Island Readimix Limited (Port McNeill)
36. Van-Isle Construction Materials Ltd. (Nanaimo)

Source: Statistics Canada, Sand and Gravel Pits, Manufacturing and Primary Industries Division. 1938 to 1973.

APPENDIX B

MAJOR COASTAL SAND AND GRAVEL OPERATORS BY MINING DISTRICTS - 1981/82

Appendix B

MAJOR COASTAL SAND AND GRAVEL OPERATORS BY MINING DISTRICTS - 1981/82

Municipal Operators

1. Alberni Mining District - City of Alberni

2. Nanaimo Mining District - Village of Alert Bay
   - Corporation District of Campbell River
   - City of Nanaimo

3. New Westminster Mining District - Corporation of Langley
   - Corporation District of Maple Ridge
   - District of Matsqui
   - District of Mission
   - Municipality of Surrey

4. Vancouver Mining District - Municipality of Powell River

5. Victoria Mining District - Corporation District of Central Saanich
   - Corporation District of North Cowichan

NOTE: There are no municipal operations in the Skeena Mining District.

Ministry of Transportation and Highways Operations

1.	Alberni Mining District	- 25 pits
2.	Nanaimo Mining District	- 64 pits
3.	New Westminster Mining District	- 6 pits
4.	Skeena Mining District	- 61 pits
5.	Vancouver Mining District	- 25 pits
6.	Victoria Mining District	- 16 pits
	Total Active Pits	197 pits

Commercial Operators

Alberni Mining District:

Alberni	1. Columbia Bithulithic Ltd.
	2. Dolan's Concrete
	3. Rayner and Bracht Ltd.

Gold River	4.	Conuma Excavating and Trucking Ltd.
Ucluelet	5.	Haulmor Sand and Gravel Ltd.
	6.	J. Shephard Trucking

Nanaimo Mining District:

Alert Bay	1.	Mid-Island Excavating Ltd.
	2.	Nimpkish Transfer
Bowser	3.	Deep Bay Sand and Gravel
	4.	Spruston Aggregates Ltd.
Buckley Bay	5.	Keenan Gravel and Trucking
Campbell River	6.	Island Ready Mix Ltd.
	7.	Luoma Bruce Trucking
	8.	Tayco Paving Co. Ltd.
	9.	Upland Excavating Ltd.
Comox	10.	J.D. Longland Gravel Supplies
Courtenay	11.	Bay Concrete Ltd.
	12.	J.C. Excavating
	13.	Harold Leighton Contracting Ltd.
	14.	Pilon Backhoe and Gravel Service
Cumberland	15.	E.J. Backhoe and Excavating Ltd.
	16.	Comox Valley Ready-Mix Ltd.
Gabriola Is.	17.	Rowan Excavating Ltd.
Nanaimo	18.	A-1 Contracting Ltd.
	19.	Reg Dorman's Trucking Ltd.
	20.	Greenway Sand and Gravel Ltd.
	21.	Long Lake Trucking Co. Ltd.
	22.	Jack Milner Trucking
	23.	Nanaimo Sand and Gravel Ltd.
	24.	Squire A & B Trucking Ltd.
	25.	Tub City Excavating
	26.	Van-Isle Construction Materials Ltd.
	27.	V.R. Paving Co. Ltd.
Parksville	28.	Can-Go Services Ltd.
	29.	Fitzpatrick Contractors Ltd.
	30.	Island Pre-Case Concrete Ltd.
	31.	Kincade Development Ltd.
	32.	Parksville Sand and Gravel (1975) Ltd.
	33.	Tezzeron Enterprises Ltd.
	34.	Tomahawk Construction Inc.
	35.	Town and Country Construction
Port Hardy	36.	T.G. Carnell Trucking
	37.	Don Gord Trucking Ltd.
	38.	OK Paving Co. Ltd.
Port McNeill	39.	Port McNeill Enterprises Ltd.
Qualicum Beach	40.	A Good Contracting Ltd.
	41.	Arrowsmith Sand and Gravel Ltd.
Sayward	42.	Dongor Holdings Ltd.
Wellington	43.	Fred Barr Bulldozing and Trucking

New Westminster Mining District:

Abbotsford	1.	Abbotsford Gravel Sales
	2.	Abby Sand and Gravel
	3.	Aldor Trucking Co.
	4.	Blackhams Construction Ltd.
	5.	Central Aggregates Ltd.
	6.	Discount Concrete Ltd.
	7.	Elias Sand and Gravel Ltd.
	8.	Fraser Sand and Gravel and Excavation Ltd.
	9.	Mike McFarlane Excavating Ltd.
	10.	Penners Trucking
	11.	R.N. Phillips Trucking
	12.	Star Trucking Ltd.
	13.	Valley Rite-Mix Ltd.
	14.	Woodbrook Aggregates Ltd.
Alderwood	15.	B & B Trucking
	16.	Bill's Trucking
	17.	Breaks Gravel Sales
	18.	Goodbrand Industries Ltd.
	19.	Triple E Trucking
Chilliwack	20.	Chilliwack Gravel Sales Ltd.
Clearbrook	21.	Valley Gravel Sales Ltd.
Cloverdale	22.	Fraser Valley Aggregates Ltd.
Coquitlam	23.	Jack Cewe Ltd.
	24.	Columbia Bithulithic Ltd.
	25.	Kanaka Gravel Ltd.
	26.	Lafarge Concrete Ltd.
	27.	Tupps Trucking Ltd.
Delta	28.	Mackie Bros. Sand and Gravel Ltd.
	29.	Western Paving Ltd.
Deroche	30.	Nicomen Gravel Sales
Langley	31.	Border Sand and Gravel Ltd.
	32.	Fort Langley Aggregates
	33.	Dan Kitsul Sand Development Ltd.
	34.	P & M Gravel Supplies Inc.
	35.	G.H. Singh and Sons
Maple Ridge	36.	Camaro Gravel Supplies
	37.	Cargo Enterprises Ltd.
	38.	Carr Sand and Gravel
	39.	H & R Redi-Mix Ltd.
	40.	Justesen Excavating
	41.	Kirkpatrick Sand and Gravel
Mission	42.	Cannon Contracting Ltd.
	43.	Roger M. Castle
	44.	Davies Sand and Gravel Ltd.
	45.	Mission Paving Services Ltd.
	46.	Western Topsoil and Gravel
New Westminster	47.	Thwaites Bros. Trucking Ltd.
Pitt Meadows	48.	Bell Bryan Trucking Inc.
Port Coquitlam	49.	Allard Contractors Ltd.

	50.	Poco Building Supplies Ltd.
	51.	Port Coquitlam Building Supplies Ltd.
	52.	Port Moody Sand and Gravel Ltd.
Surrey	53.	Bonex Excavating Ltd.
	54.	Bray Enterprises Ltd.
	55.	Canex Excavating Ltd.
	56.	Felix Bulldozing
	57.	Halvorson Trucking Ltd.
	58.	Hardychuk Trucking
	59.	Mainland Sand and Gravel Ltd.
	60.	Gary Pocha Landscaping Kartage Ltd.
	61.	Sonny's Excavating
	62.	Top Notch Construction Ltd.
	63.	Tutt Bros. Trucking
	64.	Walley S & G Sales
Tsawwassen	65.	Delta Aggregates Ltd.

Skeena Mining District:

Kitimat	1.	Aarin Trucking Ltd.
	2.	Columbia Bithulithic Ltd.
	3.	Glacier Concrete Ltd.
	4.	Hammerquist and Son
	5.	K. Landscaping and Contracting Ltd.
	6.	Jean Lionel Trucking
	7.	Norms Contracting Ltd.
	8.	Northwest Blacktop
	9.	Russell and Sons Trucking
	10.	L.G. Scott and Sons Construction Ltd.
Prince Rupert	11.	Boyle's Backhoe Ltd.
	12.	Eric's Trucking
	13.	Ocean Construction Supplies Northern Ltd.
	14.	Riv Tow Straits Ltd.
	15.	Rupert Cement Products
	16.	Wally's Trucking
Terrace	17.	16-25 Transport Ltd.
	18.	F.J.H. Construction Ltd.
	19.	Far-Ko Contracting Co. Ltd.
	20.	Fleming & Dixon Trucking Ltd.
	21.	Vic Froese Trucking Ltd.
	22.	Gerry's Trucking
	23.	R. King and Sons Trucking
	24.	Mur-Ford Contractors Ltd.
	25.	Schmitty's Excavating

Vancouver Mining District:

Brackendale	1.	Cardinal Concrete
	2.	Coast Aggregates Ltd.

Gibsons	3.	Fielder Bros. Contracting Ltd.
	4.	Gibsons Ready-Mix
	5.	J.B. Excavating
	6.	Jande Excavating
	7.	Pacific Coast Bulldozing Ltd.
	8.	Shoal Development Ltd.
Powell River	9.	Best Bulldozing Ltd.
	10.	Coast Paving Ltd.
	11.	Hawkins Sand and Gravel
	12.	Marta Trucking
	13.	P & R Tru-Mix Ltd.
	14.	Pete's Transfer
	15.	Southern Sand and Gravel
	16.	Southview Sand and Gravel
	17.	T & R Contracting Ltd.
	18.	Rod Warman Contracting
Sechlet	19.	Pacific Rim Aggregates
	20.	Ron's Contracting
	21.	L. & H. Swanson Ltd.
Whistler	22.	Alpha Lakes Aggregates Ltd.
	23.	Sabre Companies Ltd.
	24.	Sno Blo Ventures Ltd.

Victoria Mining District:

Chemainus	1.	Beggs Bros. Sand and Gravel Ltd.
Cobble Hill	2.	Mill Bay Sand and Gravel Ltd.
Cordova Bay	3.	Trio Ready-Mix Ltd.
Duncan	4.	Armour and Saunders Ltd.
	5.	Cowichan Aggregates Ltd.
	6.	Duncan Excavating Ltd.
	7.	Duncan Paving Ltd.
Goldstream	8.	Goldstream Meadows Ltd.
Ladysmith	9.	Hub City Sand and Gravel Ltd.
	10.	Mid-Island Paving Ltd.
	11.	Sprouston Aggregates Ltd.
	12.	Timberland Sand and Gravel Ltd.
Metchosin	13.	Construction Aggregates
N. Pender Is.	14.	Gulf Excavating Ltd.
Saanich	15.	Circle 6 Trucking Ltd.
	16.	OK Trucking Co. Ltd.
Sooke	17.	Butler Bros. Supplies Ltd.
Victoria	18.	Beacon Ready-Mix Ltd.
	19.	Columbia Ready Mix
	20.	Hatchpoint Aggregate Ltd.
	21.	Mattison & Patterson Ltd.
	22.	Nixon Bros. Trucking (1978) Ltd.

Source: Government of Canada, Statistics Canada. Sand and Gravel Pits, Manufacturing and Primary Industries Division, 1981.
Province of British Columbia, Ministry of Transportation and Highways. Sand and Gravel Pits, Maintenance Systems, 1982.

APPENDIX C

DISTRICT MUNICIPALITY QUESTIONNAIRE
JANUARY, 1983

UNIVERSITY OF VICTORIA

P.O. BOX 1700, VICTORIA, BRITISH COLUMBIA, CANADA V8W 2Y2
TELEPHONE (604) 721-7211, TELEX 049-7222

Department of Geography

February 14, 1983.

Coastal Sand and Gravel Study

Dear Sir/Madam:

As part of my thesis research regarding the coastal sand and gravel industry, I require information dealing with the impact of the regulatory process on the commercial operators. The attached questionairre is intended to compile and compare the information obtained from the relevant municipal districts located in the coastal region. The questions pertain to past trends and existing practices evident in the regulatory process. Other questions are designed to generate general perceptions and attitudes concerning the role the municipal districts play in the industry. I hope you will be willing to respond to these questions, on behalf of your municipal district. Please feel free to add any comments.

The information will be used to evaluate the present regulatory process, along with responses obtained from commercial operators. Thank you for your co-operation and assistance.

Sincerely yours,

Ann Manni

COASTAL SAND AND GRAVEL STUDY

The questionnaire is divided into five sections - tenure, permit renewal, enforcement, public safety and reclamation. Please complete the sections which are covered by the municipal soil removal by-law.

Municipality _____
Number of Commercial Sand and Gravel Pits (1982) _____
Number of Municipal Pits _____

Tenure

1. Please indicate the number of applications and the number accepted for sand and gravel permits in your municipality:

	Applications	Accepted
1982	_____	_____
1981	_____	_____
1980	_____	_____
1979	_____	_____
1978	_____	_____
1977	_____	_____
1976	_____	_____
1975	_____	_____
1974	_____	_____
1973	_____	_____

2. What are the main reasons for not approving the permit?

_____
_____
_____
_____
_____

3. Are guidelines available for the applicants to assist completing and filing their applications? Yes_____ No_____. If yes, what do they cover?

_____
_____
_____
_____

4. How long, on average, does the permit application approval process take?

_____
_____

5. Are permit applications reviewed by any of the provincial agencies before approval? Yes_____ No_____. If yes, specify the agency and the circumstances.

_____
_____
_____
_____
_____

6. If the permit is denied, what recourse (such as appeals or refiling) do the applicants have?

_____
_____
_____
_____
_____
_____

Permit Renewals

7. What steps are involved in the permit renewal process by the applicant?

8. How long, on average, does the permit renewal process take?

9. Please indicate the number of permit renewal applications and the number approved:

	Renewal Applications	Approved
1982		
1981		
1980		
1979		
1978		
1977		
1976		
1975		
1974		
1973		

10. What are the main reasons for the denial of a renewal permit?

Enforcement

11. Is there a regular schedule for inspecting sand and gravel sites?
Yes_____ No_____

12. How often are the sites inspected?

13. How many inspectors are employed by the municipality?

14. Are the operators informed prior to an inspection? Yes_____ No_____.
If yes, how soon beforehand?

Public Safety Standards

15. Are the municipal regulations pertaining to public safety requirements available to the operators? Yes_____ No_____.
If yes, please specify in what format.

16. If a violation occurs, what is the general procedure taken by the inspector/ municipality?

17. Have permits been suspended for violations? Yes_____ No_____.
If yes, specify the number, the year and the reasons for the suspension.

18. Has a violation ever led to prosecution? Yes_____ No_____.
If yes, specify the year, reasons for prosecution and the outcome.

19. What legal/institutional difficulties do you encounter enforcing public safety regulations?

20. How can these be minimized?

Reclamation/Rehabilitation

21. Are the reclamation requirements specified to the operators before operations begin?
Yes_____ No_____.

22. If a violation occurs, what is the general procedure taken by the inspector/ municipality?

23. Have permits been suspended for violations? Yes_____ No_____.
If yes, specify the number, the year and the reasons for the suspension.

24. Has a violation ever led to prosecution? Yes_____ No_____.
If yes, specify the year, reasons for prosecution and the outcome.

25. What legal/institutional difficulties do you encounter enforcing reclamation/ rehabilitation regulations?

26. How can these be minimized?

APPENDIX D

COMMERCIAL SAND AND GRAVEL OPERATORS' QUESTIONNAIRE - FEBRUARY, 1983

UNIVERSITY OF VICTORIA

P.O. BOX 1700, VICTORIA, BRITISH COLUMBIA, CANADA V8W 2Y2
TELEPHONE (604) 721-7211, TELEX 049-7222

Department of Geography

COASTAL SAND AND GRAVEL STUDY

OPERATORS QUESTIONNAIRE - 1983

Dear Sir:

I am currently studying the coastal sand and gravel industry in British Columbia. The attached uestionnaire is intended to gather information concerning the effect present regulations have on sand and gravel operators. As a sand and gravel operator, I hope you will be willing to respond to the uestions. Some of the uestions pertain to your own experiences in dealing with the various government agencies. Other questions are designed to allow you to express your attitudes towards these agencies, tne regulations which they enforce and the industry in general.

Please complete all the uestions and feel free to add any comments you wish on the back. When you have completed the uestionnaire, please return it in the attached envelope.

The information that you provide will be used as part of my research. All answers will be kept strictly confidential and at no time will answers be identified with individual operators. Thank you for your assistance and co-operation.

Sincerely yours,

E. Ann Manni

COASTAL SAND AND GRAVEL STUDY

The questionnaire is divided into three sections. Please indicate your answers in the space provided. Additional comments may be made on the back. All answers will be kept strictly confidential.

General Information

1. Please indicate the following features of your operations:

   Total Number of Sand and Gravel Pits _____

   Locations of Pits: Northern Mainland _____
   Central Mainland _____
   Lower Mainland _____
   Vancouver Island _____

   Ownership of Land: Leased Agricultural Reserve Land _____
   Leased Indian Reserve Land _____
   Leased Municipality Land _____
   Leased Crown Land _____
   Private Land _____

   Size of Individual Pits: Up to One Hectare _____
   One to Three Hectares _____
   Over Three Hectares _____

   Total Annual Sand and Gravel Production: Up to 50,000 cubic metres _____
   50,000 to 100,000 cubic metres _____
   Over 100,000 cubic metres _____

   General Market Area: Northern Mainland _____
   Central Mainland _____
   Lower Mainland _____
   Vancouver Island _____

Permit Applications

1. Please indicate the agencies to which you normally apply to for a sand and gravel removal permit.

   _____

2. Specify any problems/delays you have encountered with these agencies in receiving a sand and gravel removal permit.

   _____

   _____

   _____

3. What do you feel are the reasons for these problems/delays?

   _____

   _____

   _____

   _____

Regulations

1. Please indicate the public and general safety regulations which your operations normally follow:

   Industrial Health and Safety Regulations _____
   Mining Regulations Act _____
   Municipal By-law _____
   Other (specify) _____

2. Specify any problems/conflicts you have encountered following or meeting these regulations.

   _____

   _____

   _____

3. What do you feel are the reasons for these problems/conflicts?

   _____

   _____

   _____

4. Please indicate the reclamation/rehabilitation regulations which you normally follow for your operations:

   Mining Regulation Act _____
   Soil Conservation Act _____
   Municipal By-law _____
   Other (specify) _____

5. Specify any problems/conflicts you have encountered following or meeting these regulations.

   _____

   _____

   _____

6. What do you feel are the reasons for these problems/conflicts?

   _____

   _____

   _____

7. Have the present sand and gravel procedures and regulations in any way limited your operations and restricted your production and marketing of gravel?

_____

_____

_____

8. Why has this occurred?

_____

_____

_____

_____

THANK YOU FOR YOUR ASSISTANCE AND COOPERATION

VITA

Surname: MANNI Given Names: E. ANN

Place of Birth: THUNDER BAY, ONT. Date of Birth: October 7, 1956

Educational Institutions Attended, with Dates of Entering and Leaving:

UNIVERSITY OF WATERLOO, WATERLOO	1975 to 1979
UNIVERSITY OF VICTORIA, VICTORIA	1981 to 1984
	____ to ____
	____ to ____

Degrees, Diplomas, Etc., Awarded, with Dates and Names of Institutions:

B.E.S. (Honors)	1979	University of Waterloo, Waterloo

Honors and Awards:

University of Victoria Fellowship, 1981/82, 1982/83

Publications:

"Man's Impact on the Evolution of Atlantic City" DIRECTIONS 11(2) Fall 1979.

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Title of Thesis/Dissertation

ASSESSING THE POLITICAL AND INSTITUTIONAL ARRANGEMENTS FOR THE BRITISH COLUMBIA COASTAL SAND AND GRAVEL INDUSTRY

Author [redacted]
Signature

E. ANN MANNI
Name

April 9/84.
Date