ENVIRONMENTAL REGULATION: APPLICANT BEHAVIOR AS A FACTOR IN OBTAINING PERMITS

by

Barney M. Opton

July 1984

COLORADO WATER RESOURCES
RESEARCH INSTITUTE

Colorado State University
Fort Collins, Colorado

Information Series No. 51

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by

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Submitted to

The Water Resources Planning Fellowship Steering Committee
Colorado State University

in fulfillment of requirements for
AE 695V Special Study

July 1984

Colorado Water Resources Research Institute
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Fort Collins, Colorado 80523

Norman A. Evans, Director

ENVIRONMENTAL REGULATION: APPLICANT BEHAVIOR AS A FACTOR IN OBTAINING PERMITS

Doctoral Dissertation

by

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Submitted to:

The Graduate School
Colorado State University

in partial fulfillment of requirements for
the Degree of Doctor of Philosophy

July 1984

Reprinted by

Colorado Water Resources Research Institute
Colorado State University
Fort Collins, Colorado 80523

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ABSTRACT

ENVIRONMENTAL REGULATION: APPLICANT BEHAVIOR AS A FACTOR IN OBTAINING PERMITS

Regulation by the Federal Government has long been a part of natural resources development and utilization in the United States. Since the passage of the National Environmental Policy Act in 1969, environmental regulation has evolved as a major governmental tool in preserving environmental quality. Environmental regulation can result in substantial costs to those being regulated, their customers, and to the general public. These costs result from both lost investment if permits are denied and costs incurred due to the regulatory process.

Because of a lack of understanding by applicants and because of a widespread mistrust of the process, applicants who have failed to obtain authorization sometimes lay the blame for their loss on the regulatory agencies, implying that they (the applicants) have been powerless to influence the process. This dissertation examines a somewhat different explanation. The primary hypothesis of the dissertation is that the applicant can have a high degree of control over the regulatory process and the final outcome, which is the issuance or the denial of the authorization.

The "control" over the process is derived from early (pre-application) coordination with the authorizing agency and with the commenting agencies that represent specific environmental and public interests. It involves the use of technical and administrative expertise by the applicant as well as knowledge of the regulatory process. The applicant uses the same aggressive, yet compromising, management procedures that are appropriate in other elements of managing a business.

A sample of project applications submitted by six hundred and fifty businesses, individuals, agencies, and others to the U.S. Army Corps of Engineers and for which final action had been taken, provided information on how applicants had dealt with the regulatory process. Based on this and other information describing each project, its environmental impact, and other characteristics, a series of models and other correlations were developed to describe the effect of alternate applicant process management techniques in terms of their success or failure in the regulatory process.

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CHAPTER I

STUDY OBJECTIVES

Regulation by the Federal Government has long been a part of natural resources development and utilization in the United States. In the nineteenth century, the Congress regulated the construction of dams on, and bridges across, navigable rivers. This form of early regulation facilitated water traffic on these rivers and prevented the construction of anything that would interfere with it unless the Federal Government permitted it. Other regulation in the national interest followed (page 18ff). The alternative is seen as uncontrolled development which poses the threat of misuse or waste of the nation's resource base.

Statement of the Problem

Environmental regulation in more recent times is concerned more with preservation of the natural environment itself. Such regulation can result in substantial costs to those being regulated (the 'applicant') their customers and to the general public. These costs are a consequence of the time and money required to deal with the regulatory process; lost investment, such as investment in land which cannot be used if a permit is denied; and additional

investments made necessary to satisfy environmental requirements. This dissertation presents the results of research which examines the options available to a permit applicant that might influence the final action and reduce the cost of the process. It considers the possibility and usefulness to the applicant of efforts to plan and to manage the applicant's part of the process when preparing and submitting a proposal for review and final action.

The Primary Hypothesis

Not only does environmental regulation cost the business community and private citizens through time lost and cost of dealing with the regulatory process, but even more substantial are the losses which result when a major investment is made geared to construction at a specific site in a certain time frame and authorization for use of that site is denied by the regulating agency. Research indicates that losses due to termination or relocation of a project can easily exceed ten to twenty million dollars (Dow, 1984). For persons or businesses with little capital for smaller projects, the relative losses can be extremely high. The losses are most typically due to costs incurred in dealing with the regulatory process and funds lost because the only permitable uses remaining for the site will not begin to compensate the purchaser for what was paid to acquire the land.

Such losses can be largely avoided through proper planning or management by the applicant. Of late,

considerable attention has been given to the role of the agencies in minimizing the possibility of this type of occurrence (Hall, 1983). An excellent example of agency action is the Colorado Joint Review Process (CJRP). CJRP is a voluntary intergovernmental process that coordinates the review of major mineral and energy projects by all levels of government. CJRP addresses three on-going natural resource development problems: (1) overlapping regulatory agency jurisdictions which result in duplication of effort; (2) less than adequate public involvement processes which are often adversary in nature and tend to encourage disagreement; (3) distrust of the regulatory agencies by applicants which often results in the applicants not seeking agency input at an early stage of development (Biddle, 1982, p. V-D. 1). CJRP was conceived by the Colorado Department of Natural Resources. The model used to create the CJRP coordination network was an AMAX Corporation molybdenum mining project proposed near Crested Butte, Colorado. AMAX's willingness to formulate an early-on coordination process and to work with the regulatory agencies was a major factor in allowing CJRP to function.

AMAX may be the exception, not the rule. Many people dealing with regulatory processes have a basic misunderstanding of how the environmental and related regulatory processes operate. This "basic misunderstanding" often results in situations where the compliance with environmental laws and accompanying regulations is confusing to applicants

and is not well coordinated. Two myths of environmental regulation help foster poor applicant management of regulatory processes:

> (1) that compliance will necessarily create increased costs and lengthy delays in a project's completion, and (2) that it is better not to disclose and candidly assess any negative environmental aspects of the project unless and until forced to do so (Scroggin, 1983, p. 395A).

Because of a lack of understanding by applicants and because of a widespread mistrust of the process, applicants who have failed to obtain authorization sometimes lay the blame for their loss on the regulatory agencies, implying that they (the applicants) have been powerless to influence the process. This dissertation examines a somewhat different explanation.

The primary hypothesis of this dissertation is that those being regulated (the applicants) have a high degree of control over the regulatory process and that, therefore, the substantial cost of environmental regulation is at least in part due to less than effective management of the process on their part.

Before coming to the authorizing agency to apply for a permit for a given activity, it is reasonable to expect that most applicants will have some knowledge and understanding of the regulations which the agency must enforce. If the applicants also understand how these regulations are being interpreted, it can be expected that at least some applicants will examine their projects and their project

sites in advance of application submission to determine whether they are likely to be approved or disapproved. This initial examination can include varying degrees of coordination with numerous agencies which are part of the permit review process. If there is likelihood of disapproval, the applicant may be expected to re-examine the project to determine whether it is feasible, in terms of his/her interests, and make changes which would improve the chances of obtaining approval of the project by the authorizing agency, or to abandon the project and/or project site before additional funds are expended. It is also conceivable that an applicant who finds it too costly to modify the project will approach the authorizing agency with the best argument he can make for an interpretation of the regulations that would find the project acceptable without changes in it. One might refer to these activities as "pre-submission management."

Objectives

The objective of the research was to describe management by the applicant, hereafter referred to as "applicant process management", by quantification of the characteristics. The primary measure of the effectiveness of applicant process management was the end result of the regulatory process, the "final action" or decision to grant or withhold project authorization. Thus, the final action results in either a "success" or a "failure", depending on whether authorization was granted or withheld.

A series of decision models has been developed to identify applicant process management paths to success or failure. These models are presented in Chapter VI. A number of other correlations to success or failure are also presented in Chapter VI.

The research has focused on quantifying applicant process management. The logic involved is that if applicant process management can be quantified, and if the quantification shows that certain management paths or characteristics correlate with success or failure, then applicant control of the environmental regulatory process has been demonstrated. The null hypothesis is that there is no applicant control over the regulatory process. Quantified evidence of effective applicant management will allow rejection of the null hypothesis.

A Definition of Applicant Process Management

The governmental decision to issue or deny a specific permit is based on the merits of the project and the public's net economic, social, and environmental gain and/or loss resulting from the project. An applicant cannot influence this decision except by varying the design of the project and its beneficial and adverse impacts. These elements of the project and the perceived impacts are then the basis for the government to make its decision to issue or deny a given authorization.

An applicant has an opportunity to play a role in virtually all aspects of a given regulatory process. During

formal processing of an authorization request, the applicant can aggressively interact with the authorizing agency, with the commenting agencies (which have expertise in specific areas and/or have special interests to 'protect'), and any other individuals or organizations who have shown specific interest in the project. In environmental regulation this interaction is often centered around the development of mitigation measures, the consideration of project alternatives, and design changes to minimize impacts. Prior to applying formally for authorization, an applicant can initiate and manage his own "planning" process. This planning process is almost totally in the control of the applicant.

During the planning process, applicant process management can focus on site selection prior to making a significant commitment of monetary resources related to a specific site. The appropriateness of the site in terms of the sensitivity of environmental and socio-economic resources can be determined early-on and the site can be rejected if insurmountable problems are encountered.

Following selection of a suitable site, or suitable alternate sites, similar evaluations can be performed concerning project acceptability and design. During this entire process the applicant can control the timing of the coordination, agency and public meetings, and essentially all aspects of the planning process. With active rather than passive management by the applicant, there is little reason that a specific project should ever formally enter

into a regulatory process with a high degree of uncertainty concerning the final outcome. The flow charts shown in Figure 1 compare passive and active (aggressive) management by the applicant.

The primary elements of applicant process management can be considered to fall into four categories:

(1) Agency coordination

(2) The use of technical and planning expertise

(3) Timing

(4) Amount of time spent

These four elements are related to each other and include many other types of management considerations. This study has focused on measurement of these four elements of applicant process management.

Methodology Overview

The methodology followed in this study is discussed in detail in Chapters IV and V. The following summarizes the key elements.

Because the defined objective of the research is to measure the effectiveness of applicant process management in environmental regulation, a regulatory process was selected for study which is likely to be representative of the majority of types of Federal environmental regulation involving physical construction activity. The U. S. Army Corps of Engineers' regulatory program has the following characteristics:

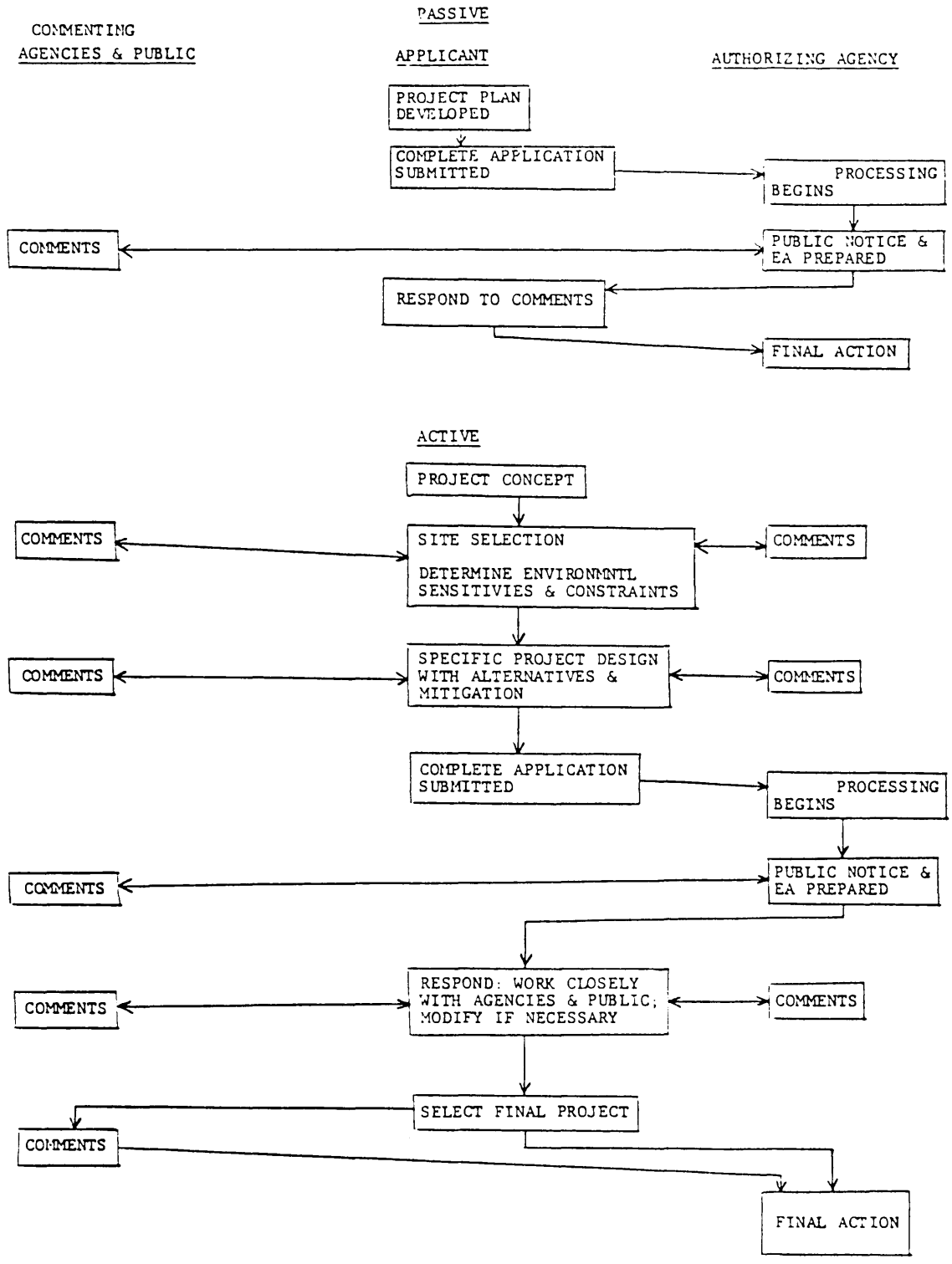


FIGURE 1. COMPARISON OF PASSIVE AND ACTIVE APPLICANT MANAGEMENT

(1) The final action is based on the overall public interest. Therefore, by definition, the Corps must consider all positions taken on the permit application at local levels of government, by states, other Federal agencies, individuals, conservation groups, and other special interest groups.

(2) Jurisdiction is determined by location in, and proximity to, water and areas such as wetlands which are a functional part of the aquatic ecosystem (Federal Register, 1982). Because the jurisdiction is defined by location, and not category of project, all types of construction and development projects require Corps authorization. This includes activities such as farming, residential, industrial, and commercial uses of land.

(3) The Corps program must comply fully with NEPA and with the Regulations implementing the Act (U.S. Department of the Army, 1980). This, and the emphasis on protection of the Nation's waterways and wetlands, clearly puts the Corps regulatory program in the category of environmental regulation and, in NEPA, provides a common denominator with all other Federal regulatory programs.

For these reasons the Corps of Engineers' regulatory program was selected as the population to be studied. Table 2 (page 56) identifies the range of projects with which the Corps deals.

The primary authorities for the Corps of Engineers' regulatory program are Section 10 of the River and Harbor Act of 1899 and Section 404 of the Clean Water Act (Federal Register, 1982). Primarily under these authorities, the Corps issues General and Nationwide permits and individual permits (see Chapter IV). A high percentage of all the permits, over 95 percent, are relatively routine in nature and generally involve small acreages; low intensity development; do not have significant impact on the environment; and because of these characteristics normally do not result in the applicant losing substantial sums of money because of what occurs during the regulatory processes. The applicant management requirements for these projects are minimal, although there can be exceptions if there are legal problems or if one specific resource such as an endangered species will be directly impacted.

The focus of the subject research has been the category of projects which are often referred to as being "controversial". These projects usually have drawn objections from agencies and/or the general public; often involve important resources such as wetlands; and are the category of project which can benefit the most from effective applicant management. There are no data available to determine

specifically the absolute number of such projects exposed to environmental regulation, or even the absolute number processed by the Corps of Engineers. The two most recent reports available, one concerning the Corps Baltimore District, which has data through 1977 (U.S.A.C.E., 1982), and one concerning the San Francisco District, with data through 1980 (U.S.A.C.E., 1983), indicate that the total percent of controversial cases may have been somewhere between 11 to 17 percent of all applications by 1980. These reports were both prepared by the Corps of Engineers (Corps) in an effort to improve their "Permit Application Data Base".

The Corps reports, however, indicate that the absolute number of controversial cases (projects) was dropping substantially from year to year. Based on these reports and information collected for this study, a reasonable estimate from 1980 through 1983 might be that only five percent or less of the projects would be classified as controversial under the classification system used in the referenced reports.

The classification of controversy used by the Corps was similar for the two referenced reports. There were two criteria:

(1) Processing by the Corps took 365 or more days.

(2) Either a Federal environmental review agency (Fish and Wildlife Service, Environmental Protection Agency, or National Marine Fisheries Service) opposed issuance, or the application

> received one or more letters of opposition from citizens or private groups (the San Francisco District report limited this second criteria to receipt of 'significant comments' from the Fish and Wildlife Service).

The second criterion is a good indicator of controversy. The first criterion may not be as reliable, but is the primary measure (reduction of time in processing) used by the Corps in improving and evaluating the internal review process. Therefore, for its purposes it was necessary to include both. In this study, "time" has not been used as a criterion for identifying the sample, and the cases chosen for the study have been referred to as "complex projects", rather than "controversial projects".

Time was not used as part of the complexity criteria because in some cases increased time may merely be an indication of effective applicant management. A project with significant environmental problems may still be salvaged by effective management, but this usually takes time. Also, time in processing can be due to inaction by other agencies or by inaction by the applicant.

The complexity criteria used for this study is discussed in Chapter IV. The criterion is similar to the second criterion used in the Corps reports mentioned above. The selection of the sample (Chapter IV) also allowed for inclusion of projects which may not have been controversial, but were nevertheless complex. This was the case because a

project by the sheer complexity of planning effort required (i.e., a shopping mall or airport), may require substantial work by the applicant even though no important resources are to be impacted.

The variables used for measurement are presented in Appendix A. A brief description is given of each variable and its purpose in Appendix A. The variables fall into three categories: (1) process variables; (2) environmental variables; and (3) applicant process management variables. Table 1 indicates which category each variable falls into. Chapter IV provides a more detailed discussion of the variables.

The process variables have been used primarily for keeping counts and insuring reasonable distribution of the sample. Some were included for specific purposes which are not included in the results of this dissertation.

The environmental variables allow each project to be classified in terms of its tendency toward success or failure (based on resources impacted and/or sheer magnitude) and to allow for classification in terms of complexity. This category of variables was necessary to insure that the sample represented projects which required significant management efforts by the applicants. The management variables were required to measure the effort that each applicant put forth for each project studied.

TABLE 1. CATEGORIZATION OF THE VARIABLES

Process Variables

1.** CORPS DISTRICT
2. REGION
3. WATERWAY LOCATION
4. TYPE OF AUTHORIZATION
5. FINAL ACTION
6. YEAR OF APPLICATION
7. YEAR OF FINAL ACTION
8. TIME IN PROCESSING
9. ARBITRARY PROJECT SIZE
10. ACRES INVOLVED
11. TYPE PROJECT
12. AMOUNT OF FILL
13. WATER DEPENDENCY
14. REGIONAL DESCRIPTION
15. DEGREE OF URBANIZATION
16. ENVIRONMENTAL DOCUMENTATION
24. PROJECT SIZE CLASSIFICATION
28. STATE PROJECT IS IN
30. REASON FOR DENIAL
38. PROJECT MODIFIED
39. U.S. F&WS AND NATIONAL MARINE FISHERIES SERVICE COMMENT SIMILARITY

Environmental Variables

17. WORK IN WETLANDS
18. FILL IN OPEN WATER
19. IMPACT ON THREATENED OR ENDANGERED SPECIES
20. WATER QUALITY IMPACT
21. IMPACT ON CULTURAL RESOURCES
22. GEOGRAPHIC EXTENT OF IMPACT
23. PREDOMINANCE OF IMPACT TYPE
29. IMPACT ON FISHERY
31. U.S. ENVIRONMENTAL PROTECTION AGENCY OBJECTION
32. U.S. FISH AND WILDLIFE SERVICE OBJECTION
33. OTHER FEDERAL OBJECTION
34. STATE OBJECTION
35. LOCAL OBJECTION
36. ENVIRONMENTAL AND CONSERVATION GROUP OBJECTION
37. PRIVATE OBJECTION

Management Variables

25. MITIGATION
26. TYPE APPLICANT
27. AGENCY AS APPLICANT
41. PREVIOUS EXPERIENCE WITH CORPS PROCESS
42. TIME SPENT COORDINATING PRIOR TO FORMAL APPLICATION
43. TIME SPENT COORDINATING AFTER FORMAL APPLICATION
44. APPLICANT RATING OF CORPS EXPERIENCE
45. ADVANCE NOTICE TO THE CORPS

OVERALL PROJECT COORDINATION PRIOR TO FORMAL APPLICATION (WITH):

46. WITH AT LEAST ONE OF THE FOLLOWING
47. WITH THE CORPS
48. WITH U.S. F&WS
49. WITH U.S. EPA
50. U.S. DEPARTMENT OF COMMERCE
51. WITH STATE
52. WITH LOCAL AGENCY

AGENT OR CONSULTANT USED TO REPRESENT APPLICANT IN CORPS PROCESS:

53. AT LEAST ONE OF THE FOLLOWING
54. LAW FIRM
55. ENGINEERING FIRM
56. ENVIRONMENTAL FIRM
57. SPECIALTY FIRM
58. TYPE FIRM TO JUST COORDINATION ENVIRONMENTAL ASPECTS
59. IN-HOUSE ENGINEER
60. IN-HOUSE PHYSICAL SC.
61. IN-HOUSE SOCIAL SCI.
62. IN-HOUSE BIOLOGICAL SCI.
63. IN-HOUSE ATTORNEY
64. IN-HOUSE, OTHER
65. IN-HOUSE, ANY
66. PROJECT MANAGER
67. PERMIT REVIEW SPECIALIST

**THE NUMBERS CORRESPOND WITH THOSE USED IN APPENDIX A

The variables and the Corps process and its relation to the applicants and other agencies is discussed in detail in Chapter III.

Importance of the Study

Extensive communications with agency personnel and researchers, university staff, and applicants, as well as the literature review indicated that no similar study concerning applicant behavior in environmental regulation had been performed. Quantification of applicant management in terms of developing models and single-variable correlations appears to be the breaking of new ground. This research can provide a foundation for additional work in this area.

The research will be of value to all of the actors involved in the authorization process. The applicant will benefit because the work provides guidelines for how to approach the regulatory process and project design most effectively. Although agencies are carrying out research related to improvement of their internal processes, they can also benefit from this study for it can provide them with new insights into the external aspects of the process. Agency perception of how the external process operates and what drives it is now primarily based on personal observations and "truisms" which have developed over time. While this study has substantiated some of these truisms, which is of value, it also provides new insights.

Environmental Regulation: Overview of its Evolution

A full understanding of the subject research requires some explanation of the evolution of the environmental movement in the United States and how regulation serves its purposes.

The Conservation Movement

The conservation movement in the United States can be traced back to the nineteenth century. As economic development intensified, some political and scientific experts in the natural resources fields began to perceive the "...unnecessary waste and destruction of America's once-great abundance of natural wealth and beauty" (Caldwell, 1970, p. 39). A primary theme of the early conservation movement was "wise use". The conservationists had as a primary goal the effective use of the resource base. They were not preservationists.

A conference of state governors convened at the White House by Theodore Roosevelt in 1908 focused on conservation of natural resources. This conference "...dramatized the arrival of the conservation of natural resources as a public issue" (Caldwell, 1970). President Theodore Roosevelt and political progressive and conservationist Gifford Pinchot are considered early leaders of the movement.

Naturalist John Muir represented a somewhat overlapping but essentially opposing view. Muir was a preservationist. Whereas the conservationists perceived their mission as

scientific forestry, irrigation of arid lands, drainage of wetlands, and harnessing the rivers for navigation and electric power, the preservationists' philosophy was one which emphasized

> ...the establishment of inviolated national parks and reservations, and in the protection of wildlife and the distinctive natural features of deserts, coastlines, river valleys, and unique geological formations (Caldwell, 1970).

The conservation movement, including the preservationist opinion, represents the first significant organized protest in America against the degradation of the natural environment. Initially, conservation was as concerned with eliminating economic waste as it was with preventing environmental degradation.

> Conflict over specific conservation issues revealed the cleavage between the economic, engineering, aesthetic, and ecological viewpoints in the movement. In the heat of repeated controversy, these differences tended to widen, and the economic conservationists by mid-twentieth century had largely abandoned the conservation label for the more appropriate term 'economic development' or 'natural resources administration'...Influential resource economists reassured the American people that the cries of earlier conservationists had often proved to be alarmist and that the nation was not about to run out of essential raw materials. This line of reasoning tended to shift the weight of the conservation argument from economic to aesthetic and, more importantly, to ecological considerations (Caldwell, 1970, p. 42).

In the early 1960's both President John F. Kennedy and President Lyndon B. Johnson indicated that "...new problems will require a new conservation--not just the classic conservation of protection and development, but a creative conservation of restoration and innovation" (Caldwell, 1970, p. 43).

The Environmental Movement

The "new conservation" was the beginning of the environmental movement. The environmental movement was largely the result of changing values in American life, population pressures, and a new perception of risk as a byproduct of technological advancement.

The environmental movement combined elements of both the conservation and preservation philosophies, and underscored a new widespread concern for health hazards resulting from environmental pollution. The environmental movement's underlying philosophy was that man must live in harmony with nature. As with the conservation movement, there was a wide range of beliefs within this movement. Many followers were preservationists while others believed development must continue but should be tempered to minimize environmental degradation.

Growing affluence and a resultant increase in educational levels and leisure time allowed many Americans to gain a new understanding of the man-nature relationship (Detwyler, 1971). By many, man's relationship to nature was no longer taken for granted:

> The growth of surplus increments in the American production economy, and the enlargement of popular choices resulting from increased economic and geographic mobility, made feasible a popular concern for environmental quality. Americans could now afford to move to higher levels of dissatisfaction, and this dissatisfaction was stimulated by a pervasive and accelerating decline in the quality of American environments (Caldwell, 1970).

The use of the word "dissatisfaction" suggests that environmental "problems" are to a degree in "the eyes of the beholder", or in other words, are a matter of perception. Another way of viewing this is related to the concept of risk. The new environmental movement can be seen as largely a product of rapidly accelerating technology (and knowledge) and uncertainty on the part of society as to where that knowledge would take it. Risk can then be seen as "...a joint product of knowledge about the future and consent about the most desired prospects" (Douglas, 1982, p. 5). As technology continues to accelerate, the gap between what is known and what is desirable to know increases. This area of unknown increases the perception of risk. Each society performs its own risk assessment (the ranking of dangers). Since the 1960's American society has moved environmental pollution and related environmental problems high on the ranking of perceived dangers.

Historically in the United States the regulation or the use of natural resources has been driven primarily by economic goals, and to a lesser degree by national defense

oriented goals, particularly in the area of water resources. The new awareness in the 1960's of potential threats to human health resulting from water and air pollution combined with the more traditional interests in conservation and preservation of natural resources, led to the passage of the National Environmental Policy Act (NEPA) in 1969 (42 U.S.C. 4321).

NEPA became law on 1 January 1970. It required Federal agencies to begin considering the overall impact of their actions on the biological, physical, social, and economic environment. Documentation was required in the form of environmental impact statements if this impact was found to be "significant". Some form of environmental documentation was required in all cases for construction activities.

A number of states soon followed the Federal government in developing their own environmental quality acts. By the late 1970's environmental protection laws and guidelines could be found at all levels of government. In many cases the laws concerning environmental protection were implemented in the form of environmental regulation. By the mid-1970's, NEPA, along with the Clean Air Act (42 U.S.C. 4321), produced a substantial body of environmental regulations.

Senator Henry Jackson was the prime mover in the passage of NEPA. The following statement made by Jackson in support of NEPA summarizes the mood of the times and the risk perception which gave rise to the "new conservation":

> Although historically the Nation has had no considered policy for its environment, the unprecedented pressures of population and the impact of science and technology make a policy necessary today. The expression 'environmental quality' symbolizes the complex and interrelating aspects of man's dependence upon his environment. Through science, we now understand, far better than our forebearers could, the nature of man-environment relationships. The evidence requiring timely public action is clear. The Nation has overdrawn its bank account in life-sustaining natural elements (U.S. Congress, 1969, p. 44).

Environmental Regulation

Government regulation of natural resource use and development, or environmental regulation, is deemed necessary to protect the needs of the overall population and to assume that national policies relative to resource utilization are adhered to and are uniformly applied. The alternative is seen as uncontrolled development which poses the threat of misuse and eventual depletion of the resource base. In general, "...protective regulatory programs deal with economic and social problems that are imperfectly dealt with by the marketplace and the liability law" (Bardach, 1982).

The protection of the environment through regulation is controversial because of the disagreement on the need, the degree, the benefits, and the costs of regulation. One source summarizes the essence of this controversy with the following:

> In recent years we have been bombarded with conflicting assertions about the incompatibility of environmental quality with

> other important goals. On the one hand, opponents of the environmental movement argue that stiff controls will be inflationary, will impede economic growth, will deprive firms of needed productive investment, will lead to plant closures, and will cause a loss of jobs. On the other hand, increasing numbers of environmentalists have argued that it is possible simultaneously to create jobs, conserve energy and nonrenewable resources, and protect the environment (Portney, 1979, p. 144).

The impact of environmental regulation on the economy is perhaps the most controversial element of the issue. Two extremes of opinion have been voiced on this matter. First, there are those who claim that environmental regulation (and government regulation in general) place a significant burden on the economy and add measurably to inflation. This position is well-documented in works such as "Clear and Present Dangers: A Conservative View of America's Government" by M. Stanton Evans (1975). In October of 1983 the chief economist of the National Association of Manufacturers estimated that business "...is paying $145 billion a year to comply with government regulations, including direct costs and indirect ones such as profits foregone on ventures that might otherwise have been undertaken" (San Francisco Examiner, 1983). Regulatory reform has been one of President Reagan's stated goals. Reagan estimates that his regulatory reform program will save business and consumers $150 billion over the next decade (San Francisco Examiner, 1983). Expenditures to run Federal environmental regulatory programs alone are over $2 billion dollars a year (Baroody, 1983).

The other extreme opinion on environmental regulation is taken by groups such as the Sierra Club which believe that the cost of such regulation is well justified and is not that great, particularly considering long-term benefits to business and health and welfare, only some of which are quantifiable. At the end of the first decade of NEPA the President indicated that "...the nation's environmental programs are producing tangible benefits" (CEQ, 1980):

> In two dozen of our larger cities, the number of days that air quality was in violation of pollution standards declined 18 percent between 1974 and 1978. By and large, water quality in our rivers and lakes has stopped deteriorating. Levels of certain damaging pesticides in the environment have ceased to climb or have dropped, and some of the bird species in danger of extinction a few years ago are returning (CEQ, 1980, p. iii).

In relation to the cost of environmental regulation and the belief that it is inflationary, the Council on Environmental Quality has put forth the argument that it may also be perceived as being deflationary:

> For example, suppose goods in the fixed market basket are categorized as either 'discretionary' products consumers buy because they enjoy the services they provide, or 'defensive' items--such as medical care, insurance, or burglar alarms--that provide no satisfaction in and of themselves. Among other things, environmental regulations may alleviate the need for certain kinds of defensive expenditures--medical care, crop protection, and water treatments costs, for example. To the extent such regulations allow consumers to reduce spending for defensive goods by more than the amount they may add

> to the prices of discretionary goods, the regulations may actually allow increased consumption of discretionary goods. In this sense, environmental regulation can increase the standard of living and might therefore fairly be called deflationary (CEQ, 1979, p. 643).

The controversy over environmental regulation may never be resolved because of differences of opinion as to the priority to be given environmental values versus non-environmental values. Environmental regulation does cost those being regulated and the general public, and it does provide immediate and long-term benefits. Haveman and Smith (in Portney, 1979) provide methodologies which can be used to attempt to estimate the economic impacts of environmental regulation (policy). But even as they provide the methodology they indicate that such impacts are extremely difficult to estimate because of complex loops in the economic system and because "...the channels by which environmental policies affect the economy are muddy and meandering."

Regulation, whether it is to provide protection of environmental values or to serve other public purposes, will continue to be a necessary governmental activity as long as there is a major gap between the public interest and welfare and that which is most profitable to the individual. While there are bound to be costs because of the limits imposed on alternative profitable activities or extra requirements which may be costly, there are also unavoidable administrative costs. The challenge which a regulatory agency faces is

that of carrying out its regulatory responsibilities in such a manner that the ends for which the regulations were established are achieved with the least possible delay and cost to those subject to the regulation.

Definitions

The following pages define selected words and phrases which are used in this dissertation:

Applicant: Includes individuals, business organizations, government agencies, and any other type of group or organization which has applied for a project permit or authorization.

Authorization process: Authorization refers to issuance of a permit to carry out the proposed project. The authorization process, as defined herein, begins with conception of the project by the applicant and terminates with the final action taken by the Corps. The process includes agency interaction, public review, project improvement, mitigation negotiation, and, in general, all elements which the applicant and agencies must deal with in working toward the final action.

Controversial: The working definition applicable to environmental matters is that there are opposing views on the use, or manner of use, of a specific resource.

Development project: Any project which involves physical construction activity.

Environment: A term which, following the passage of NEPA is often used to describe the physical world. More specific meaning is that there is a physical environment, a biological environment, a social environment, and a economic environment. The characteristics of each specific element. The circumstances, objects, or conditions by which one is surrounded. The definition as used in biology to describe the aggregate of all external conditions and influences affecting the life and development of an organism. An environment can have either positive or negative effects on an organism and a particular environment may have some elements that are favorable and others that are unfavorable for a given organism.

Environmental variables: The variables used for this study to describe the elements of the environment which are involved in a specific project.

Federal agency: Refers to agencies of the United States Government.

Final action: The termination of the authorization process by the authorizing agency due to denial of the permit, issuance of the permit, or withdrawal of the application.

In-house staff: Individuals who are regularly employed by the applicant, in contrast to consultants who are normally hired by contract only for specific projects.

Management variables: The variables which describe how the applicant has dealt with the planning and regulatory processes. Those variables which are under control of the applicant.

Mitigation: Changes in a project design or other actions for the purpose of softening or modifying an adverse impact which the project would produce. An example would be to preserve an area of on-site wetland and perhaps improve it to offset the destruction of another area of wetland. "Compensation" is sometimes used synonymously, but refers to making up for an adverse impact by, perhaps, preserving something similar elsewhere to that which has been damaged or destroyed. The on-site impact is not lessened, however.

Model: An abstract representation of reality based on relationships determined, in this study, by the science of statistics.

Negotiation: To confer with another so as to arrive at the settlement of some matter, usually involving a compromise by the parties.

Overall public interest: The Corps of Engineer's primary criteria for issuance of a permit. The Corps must consider the national interest, the interests of the state, and of local agencies and the public. All are weighed in reaching a decision on the final action.

Success and failure: For the purposes of this study, success has been defined as issuance of the permit. Failure

has been defined as denial of the authorization or withdrawal due to imminent denial.

Section 10: Refers to Section 10 of the River and Harbor Act of 1899. This is the Corps authority for requiring a permit for any structures or work in or affecting navigable waters of the United States. This along with Section 404 is the Corps primary regulatory authority.

Section 404: Refers to Section 404 of the Clean Water Act Amendments of 1972. This is the Corps authority for requiring a permit for the discharge of dredged or fill materials into the waters of the U.S., or adjacent wetlands.

Summary

This initial chapter has presented the primary hypothesis, the objectives of the research, an overview of the methodology, a brief overview concerning the evolution of environmental regulation, and definitions of important words and terms presented in this dissertation. Before preceeding with specifics concerning the regulatory framework, methodology, and the results of the research, the following chapter, concerned with the literature review, shows what similar work has been performed and what the subject research contributes to the state of the art.

CHAPTER II

LITERATURE REVIEW

The most significant conclusion drawn from the literature search was that no similar quantitative analyses dealing with the applicant's behavior in regulation had been performed. The following pages present this conclusion in greater detail and present the other relevant findings of the literature search.

Related Materials

The only relatively similar study identified is a doctoral dissertation completed at the University of California, Los Angeles (West, 1982). This work, entitled An Analysis of California's System of Environmental Regulation, focused on the impact of California's Permit Streamlining Act (State Assembly Bill 884). West indicated that AB 884 has paved the way in California for innovative means to minimize the time required for a project to pass through the local regulatory processes.

West's focus is on the advantages of a "complete early consultation document", and meetings, to develop mitigation measures versus other means. The primary advantage indicated is time saved in the process. West also indicated that a major problem with environmental documentation in California

was that the analysis of alternatives is usually limited to a few pages and/or table which leaves the decision makers with very little choice except the preferred alternative.

West's work would be considered qualitative, not quantitative. Fourteen mining projects in California were used as a case study to show how early consultation documents and mitigation impacted the time required for the local environmental review process. The following are important characteristics of the West work in terms of comparison to this study:

1. The 14 projects West focused on were drawn from her own experience to build a case. A large random sample was not studied.
2. The focus of the West work was on local agency management of the environmental process. Her work did not focus on a regulatory agency as such and did not investigate applicant behavior as a primary objective.
3. Essentially only one category of project and one category of applicant were involved. She was not interested in using a wide range of applicant types or projects because the conformity among these essentially served as a control.
4. The scenario developed by West is primarily based on her own experience with the 14 projects and does not consider input from the applicants.

The relevance of the West work to this study is to be found in the evidence that certain types of early consultation may be more effective than others in agency environmental review, in terms of decreasing the time spent in the review process. This implies that if the applicant can select or have input into the type of early consultation, the applicant does have some control over the process.

The West work would have been of greater value to this research if a statistically valid sample had been drawn. This, however, was not West's objective; her intent was to draw upon selected projects to show how she believed the system best operated. It would have been more helpful if a broader category of project (both in magnitude and type) had been studied, and if a significantly greater amount of input had been obtained from the applicants, thereby minimizing the weight of conclusions drawn from her own work experience and providing data which would be comparable to the data obtained for this study.

A doctoral dissertation completed at Carnegie-Mellon University in 1982, entitled Behavioral Models of State Regulation: A Case Study of the Pennsylvania Public Utility Commission, deals with the operation and motivations of a particular authorizing agency (Green, 1982). The study provides information useful in policy formation. The focus is on internal mechanisms within the regulating agency and how changes in the national economic marketplace impact the agency decision-making process. This work can be compared

and contrasted with this study in that while it deals with the management of a regulatory process, the focus is again on the agency, not the applicant. The effect of applicant behavior on the process is not considered by Green.

A doctoral dissertation completed at the University of California, Berkeley, 1979, entitled Environmentalists in the Bureaucracy: Environmental Impact Analysis in the Forest Service and Army Corps of Engineers, provides insight into agency behavior in the environmental process (Taylor, 1979). This work describes the Corps environmental process and related coordination process, but only for Corps projects. It does not deal with the Corps regulatory program.

Taylor's work is a critical look at the Corps and the Forest Service. One of the primary conclusions is that "In pursuit of their programmatic goals, government agencies cause much of the environmental damage visited upon this country" (p. 67). The most important conclusions in the Taylor work relative to this study are concerned with his finding that the depth of environmental analysis, the amount of environmental documentation, and the amount of mitigation provided by the agency are influenced by external factors. Taylor indicates that the external influences, identified primarily as environmental commenting agencies and environmental groups, vary in strength and interest from region to region. Taylor indicates that:

> In some regions, for example, environmental groups are strong, in others weak, in some localities, environmental commenting

> agencies are highly motivated and well armed, in others lackadaisical and improverished. Hence the pressure on the agency for thorough analysis and extensive mitigation can vary. The more attentive the outsiders, and the greater their resources, the stronger the analysts are inside the agency and the more the leadership feels compelled to engage in extensive mitigation (p. 102).

The value of this information in terms of this study is that it provides evidence that the environmental process is not cast in stone. It is administered by human beings and the technical evaluations are performed by human beings. If those people who perform and administer the agency's environmental review can be influenced by external factors, then one could assume that the people who perform technical evaluations and make decisions concerning the regulatory programs can also be influenced by external factors. The applicant has control over many of these external factors. This supports the concept that aggressive applicant management is effective in improving the probability of success in the regulatory process. Aggressive applicant management is concerned with making compromises and selling the project to those external elements who have great influence with the Corps.

Taylor's work is of value in that it provides insight into the workings of the Federal environmental process. But again, it deals with agency behavior and not the behavior of an applicant in a regulatory situation. A parallel could be drawn between a Federal agency seeking approval

for one of its own projects and an applicant seeking approval for his project. However, there are more differences than similarities. The applicant in most cases has no staff or at least a significantly smaller staff than that available to the large Federal agencies; the applicant is not forced by the regulations to engage in a formatted and staged early consultation process (U.S.A.C.E., 1978); the applicant is not dealing with agencies as an equal who may in the future be the evaluator of a project which is being proposed by an agency who is now the evaluator; and the applicant must gain approval of the project, not just the environmental documents concerning the project. In short, the Federal agency, as a project proponent, is in a markedly different situation in that the agency must always engage in early project coordination (which is usually laid out by a specific series of documents such as feasibility reports and EIS working papers), the agency has substantial staff and resources, the agency has ongoing and open lines of communication with other commenting agencies, the Federal agency is normally not seeking project approval from the other agencies (merely approval of the environmental documentation), and the agency is not seeking approval from an entity which is in a "superior" position with nothing to lose in terms of future considerations.

An article entitled "How Large and Small Plants Fare Under Environmental Regulation" provides a major conclusion which is relevant to work performed for this study

(Pashigian, 1983). Pashigian compared the performance of small plants to large plants in terms of dealing with the costs of environmental regulation. The study quantifies certain categories of costs, specifically those dealing with equipment improvements related to air and water quality regulations. The study shows that as each new wave of environmental requirements has been implemented, the ratio of large plants to small ones has increased. The conclusion is that large plants have the resources to better deal with the environmental requirements and that as these continue to "proliferate", the tendency will be to have a greater and greater proportion of large plants.

This finding is of value to this study as there is also evidence herein that success can be correlated to applicant size and resource availability.

Background Materials

One of the most comprehensive recent works dealing with the overall field of regulation is Going By The Book: The Problem of Regulatory Unreasonableness (Bardach, 1982). This publication is not concerned with the "problems" of overregulation but rather is concerned with what might be done to make regulation more constructive and reasonable. Significant consideration is given to "protective regulation" which includes environmental regulation.

Bardach (and Kagan) indicate that, ideally, government would "forge perfect connections to the society it governs",

but if necessary, it might forge imperfect connections. These imperfect connections are often points of friction and protective regulation has in recent years become one of these. The protective regulation is intended to protect citizens from a broad range of "social harms" including environmental pollution and environmental degradation.

Bardach indicates that despite growing objection to the cost of regulation, "...the public broadly supports the principle of government intervention to protect health and safety, environmental quality, and other humane values" (p. 300). Events such as chemical spills or airline crashes receive enormous publicity and allow for this support to be easily transformed into policy.

Further elaboration on why society supports and requires protective regulation is provided in a publication entitled Risk and Culture (Douglas, 1983). This work presents the concept of risk perception as the explanation for protective regulation. Depending on the dynamics and point of evolution of a given society, perceived dangers (risk) are ranked in order of importance. At this point in time in the United States and much of the developed world, rapid changes and developing technologies are increasing the gap between "...what is known and what is desirable to know" (p. 3). A somewhat widespread fear of technology's unknown byproducts has helped elevate the ranking of environmental risks in the U.S. The new wave of protective regulation represents our society's changing priorities in risk perception.

Literature Search Overview

Although considerable information has been published concerning the development of the environmental movement, the development of environmental regulation, the cost of environmental regulation, and the agencies' role in environmental regulation, there is little else available which focuses on applicant behavior in environmental regulation.

The literature search has included a thorough review of all dissertations prepared in the environmental and traditional sciences and other fields such as political science and planning. In addition to periodical guides, journals, and other publications, known experts in the related fields were contacted including current staff of the President's Council on Environmental Quality (Baer, 1984) and a former head of CEQ (Baldwin, 1984). A computerized search for relevant materials was carried out through the Colorado Water Resources Research Institute's "Colorado Remote Console Water Information Retrieval Service" (1983). This computerized abstracting service was used to search the extensive Water Resources Scientific Information Center (WRSIC) Data Bank of completed water resources research abstracts dating from 1969.

CHAPTER III

THE REGULATORY FRAMEWORK AND THE VARIABLES

This chapter provides an overview of the regulatory program of the Corps of Engineers, including the primary policy governing the program and the regulations which create the coordination network. The variables used for this study are then discussed in light of the Corps regulatory program and the questions with which each variable deals.

The Regulatory Framework

The Corps authority to issue permits is derived from three acts. Nine additional authorities involve requirements which create the Corps primary coordination network with other Federal, state, and local agencies.

Authorities to Issue Permits

The River and Harbor Act of 1899 (33 U.S.C. 401)

Sections 9, 10, 13, and 14 of this Act are all administered by the Corps. Section 10 is the primary authority under this act and covers construction in or over any navigable water of the United States. "Navigable waters" legally extend up to the mean high water line in coastal areas and up to the normal high water line on inland waters

(U.S.A.C.E., 1982, p. 31797). The jurisdiction under this authority can also include historical navigable waters.

Section 404 of the Clean Water Act (33 U.S.C. 1344)

Section 404 gives the Corps authority to issue permits for the discharge of dredged or fill material into the waters of the United States at specified disposal sites. The Administrator of the U.S. Environmental Protection Agency (EPA), in conjunction with the Corps, developed guidelines for evaluating disposal sites. The use of the term "disposal site" is somewhat misleading as many fills evaluated under Section 404 are placed for the purpose of construction and not for the purpose of disposing of the fill material. The jurisdiction under Section 404 includes adjacent wetlands, with a strong emphasis on protecting this valuable and productive resource, adjacent seasonal wetlands, and riparian areas.

Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413)

Section 103 authorizes the Corps to issue permits for the transportation of dredged material for the purpose of disposal in the ocean.

Authorities Creating the Coordination Network

Section 401 of the Clean Water Act (33 U.S.C. 1341)

This Section requires applicants for Federal permits or licenses for the discharge of "pollutants" into the waters

of the U.S. to obtain certification from the affected state to do so. Section 401 thereby brings the states and specifically the state agency issuing water quality certification into the coordination process.

Section 307(c) of the Coastal Zone Management Act of 1972 (16 U.S. C. 1456(c))

Section 307 requires that applicants for Federal permits for development projects and other physical work in the state's coastal zone to comply with the state's coastal zone management program. This Act brings state coastal zone management agencies into the Corps regulatory coordination network.

Section 302 of the Marine Protection, Research and Sanctuaries Act of 1972 (16 U.S.C. 1432)

This Act, along with the Marine Mammal Protection Act of 1972 (16 U.S.C. 1361), brings the U.S. Department of Commerce into the regulatory framework of the Corps. One Commerce agency in particular, the National Marine Fisheries Service, has the primary responsibility for protection of valuable marine resources.

Fish and Wildlife Coordination Act (16 U.S.C. 661)

This Act and the Fish and Wildlife Act of 1956 (16 U.S.C. 742a) and the Endangered Species Act (16 U.S.C. 1531) bring the U.S. Fish and Wildlife Service (Department of the Interior) into the coordination network. This agency is considered the Corps' most important consultant in fish and wildlife matters.

National Historic Preservation Act of 1966 (16 U.S.C. 470)

This Act created the Advisory Council on Historic Preservation to advise the President and Congress on matters concerning cultural resources and historic preservation. This Act brings Federal and state agencies interested in cultural resource preservation into the coordination network.

National Environmental Policy Act of 1969 (42 U.S.C. 4321)

This Act declared a national policy to encourage a productive and enjoyable harmony between man and his environment. Regulations implementing the procedural provisions of the Act were published in 1978 and the Corps published its interpretation in 1980 (Engineering Regulation 200-2-2). This Act provides common requirements for all Federal agencies to perform environmental review and requires coordination between these agencies to minimize overlap.

Decision Making Process

The following briefly describes the Corps legal obligations to respond to the views of Federal, state, and local agencies, the general public, and the applicant. Also briefly described are the administrative and judicial appellate systems relevant to Corps permit actions.

Corps regulations indicate that where "...required Federal, state and/or local certification and/or authorization has been denied for activities which also require a Department of the Army permit before final action has been

taken on the Army permit, the Army permit will be denied..." (U.S.A.C.E., 1982, p. 312805). If other certification or authorization is not required by "...state or Federal law, but a state, regional, or local agency having jurisdiction or interest over the particular activity comments on the application, due consideration shall be given to those official views as a reflection of local factors of the public interest" (U.S.A.C.E., 1982, p. 31805). NEPA states that for major Federal actions "...the responsible Federal official shall consult with, and obtain the comments of, any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved"(42 U.S.C. 4321). If the Corps does not at least provide the consultation required by these regulations, the Corps could be found to be unlawful in its action ('short of statutory right') under the Administrative Procedure Act (5 U.S.C. 706).

The Administrative Procedure Act also provides a mechanism for applicants and conservation groups to appeal a Corps decision. Under Section 706 a Federal agency action can be found to be in "excess of statutory jurisdiction", "arbitrary", "capricious", "contrary to constitutional right", or otherwise not in accordance with law. Based on this Act, a Corps decision to issue authorization or to deny authorization could be overturned.

The District Engineer normally makes the decision to issue or deny a specific permit. Memorandums of understanding for other agencies to appeal Corps decisions are in

effect between the Corps and the U.S. Department of Commerce (National Marine Fisheries Service), and between the Corps and the U.S. Environmental Protection Agency (the EPA also has veto power through their designation of disposal sites under Section 404 of the Clean Water Act). The memorandums of understanding (MOU) can result in the final decision on a permit being "elevated" to the Department Secretary level. In matters concerning the Coastal Zone Management Act and the Endangered Species Act, the Secretary of Commerce and the Secretary of Interior, respectively, have the final veto power over the Secretary of the Army. In matters concerning the National Historic Preservation Act and Section 302 of the Marine Protection, Research and Sanctuaries Act, the Secretary of the Army's final decision cannot be vetoed.

Full Public Interest Review

The Corps, in taking final action on permit applications, considers the "...full public interest by balancing the favorable impacts against the detrimental impacts. This is known as the public interest balancing process. The Corps program is one which reflects the national concerns for both the protection and utilization of important resources" (U.S.A.C.E., 1982, p. 31800). The Corps determines what the full public interest in a specific project is through formal coordination with the agencies indicated in the above paragraphs and also through coordination with local agencies, special interest groups, and the general public. The

decision by the Corps authorizing official (normally the district engineer for the Corps district processing the specific application) to issue or deny a given permit is based on that official's conception of the full public interest.

The Corps describes itself as a "highly decentralized organization" (U.S.A.C.E., 1982, p. 31800). The authority for administering the regulatory program is largely in the hands of the individual 37 district offices (including one Division/District). There is no established administrative appeal, for applicants, of a final action by a district engineer if the decision was made in accordance with the required authorities and procedures. This decision framework allows the Corps to interpret the full public interest with considerable emphasis on the local public interest. By these means the Corps serves the national interest but is not insensitive to the needs of the local populus which is most impacted by the given project.

The Corps believes that "...applicants are not necessarily due a favorable decision but they are due a timely one. Reducing unnecessary paperwork and delays is a continuing Corps goal" (U.S.A.C.E., 1982, p. 31800). Along these lines the Corps implemented the availability of "pre-application consultation for major applications" (U.S.A.C.E., 1982, p. 31815). This encourages Corps regulatory offices to advise applicants of studies or other information which may later be required during the processing of their permit

applications. The Corps indicates that "This early process should be brief but thorough so that the applicant may begin to assess the viability of some of the more obvious alternatives..." available. The Corps also has attempted to publicize the regulatory program to ensure that potential applicants are aware of permit requirements early on. However, the applicant is the only one who can take the initiative to contact the Corps and is responsible for doing so be it in early project planning phases or at time of application.

In a sense the Corps represents the applicant in coordination with other agencies during the formal permit review process. However, the Corps is not serving as a proponent of the project, but is merely carrying out the coordination required to make the public interest determination. The applicant is free to initiate his (or her) own coordination process with any or all of the agencies involved in the process.

Now that a description has been provided of the Corps regulatory program and of the coordination network built around that program, the discussion moves to a description of the variables used for this research. The variables are designed to measure the process characteristics of the Corps regulatory program, the environmental characteristics which are emphasized by the Corps regulatory program, and the management alternatives available to applicants in working toward gaining authorization from the Corps for specific projects.

The Variables

The variables used for this study are identified in Appendix A. A description of each variable is provided, as is a brief explanation of the purpose of the variable. These variables were designed to measure the effectiveness of various management options open to the applicant in dealing with the Corps regulatory process described above. As indicated in Chapter I, the variables fall into three categories: (1) process variables; (2) environmental variables; and (3) applicant process management variables. Table 1 lists the variables by these three categories.

The Process Variables

The process variables were used to keep an accounting of the characteristics of each project in terms of which Corps district was involved, which part of the country, type of waterway, elements related to time, type of project, size of project, and description of the final action. These variables were required to determine success or failure and to determine if the characteristics of the project were a factor in determining success or failure. Or, in other words, was success or failure attributable to regional characteristics, or size of project, etc., rather than the management aspects (see Tables 13 through 18).

The Environmental Variables

The environmental variables allowed for a determination of how much inherent inertia toward issuance or denial each

project had. A project that involved significant fill in wetlands or involved direct impact on cultural resources would be considered to have a lower probability of success than one not impacting significant resources, given that the management characteristics were the same.

The environmental variables were also required to substantiate the complexity criteria (see Chapter IV). A project that involved fill in wetlands, or impact on endangered species, or was objected to by the U.S. Fish and Wildlife Service, etc., would be considered to be controversial and would therefore fit the complexity criterion. These variables relate back to the agency responsibilities discussed in the previous section.

The Management Variables

The management variables were required to measure the effectiveness of the management effort put forth by the applicant. Each of these variables deals with a specific hypothesis or question. The following provides a discussion of these variables. They are presented in the same order as shown in Table 1.

Mitigation

This variable deals with two primary questions: (1) Does the provision of mitigation affect the probability of success? (2) Does the timing of the mitigation affect success? It could be argued that the determination of the need for mitigation is in the hands of the agencies

and is not the applicant's decision, but this is not the case. Applicants can work with the appropriate agencies in the very early project planning phases (perhaps years before formal application is made to the Corps) and can build acceptable mitigation into the initial project plan. This is considered aggressive management by the applicant. This variable measures if this category of action affects the probability of success.

Type Applicant

This variable allows for the categorization of the projects by type of applicant. The question dealt with is: Does the probability of successfully dealing with the permit process vary depending on the type of applicant? This variable is included as a management variable but may be more a measure of inherent characteristics by type of applicant rather than a measure of specific actions.

The classification of the applicants was based on information in the public notices, statement of findings, government and applicant correspondence, personal communications with applicants, information on returned questionnaires, and other related research. Group A, B, and C applicants are business entities. Group A includes major national and international corporations. These are the largest business entities in terms of resource availability (essentially monetary resources and staff). Group C applicants includes the smallest business entities in terms

of resource availability. These are primarily owner-operated, small businesses. Group B includes a wide range of applicants which do not fit into categories A or C. Group B includes companies which have multiple offices, plants, or outlets and can be multi-state. There is a wide range of resource availability within Group B.

The other applicant categories are conservation groups, private organizations other than those identified as conservation groups, private individuals, and government agencies. Another variable (No. 27) breaks government agencies down into separate categories. This is for the purpose of determining if different levels of government have a higher probability of success than others.

Previous Experience with the Corps Process

This variable deals with the question: Does previous experience with the Corps regulatory process improve the probability of success? This is considered a management tool, because even if an applicant does not personally have the experience, it can be obtained through the retention of a consulting firm which does have the experience.

Time Spent in Coordinating the Permit Authorization Process Prior to and After Making Formal Application

The specific wording in the questionnaire was "...estimate the time put into the permit authorization process with the Corps and/or other Federal environmental agencies by you or your firm (and your representatives, if appropriate) prior

to making formal application to the Corps". A second part to this question had the same wording but asked for an estimate of time spent after making application. The primary question dealt with here is: Does increased time in coordinating prior to making formal application improve the probability of success: The inclusion of the "after" question allows the "before" to be put in perspective. If the data indicate that applicants who spent more (or at least as much) time in coordination prior to making application than during the formal processing have a higher probability of success, this is a significant indicator of applicant control of the process.

Advance Notice to the Corps

This variable was used to determine if advanced notice to the Corps was an effective management tool, and more specifically, if given amounts of time are more effective than others. Does the probability of success increase as the lead time increases? Is it possible that too much lead time decreases the probability of success? Is there an optimum amount of lead time?

Overall Project Coordination Prior to Formal Application

This series of variables deals with a number of related questions. Does overall prior coordination increase the probability of success? Are certain agencies more important to coordinate with than others? Are certain combinations more effective? Is the sheer number of agencies coordinated with important, regardless of which ones?

Agent or Consultant Used to Represent Applicant

These variables were used to determine effectiveness of consulting services used just to coordinate the environmental aspects of the project and to compare the effectiveness of types of firms. A primary question asked here is: Does the availability and use of environmental expertise improve the probability of success? This differs from the previous series of variables discussed in that those dealt with overall representation in the process while these deal with the use of experts to deal with specific technical questions. This category of consulting service would provide an applicant with people who fully understand and likely have experience in developing and negotiating mitigation.

In-House Staff

These variables determine if having various types of expertise on the payroll improves the probability of success. The primary question is: Does the availability and use of in-house staff improve the probability of success? The variables are designed to measure the relative effectiveness of different types of expertise. The variables also allow specific examination of the use of a project manager, by amount of time spent on the project, and use of a person who specializes in just the processing of permits.

CHAPTER IV

THE POPULATION STUDIED AND SAMPLE SELECTION

This Chapter describes the total population which is under consideration and the selection of a representative sample from the population which was studied.

Total Population

The objective of the research was to determine the applicant's influence and degree of control over the environmental regulatory process. The total population consists of all the private individuals, businesses and other groups, government agencies or anyone requiring a permit at some level of government for physical construction work. Virtually all physical construction work in the United States is subject to environmental review at some level of government unless exempted for a specific purpose.

Population Studied

The population of applicants applying for Corps of Engineers' permits was the portion of the total population which was selected for study. As the defined objective of this research is to measure the effectiveness of applicant management of the environmental regulatory process, a regulatory process was selected for study which is likely representative, in terms of opportunities for active

applicant management of the process, of the majority of Federal environmental regulation involving physical construction. The Corps regulatory program has the following characteristics:

1. The decision to issue or deny the permit, which is referred to as the "final action", is based on the "overall public interest" (U.S.A.C.E., 1982). Therefore, by definition, the Corps must consider all positions taken on the permit application at local levels of government, by state, other Federal agencies, individuals, conservation groups, and other special interest groups (the Corps solicits comments through its public notice process). This characteristic puts the Corps in the position where they often cannot take final action until decisions have been made at other levels of government. The Corps thereby is often the last government agency to make a decision on the project. It tends to serve as a clearinghouse which is exposed to and influenced by all problems and objections which have been raised at all levels of government. This characteristic makes the regulatory process used by the Corps ideal for study because the Corps and the applicant must deal with all types of environmental regulation, all categories of environmental sensitivity, and all levels of government.

2. Jurisdiction is determined by location in, and proximity to water and areas such as wetlands which are a functional part of the aquatic ecosystem. Therefore, any type of development in such areas, whether it be agricultural, residential, industrial, or commercial, comes under Corps jurisdiction. The applicants represent a cross-section of society.
3. The program must comply fully with the National Environmental Policy Act (NEPA) and with the Regulations implementing the Act (U.S.A.C.E., 1978). This puts the Corps regulatory program clearly in the category of environmental regulation and provides a common denominator with other Federal regulatory programs.

For the above reasons, the population of those who apply to the Corps for permits was selected to be studied. No one environmental regulatory program can totally represent all elements of all U.S. environmental regulatory programs, but the Corps program is perhaps as representative of the total population of Federal programs involving construction as any one program could be. Table 2 identifies the characteristics of environmental oriented regulatory programs. The table identifies the characteristics with which the Corps is directly or indirectly involved.

Selection of the Sample

The Corps processes approximately 9,000 individual permit applications each year (Goode, 1984). Over 90

TABLE 2. CORPS INVOLVEMENT IN ENVIRONMENTALLY ORIENTED REGULATORY PROGRAMS

Characteristic	Corps Directly or Indirectly Involved
Levels of Government	
Federal	x
State	x
Local	x
Applicant Type	
Government Agencies	x
Special Districts	x
Special Purpose Agencies	x
All levels of Private Enterprise	x
Private Individuals	x
Private Organizations	x
Project Type	
Navigation Improvement	x
Marina	x
Agriculturally Oriented	x
Mining	x
Residential	x
Commercial	x
Industrial	x
Recreation Development	x
Flood Control	x
Pipeline	x
Bridge and Road	x
Airport	x
Water Treatment	x
Power	x
Sanitary Landfill	x
Water Supply	x
Natural Habitat Improvement	x
Military Operations	x
Aquatic Disposal	x
Resource Category	
Water Quality	x
Air Quality	x
Fish and Wildlife	x
Cultural Resources	x
Wetlands	x
Threatened and Endangered Species	x
Aesthetic	x
Noise Pollution	x

percent of these applications are for very small projects such as individual boat docks and/or do not involve measurable impact on important resources (non-complex). All of the above types of applications are considered routine and do not require significant management effort by a single applicant for an individual application. The remaining larger, more complex projects, which often involve the loss of significant resources, are the focus of this study. These "larger" projects usually require applicant management of the process. The monetary cost of the regulatory review may be significant for such projects.

Although all of the larger projects are not necessarily "complex", the term "complex" is used in this dissertation to identify the category of project which is the focus of the research.

The applicant's and the government's processing of the complex projects requires a significantly greater effort than the processing of the routine applications. This holds true for the following reasons:

1. A single structure, boat dock, etc., which involves only a fraction of an acre of land will usually have little impact on the natural resource base. Therefore, minimal coordination is required with the fish and wildlife agencies (an exception can be if a number of such projects result in a cumulatively large impact).

2. A small project will normally not have a measurable economic or social impact on the community. Therefore coordination and negotiation is not required with the public and private entities which are interested in these matters.
3. A small, non-complex project will normally not require the preparation of extensive Federal or state environmental documentation. Such documentation, and not necessarily just environmental impact statements, takes time to prepare and can bring a much larger number of agencies and individuals into the negotiation/coordination process.

In summary, the focus of this research is to provide information on the effectiveness of applicant management in environmental regulation. The Corps of Engineers regulatory program serves as a type of clearinghouse and is representative of other Federal environmental regulatory programs dealing with physical construction activity. Because the complex projects result in the substantial expenditures of time and money by the applicant, the sample for study has been drawn from them.

The following chapter describes the specifics of sample selection and data collection and the general procedure used for the research.

CHAPTER V

GENERAL PROCEDURE

Development of the methodology for data collection and the data collection procedure itself were key elements of this study. This chapter discusses both the data collection methodology and the statistical techniques used for analysis of the data.

Data Collection Methodology

The methodology was developed through substantial consultation with the Corps of Engineers staff involved in the regulatory program both at the district level and at the Office of the Chief of Engineers (OCE) in Washington, D.C.

The Corps regulatory program is administered by 37 district offices (New England is a Division/District office which is included among the 37 'districts' because it administers the regulatory program for that portion of the country). Appendix A, Variable 1, provides a listing of the 37 districts.

From initial consultation with OCE and selected districts, it was apparent that there was a large variation in the annual number of regulatory applications processed per year and in the percentage of applications per district which could be considered "complex". The two highest volume districts, Jacksonville and St. Paul, process over 500

applications annually while a number of the low volume districts process less than 100. The number of applications per district which are considered complex also varies greatly. The highest volume districts indicated that they might have as many as 20 or 30 applications per year which fit the category, while the smaller districts indicated that they might have only one or two. A large majority of applications are for nationwide permits, general permits, and individual permits which are for relatively simple projects which have minimum impact. None of these are considered complex and normally the processing of these categories is more in control of the agencies than in the control of the applicants. Also, the cost of the project and the cost of processing to the applicant is substantially less than for the complex category.

Based on the above, it was determined that the majority of Corps districts received complete applications for no less than ten and no more than 15 complex projects per year. The remainder were closer to the extremes at the upper and lower ends.

The time frame to be used for the research was set at 1 October 1979 through any final actions taken in 1983 up to the time of data collection. The 1 October 1979 date was the beginning of the 1980 fiscal year for the Federal Government. A three-plus year time frame was selected so that the impact of change through time, if any, could be measured. Because the regulations which guide the Federal

regulatory programs have elements which change, a study based on only a one-year sample would not have been as acceptable, as certain results might be attributable to isolated changes in the regulations during the given year. The year 1980 was selected as a starting point because it corresponded well with a de-emphasis on preparing environmental impact statements (EIS's). This came about largely from agency interpretations of the 1978 NEPA regulations and changes in Corps regulations which were designed to minimize agency red tape. The de-emphasis on preparing EIS's represents the current situation and possibly the future situation. Also, under the pre-1980 conditions a larger number of EIS's were prepared, and almost all for the complex projects. The EIS process normally took one year to complete and this time frame could not be significantly reduced by applicant management. Because of this additional fixed year of time, pre-1980 measurement of applicant process management would have been significantly more difficult and equally less meaningful to current conditions.

Based on the estimate of 10 to 15 complex projects per year for each of the 37 districts (average for all districts, with a much wider range as indicated on the previous page), and a three and one-half year time frame, the number of final actions on complex projects for the given time could be estimated to be 1,295 to 1,943.

Using these estimates, a sample of 350 to 600 projects was determined to be representative (Boardman, 1983).

Twenty projects per district was established as an appropriate initial goal with potential to produce a total of 740 projects.

A primary consideration in the development of the data collection methodology was that the Corps regulatory program is essentially administered on an individual basis by each of the 37 districts. There is no overall, centralized, data collection system. OCE does keep updated records on certain selected aspects of the program and can easily request data from the districts on need. No two districts, however, have identical systems for monitoring their regulatory programs. Some districts have their regulatory data computerized; many do not. The above characteristic required that the initial data collection system be flexible, yet result in a sample that focused on the common denominator of complexity.

Development of a Two-Phase Study

The objective of this research was to measure the effectiveness of applicant management of their projects. Therefore, it was necessary to measure at least two characteristics of the regulatory process: (1) the effect of applicant management of the process, and (2) the inherent tendency of each project being studied to move toward issuance or denial based on the physical and process-oriented characteristics independent of applicant management. In other words, applicant management could not be accurately compared between project "A" and project "B" if "A" involved

200 acres of wetland and construction of a business park (which would probably not be considered water dependent or water related) and project "B" involved a single boat dock in an area that already had a number of similar structures. Project "A" would be considered to have significant reason for denial independent of applicant management and project "B" would be considered to have a very good chance of being issued independent of applicant management. Based on these dual needs, a two-phase methodology for data collection was developed.

Phase I was designed to identify the sample and provide as much information as possible on project characteristics and resources impacted. Phase II was designed to collect data on the applicant's management of the project.

The major considerations in designing the Phase I data collection were the following:

1. It would not be possible in terms of resources available or time available to go to all 37 Corps districts to collect data. Therefore, the data collection would have to be initiated and carried out through written correspondence and over the telephone.
2. Provision of the data by the districts would have to require a relatively small effort by them, as the Corps regulatory people are normally under significant pressure just to perform their day-to-day duties.

3. The information provided would need to be concise, complete, and indicate the date of initial application, the name of the applicant and address, as much as possible on the environmental/physical variables and process variables, the nature of the final action, and the date of the final action.

In the first phase of data collection, information was gathered from two types of documents at the district offices--the public notices and statements of findings. Federal regulations require that a public notice (PN) and statement of findings (SOF) be prepared by the Corps for most individual permit actions (U.S.A.C.E., 1982). The regulations set minimum requirements for the content of both documents. The PN's contain the name of the applicant, often the address, the starting date, the resources impacted, and sometimes considerably more. The purpose of the PN is to inform the general public and other agencies that application has been made for a given project and their comments are requested. The SOF provides official documentation of the final action taken on a given application. The content of this document varies greatly from district to district. Some districts merely indicate issuance or denial and the date of the action with reference to other documents which may be included with the report. Other districts go into great detail in the SOF. They may include a chronology of the application; nature of agency comments and objections; project

description; Corps rationale leading to the final action; etc.

The second phase of data collection involved the use of a questionnaire addressed to the permit applicants. Appendix B, Enclosures B-1 and B-2 are copies of the questionnaire. The modified version which omitted questions nine through 11, was used where applicants were individuals rather than organizations.

Phase I Data Collection

The delegated representative of the chief for each of the Corps' 37 regulatory function offices was informed of the study and given only a brief explanation of it in an effort to minimize possible bias in the sample to be drawn. The study was described as one in which "the objective of the research was a statistical analysis of the external parts of the regulatory process." Officials in four of the districts were given more information only because they were contacted initially and were consulted in designing the study. Others were also given more information if they requested it.

The lack of a uniform accounting system among the districts for monitoring the permitting process, and regional variations in the types of projects, made it necessary to assure that each district clearly understood the complexity criterion. As a general introduction to the complexity criterion, the following was given as a guideline:

1. Marina development of ten or more acres.
2. Dredging project involving the removal of at least 500,000 cubic yards of material.
3. Fill project involving the filling of 50 or more acres.
4. Residential or commercial development involving 50 or more acres.
5. Sanitary landfill involving 50 or more acres.

Obtaining a clear understanding of the guidelines was not difficult; there was considerable difference in the nature of complex projects from district to district. In the midwest, the complex projects were more typically agriculturally oriented. Along a major river, such as the Mississippi, the complex projects were frequently commercial docking facilities. Furthermore, the district personnel were asked to include among the complex projects all applications which involved large acreages or valuable resources such as wetlands, all of which were controversial, and any combination of these. An additional identifying characteristic was that complex projects were often the ones which required the most time to process.

Each of the districts was asked to provide 20 cases, if possible, and to select them on a random basis from all of the cases which met the criteria of the study. The highest volume districts were requested to provide a larger sample but one that was, in general proportional to the relative number of complex actions for which they believed

final action had been taken since 1 October 1979. There was no way to get a precise count of such cases, either as a total for the nation or even within district because of the varied combinations of definitions for complexity. However, the people at each district seemed to be confident that they could determine approximately the number of complex projects on which they took final action in a given year.

Each district was also asked to stratify its cases so that approximately half of the projects would be ones for which a permit was granted and the remainder of the projects those where either the application was denied or was withdrawn late in the process because denial was imminent.

Sixteen of the districts indicated either that they had not had a total of 20 complex final actions since 1 October 1979 and/or that they had not had a total of ten denials (including withdrawals) in that time frame. These districts simply provided all the cases that they had. The remainder of the districts were asked to assign temporary new numbers to all cases and to select the requested number from the total issuances and from the total of denials using the prescribed random sampling procedure.

A total of 650 complete Phase I packages were received from the 37 districts (average of approximately 18 per district). Five districts provided less than 14 and four districts provided more than 21.

Phase II Data Collection

The questionnaires sent to the applicants focused on capturing the key elements of applicant process management in a way that the results could be quantified. The first category of questions was designed to determine if previous direct experience with the Corps process was a factor (question No. 2). This is viewed as an optional management tool because if the applicant does not have the experience, it can be obtained by personal communications or by retention of a firm which has the experience.

The second category of questions was designed to measure the effectiveness of pre-application coordination by collecting information on the time spent, the timing, and which agencies were contacted. Questions 3, 5, and 6 focused on this management tool. Question 3 was divided into two parts, part one dealing with time spent prior to making the application and part two dealing with time spent after formal application was made. Without knowledge of both of these time-oriented variables, it would not have been possible to determine if an applicant had spent more time prior to application than afterwards. This is significant because, for example, if only pre-application were available, 50 hours of pre-application time could not be put in its proper perspective. Fifty hours of pre-application time could be considered adequate and effective if only ten or 50 hours were spent during actual processing of the application. But if 500 hours or more were spent

during the formal permit processing, then it could be questioned if only 50 pre-application hours was adequate.

The third category of questions was designed to measure the effectiveness of using consulting services (questions 7 and 8). The three or four most commonly used types of consultants for Corps regulatory projects were indicated.

The fourth category of questions, used only for organizations, dealt with the measurement of the effectiveness of having in-house staff; type of in-house staff; and how they might best be utilized.

A cover letter, included with the questionnaires, stressed confidentiality of individual responses; the possible usefulness of the research; the fact that the questionnaire would require a minimum of effort to complete; and indicated that a stamped, addressed envelope was attached for easy return mailing. The cover letter also included a description of the project; the Corps district to which the application was made; the Corps public notice or application number; and the date of the public notice.

The initial response rate on the 650 questionnaires sent was 52.15 percent (339 received). Follow-up included telephoning a large number of applicants who had not responded to the initial questionnaire to check addresses and set the stage for a second mailing. The second questionnaire resulted in responses from 44 applicants who had not responded initially. This brought the total response rate

to 58.92 percent (383 received out of 650 which were sent).

The nature of the Phase I data was such that certain types of non-management analysis could be done with the total sample of 650 projects. The specific applicant management date provided by the applicants was, of course, only usable for the 383 projects for which response was received.

Data Analysis

The data were analyzed using cross-tabulation and discriminate analysis. Cross-tabulation showed how the responses or variables related to each other and discriminate analysis measured the characteristics to determine if the project fit specific issues.

Initially, a cross-tabulation of success versus non-success (failure) was performed by each column of data, with a subset of variables selected which seemed important in determining success. In subsequent analyses, various combinations of variables in the given subset were examined to determine which combinations would yield high success rates. Once these models were developed, a validation of them was performed using 47 cases which were randomly selected and which had not been used in development of the models.

Chi-square was used to determine significance for most of the data. A 0.05 significance level was used. Because many of the branches on the models were represented by a

relatively low number of cases, it was determined that the use of confidence intervals would be a more appropriate measure of significance for the models. A 0.05 significance level was also used here. This means that the interval estimates have a 95 percent chance of having come from a population whose mean falls within the intervals shown. Data analysis is discussed in detail in Appendix D.

The preceding pages have presented the objectives of the research, the contribution made by the research, the regulatory framework, a description of the population studied, and in this chapter, a description of the general procedure. The stage is now set to present the results of the study.

CHAPTER VI

THE RESULTS

Introduction

The following pages present the results of the research. Three categories of information are presented: (1) the action models which show the relative success rates for alternate courses of applicant process management; (2) correlations to success or failure of single variables dealing both with management by the applicant and other characteristics of the process; and (3) distributions and correlation to success for process variables dealing with regional distributions, population characteristics, time, and project type.

The action models presented are based on, and represent, an applicant management system which involves a large number of choices. The action models indicate which courses of action have been shown to be highly successful and which are less successful. In most cases, the action models are presented as a system which also shows alternate courses of action.

No one model is representative of all successes. The applicant has alternate courses available to success and the path to success varies by the type of project and the type of applicant. The "system" approach to presenting the action

models allows for the comparison of alternate courses of action.

In reviewing the results, it should be kept in mind that the success rate for the sample studied is approximately 70 percent. Seventy percent of the cases studied resulted in success. In reviewing the models and other data presented, success rates below 70 percent are low for the sample and above 70 percent are high. Relative differences between success rates are meaningful as are individual rates close to 100 percent. Chi-square and confidence intervals have been used to show the significance of data. These are the best quantified indicators of the reliability of the data in terms of prediction.

Validation

A random sample of 47 projects selected from all of the questionnaires returned was used for validation of the action models. The data concerning validation is presented at the end of each of the sections describing the action models.

Frequencies

Frequency distribution for the variables studied is presented in Appendix C and is discussed for selected variables at the end of this chapter. All mainland U.S.A. Corps districts are represented. Mean for the 37 districts was 17.56 responses for Phase I and 10.08 responses for each district in Phase II. For specific data on representation

by region, waterway, year of final action, acreage, type project, etc., please refer to Appendix C.

Complexity

A test was developed to determine how representative the Phase I and Phase II projects were of the complexity criteria. If the project met all of the following six conditions, it would not be considered to be complex: (1) no EIS prepared; (2) no wetlands involved; (3) no impact on threatened or endangered species; (4) no impact on cultural resources; (5) no mitigation provided; and (6) no objections from any Federal, state, or local agency or from an environmental group.

From the total 650 project Phase I sample, 7.4 percent or 48 proejcts were determined to be not complex. The success rate for these was 88 percent, considerably higher than the overall sample. This would be expected. It should be noted, however, that many of these 48 involved large acreages and/or high volumes of fill. From the 373 project Phase II sample, 25 (6.7 percent) were defined as not complex. All 25 were successes. Validation of the complexity criteria produced five projects (of the total 47 used for validation) which were not complex. The success rate was 80 percent for these, represented by four successes and one failure.

The Models

The models presented deal with four related management options open to the applicant in environmental regulation.

Although each of the models presented stands alone, they are related. The first two models focus on applicant use of environmental expertise. Models No. 3 through 6 are concerned with the use of in-house staff. Model No. 7 compares the use of consulting services by two categories of applicants with differing success rates. Model Nos. 8 and 9 focus on coordination with agencies in relation to time.

The numbers given for each alternate course of action shown by the models are the success rate (i.e., 97 percent, meaning that 97 percent of the projects following that course of action were successful); the number of projects represented by that specific success rate (i.e., 63/2, meaning that there were 63 successes and 2 failures); and the confidence interval (which was explained in Chapter V and is again described as a footnote to Model No. 1).

Environmental Expertise

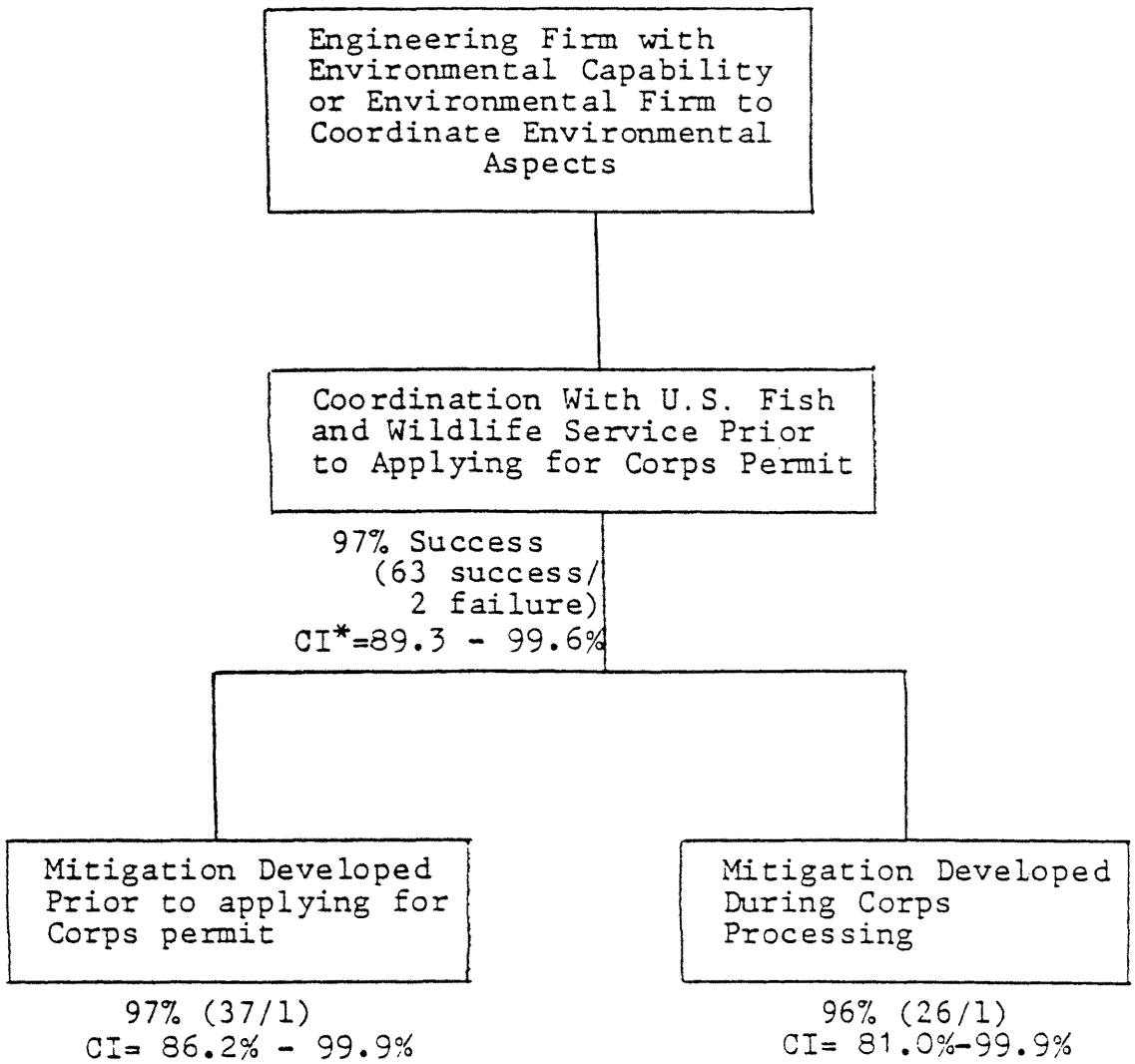
Model Nos. 1 and 2 are concerned with an applicant's use of consulting services with expertise in the environmental sciences and the environmental process. The primary question addressed by these models is: Does the availability of environmental experts improve the coordination process and does this and other aspects of environmental expertise result in an improved success rate?

A model resulting from use of the most successful category of firm to coordinate the environmental aspects of the project resulted in a success rate of 97 percent (37

success/1 failure). Model No. 1 is presented in Figure 2.

Model No. 1 reflects the environmental orientation and experience of consulting services with specific expertise in these matters. Coordination with the U.S. Fish and Wildlife Service (F&WS) is seen as a key element in project planning prior to applying for the Corps permit. Fish and Wildlife Service personnel have expertise which is valuable for project planning and their input into the design of the project minimizes the possibility of their objection after formal application has been made. Table 2 indicates that if the Fish and Wildlife Service has objected, the success rate is only 53 percent. Also, if there is prior coordination with the F&WS, it is possible to determine whether particular sites are considered to be totally unacceptable by the agency. Such sites can then be eliminated from further consideration making it possible to save significant amounts of time and money that might otherwise be expended to purchase the site and prepare a plan.

A logical variable to include in Model No. 1 was mitigation. Mitigation for resources lost is the usual byproduct of negotiations with the F&WS. The model indicates that the success rate was approximately the same for mitigation provided prior to application and mitigation provided during processing. This relationship may, however, reflect the fact that the mitigation had been developed



*CI= Confidence Interval - These interval estimates have a 95 percent chance (0.05 level of significance) of enclosing the true proportion of success.

THE CONFIDENCE INTERVAL MEASURE OF SIGNIFICANCE HAS BEEN USED FOR ALL THE MODELS WHICH FOLLOW.

FIGURE 2. MODEL NO. 1

prior to application and was either modified or finalized during processing.

Validation of Model No. 1 produced eight projects which fit the model. All eight were successes.

Model No. 2 is presented in Figure 3. This model again considers only the group which used an environmental firm or engineering firm with environmental expertise to coordinate the environmental aspects of the project. This model differs from Model 1 in that prior coordination with the Corps is included and the effect of no prior coordination with no mitigation is shown. The model indicates that pre-application coordination with the Corps or the F&WS resulted in a relatively high success rate (93 percent) and that the rate of success improved if mitigation was provided. No mitigation resulted in a 76 percent success rate. No prior coordination with these agencies and no mitigation resulted in a 71 percent success rate. However, this category included only seven projects. The action model which included environmental expertise, prior coordination with the Corps or F&WS, and initial mitigation, resulted in a 100 percent success rate (21/0).

Validation of Model No. 2 produced a success rate of 90 percent (9 successes/1 failure) when only prior coordination was considered. Including initial mitigation, the success rate was 100 percent (2/0); mitigation during permit processing resulted in 100 percent success (7/0); and no

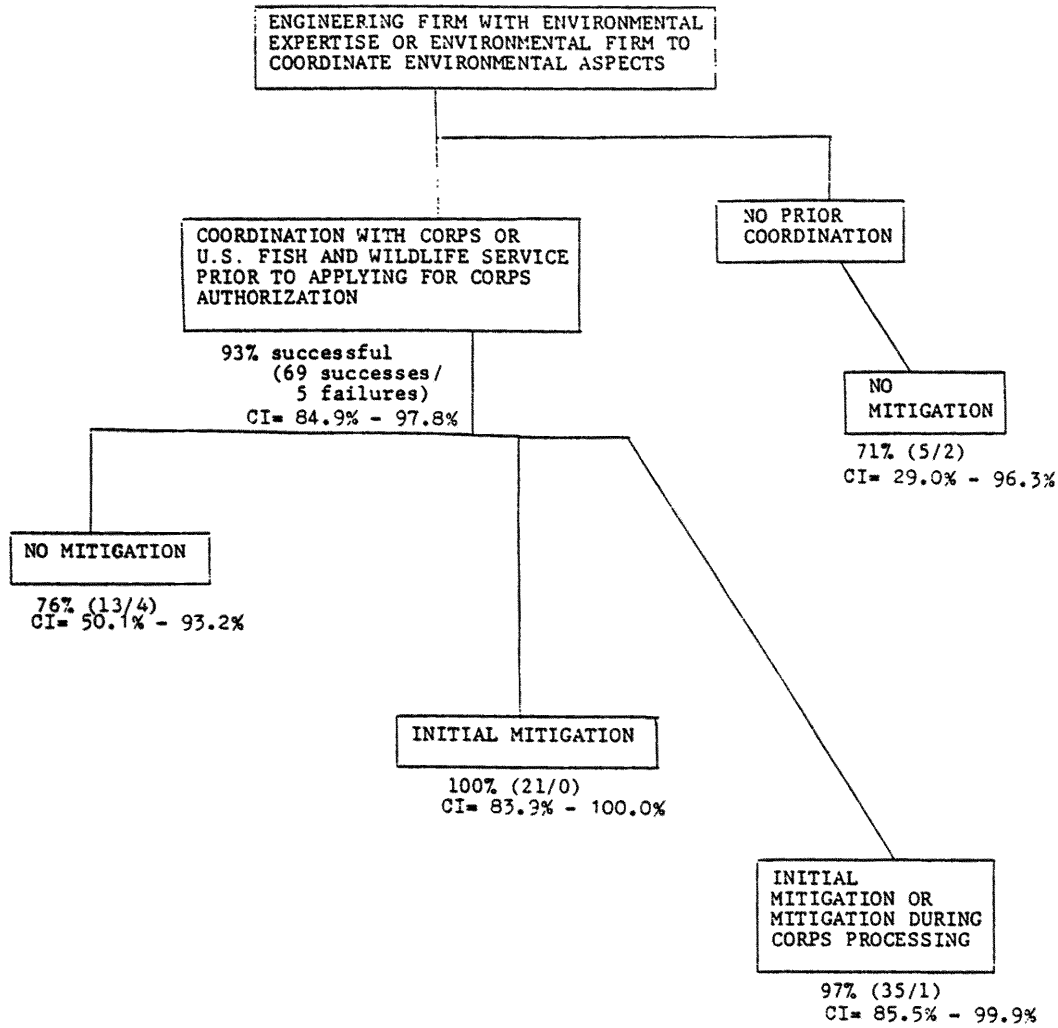


FIGURE 3. MODEL NO. 2

mitigation produced only one project, a failure. There were no projects fitting the no-prior-coordination path.

In-House Staff

Model Nos. 3 through 6 focus on the effectiveness of having certain types of technical and management people on the applicant's payroll. The primary question addressed by these models is: Does the availability of in-house staff improve the probability of success? Also, does the assignment of one individual as a project manager improve the probability of success?

Action models 3 through 6 define the value of having in-house staff available and some specific variations. Model No. 3 assumes availability of in-house staff which includes an engineer and a project manager who devotes at least 50 percent of his or her work time to the subject project. This model resulted in a 100 percent success rate (39/0). Model No. 3 is presented in Figure 4 along with model No. 4. Model No. 4 assumes in-house staff which includes an individual whose primary responsibility is to process permits. A project manager is included also, with 50 percent or more of their time on the specific project. This model resulted in a 100 percent success rate, but based on only 18 projects.

Table 7 presents a detailed analysis of in-house staff effectiveness.

Validation of Model No. 3 only produced two projects, both successes. Validation of Model No. 4 produced one success.

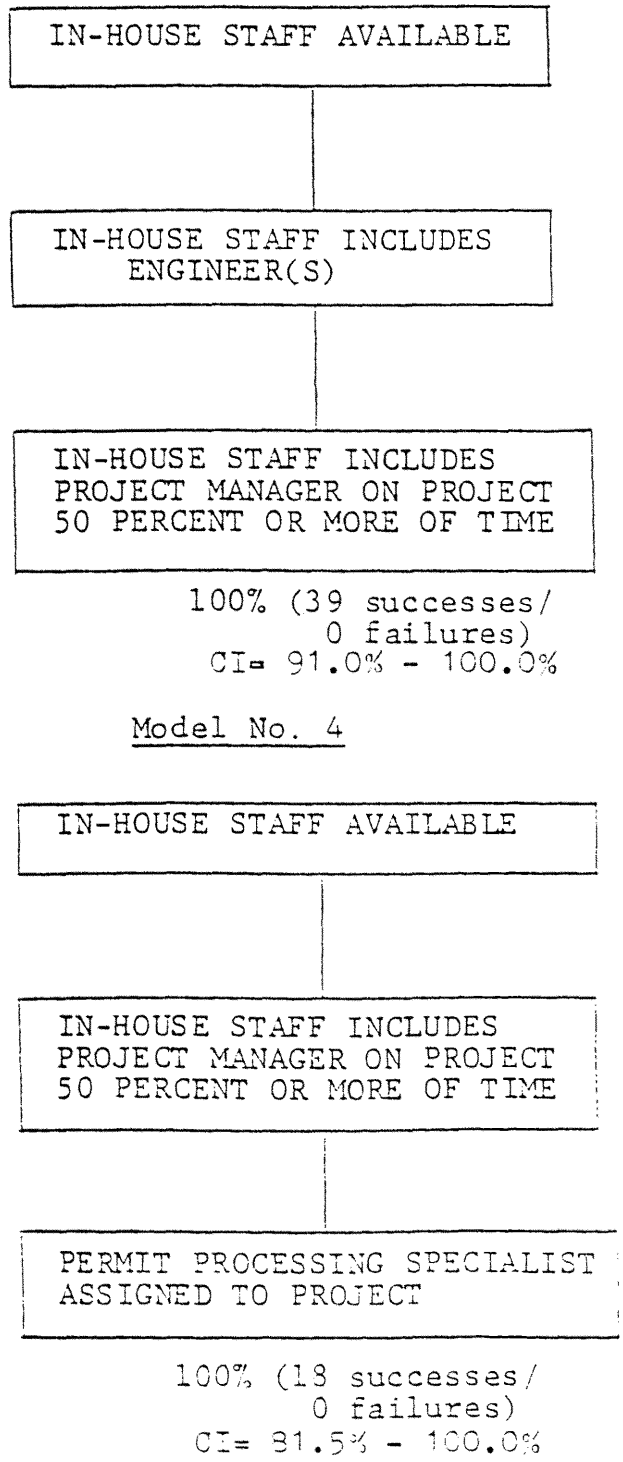


FIGURE 4. MODEL NOS. 3 AND 4

Model No. 5 is presented in Figure 5. This model compares the effectiveness of using consulting services if in-house staff is available to situations where consulting services are used without the availability of in-house staff. Model 5A presented the effectiveness of consulting services if in-house staff is available. Model 5B describes the same situations, but assuming no in-house staff.

In analyzing Models 5A and 5B, two extreme situations can be compared. Model 5A presents a situation where the maximum technical and management expertise is available. Here the use of in-house staff, a consultant to represent the applicant in the process, and environmental expertise are available. This combination produced a success rate of 86 percent (61 successes/10 failures). Model 5B presents the inverse situation where none of the three are available. The success rate here was 52 percent (32/30). This comparison indicates that the availability and use of such expertise is a significant applicant management tool which does effect the outcome of the process.

Of interest also is that if in-house staff was available, the use of a consultant to represent the applicant did not improve the success rate and it in fact decreased from 85 percent to 81 percent. Model 5B shows that if in-house staff is not available, use of consultants becomes more important. The use of a consultant to represent and the use of environmental expertise increased the success

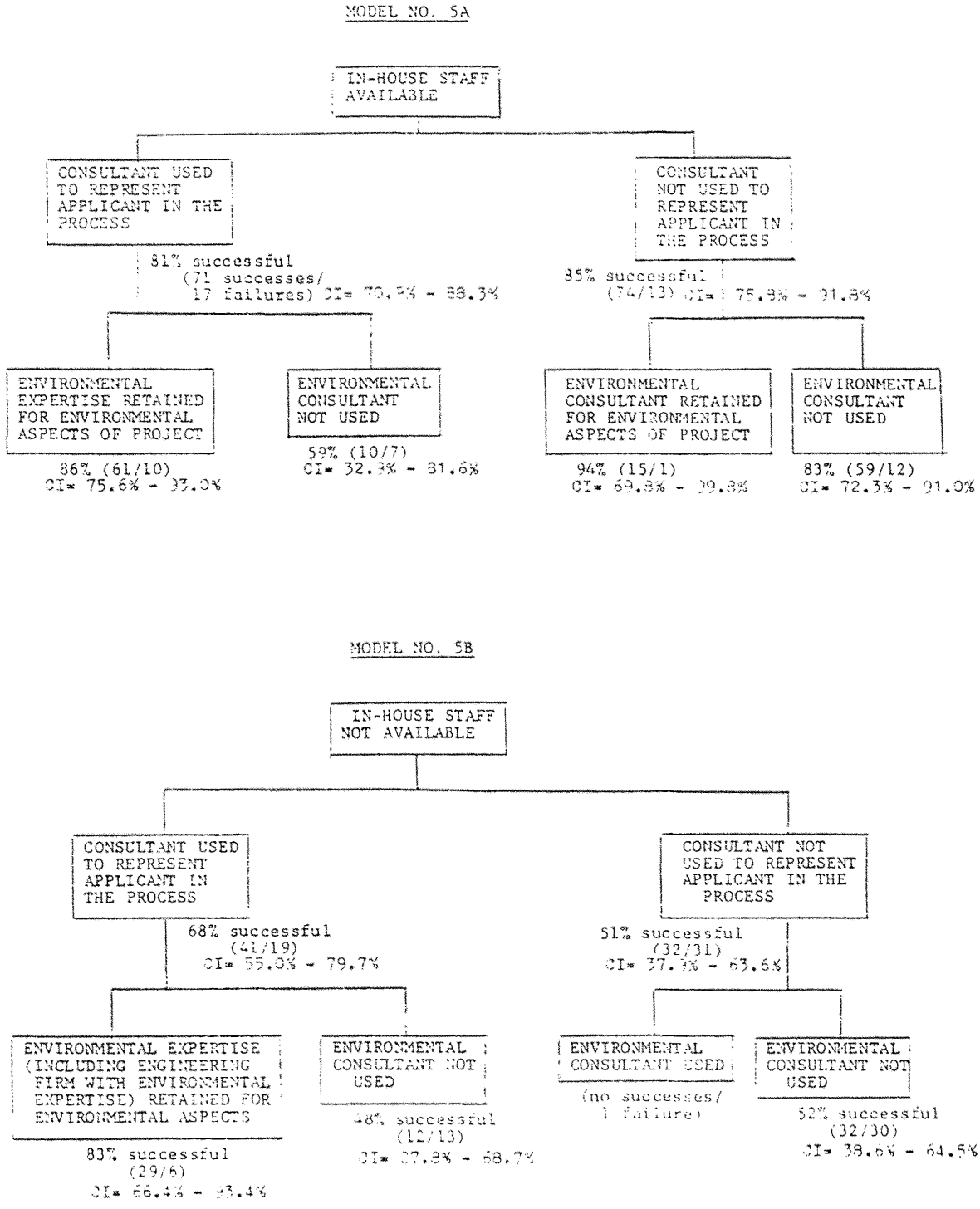


FIGURE 5. MODEL NOS. 5A AND 5B

rate of this group to 83 percent (29/6) from 51 percent (32/31).

Validation of Model 5A provided similar results. In-house staff with a consultant used to represent produced a 88 percent success rate (7/1) and with in-house staff and no consultant a 100 percent success rate (11/0).

Validation of Model 5B also provided similar results to those presented by the model. With a consultant used to represent, but no in-house staff, the success rate was 67 percent; without a consultant 29 percent (2/5).

Model No. 6 focuses on the use of a project manager in-house. Model 6 is presented in Figure 6. Table 7 also focuses on the use of an in-house project manager. Model 6 indicates that with no outside firm to represent the applicant and no coordination with the Corps prior to applying, use of an in-house project manager who spends over 50 percent of his or her time on the project, the success rate is still 89 percent. However, there were only nine projects (8/1) where this situation was found.

Use of a project manager less than 50 percent of their time produced a lower success rate (76 percent) than use of such an individual over 50 percent of their time (89 percent). With no firm to represent and no prior coordination with the Corps, there was a greater success rate with in-house staff available (77 percent versus 49 percent with no in-house staff).

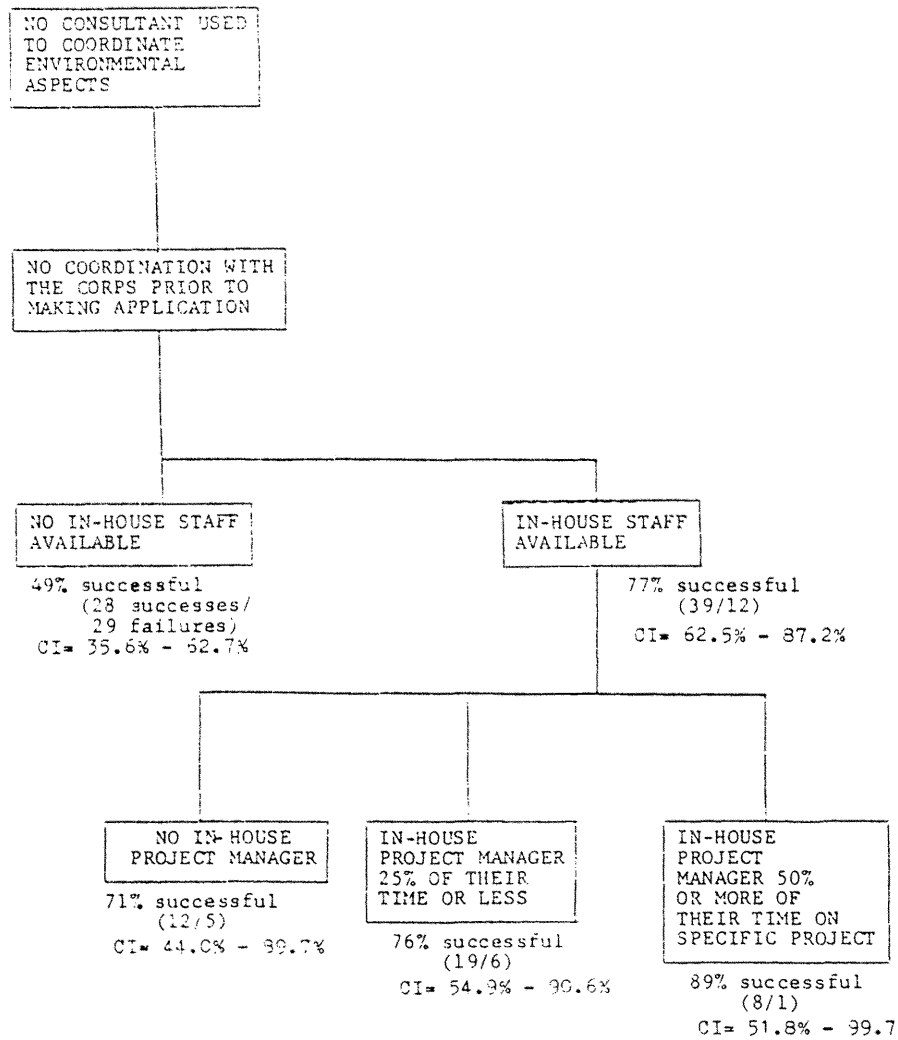


FIGURE 6. MODEL NO. 6

Validation of Model No. 6 produced similar results. With no firm to represent, no prior coordination with the Corps and no in-house staff, the success rate was 50 percent for ten projects (5/5). Under the same conditions, but with in-house staff available, two projects were found in validation. Both were successes.

Use of Consultants by Type Applicant

Model No. 7 (Figure 7) compares the use of consulting services by two categories of applicants which have been shown to have significantly different overall success rates (see Table 4). This model provides information which is specific to Group A and B applicants and applicants as individuals. A primary question dealt with here is: Can the retention of specific consulting services provide an applicant without in-house staff similar success rates to an applicant with in-house staff? Also, if an applicant has in-house staff available, does the retention of specific consulting services further improve the success rate?

Group A and B applicants are the largest business entities in terms of resource availability (essentially monetary resources and staff). Group A includes major national and international corporations. Group B are companies which have multiple offices, plants, or outlets and can be multi-state. For the purposes of the discussion which follows, Group A and B applicants will be referred to as "large businesses".

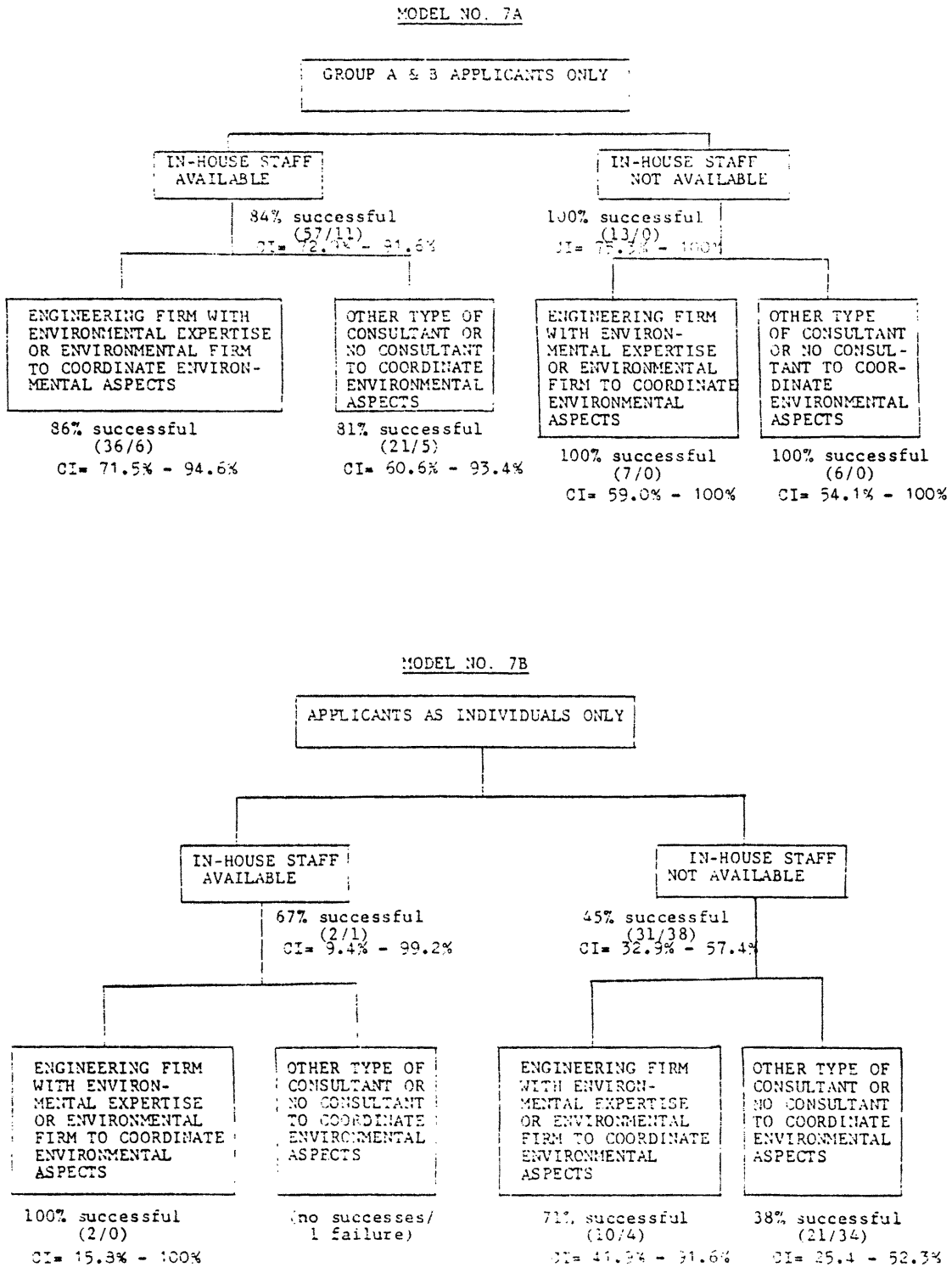


FIGURE 7. MODEL NOS. 7A AND 7B

Large businesses have relatively high overall success rates and individuals as applicants have a relatively low success rate. Table 4 provides additional information on success rate by category of applicants. Model 7 (Figure 7) indicates that large businesses may not significantly increase their success rate by also employing outside consulting services. For this group, if environmental services were obtained, the success rate increased from 81 percent (21/5) to 86 percent (36/6).

The large businesses which did not have in-house staff available for the specific project they were questioned about, nevertheless enjoyed a success rate of 100 percent. There were, however, only 13 projects in this category.

Except for three cases, none of the individual applicants had a staff. The three who indicated they had a staff (4 percent of this category of applicants) perhaps had indirect access to such a group. There is also the possibility of error in responding to the questionnaire. For those individuals as applicants without a staff, the success rate was 45 percent. Where individual applicants obtained expertise from an outside source to coordinate the environmental aspects of the application, there was a 71 percent success rate in contrast to a 38 percent success rate where there was no in-house staff available and outside environmental consulting services were not retained by the applicants.

Validation of Model No. 7 produced seven Group A and B applicants with in-house staff. Six were successful. Six of the seven retained engineering firms with environmental expertise or environmental firms. Five of these six (83 percent) were successes. Validation of Model 7B produced 12 small or individual applicants, none of which had in-house staff. Eight of the 12 also did not retain a consultant with environmental expertise. The success rate for these was 25 percent (2/6). The "individuals" who did hire an environmental consulting service had a 50 percent (2/2) success rate.

Coordination With Agencies

Model Nos. 8 and 9 focus on applicant coordination with agencies in relation to time spent by the applicant and previous experience with the regulatory process. The primary questions dealt with here are: (1) is the timing of the coordination a significant factor?, (2) is coordination with certain agencies or combinations of agencies more important than other courses of action?, and (3) is previous experience with the Corps regulatory process a factor in producing higher success rates?

Model No. 8 (Figure 8) indicates a high success rate for an applicant who has previous experience with the Corps process (two or more previous applications) and who spends 250 hours or more in coordination with agencies prior to applying for Corps authorization. The success rate here

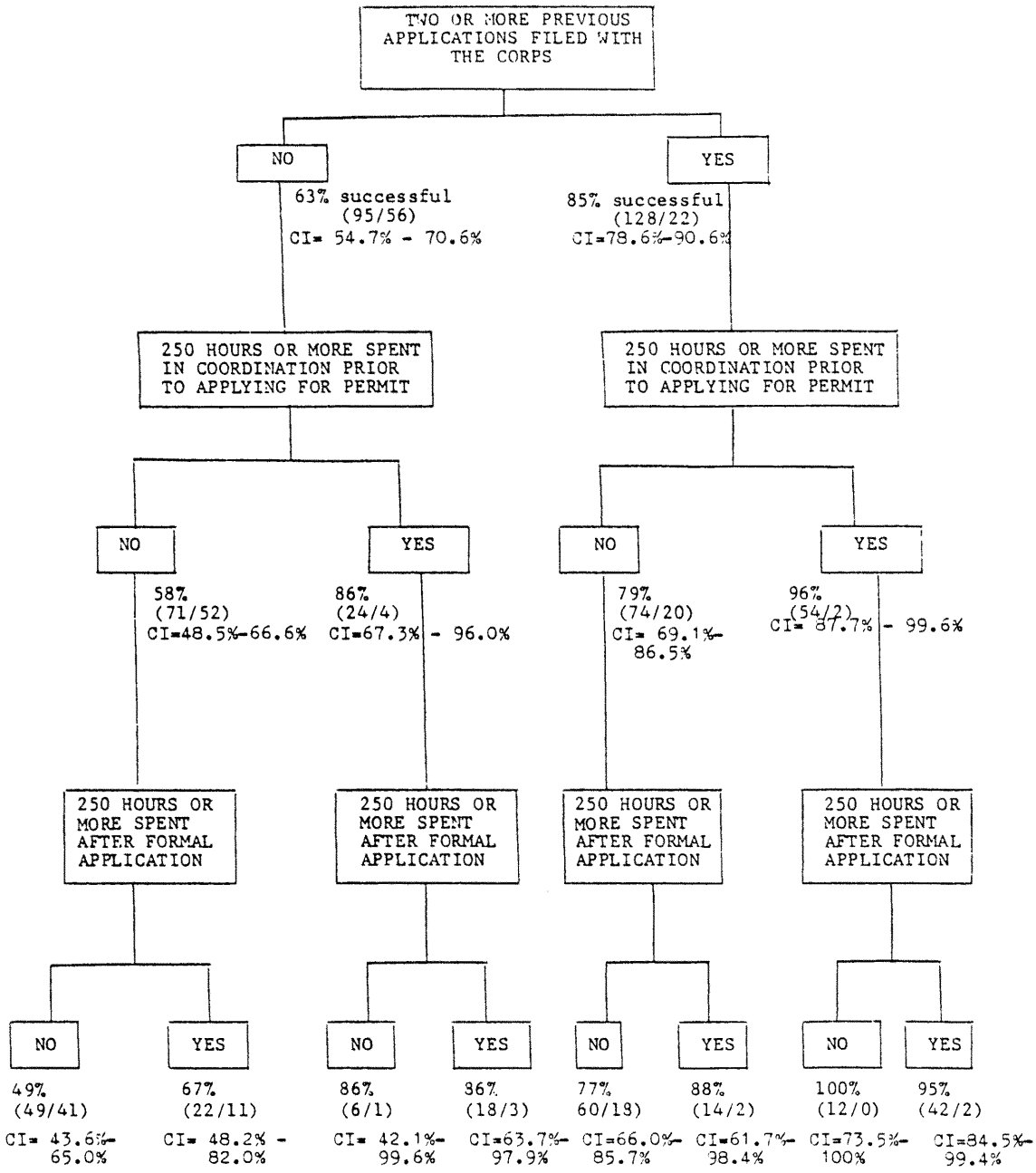


FIGURE 8. MODEL NO. 8

is 96 percent (54/2). The success rate reaches 100 percent if post-application coordination was less than 250 hours. An explanation of this could be that the majority of the coordination and negotiation process was carried out before application was made, and less time was required afterward.

The lowest success rate shown by this model is 54 percent (49/41) for applicants who had less than two previous Corps applications filed, spent less than 250 hours in coordination prior to applying for authorization, and spent less than 250 hours during Corps processing.

The negotiation process requires time and is most effectively carried out in the early project planning stages. The results here suggest that many applicants must have learned this lesson from previous experience. From among the applicants who had less than two previous experiences with the Corps, only 28 out of 151, 19 percent, spent more than 250 hours prior to making formal applications. From among the 150 applicants who had two or more previous experiences with the Corps, 37 percent (56 cases) had spent more than 250 hours prior to submitting their application.

Validation provided the same results. The optimum path provided an 83 percent (5/1) success rate and the least desirable path was a 58 percent (11/8) success rate.

Model No. 9 (Figure 9) also has as its two primary sets those applicants who spent more than 250 hours in coordination with agencies prior to applying, and those who did not. For most paths on this model, success rates were

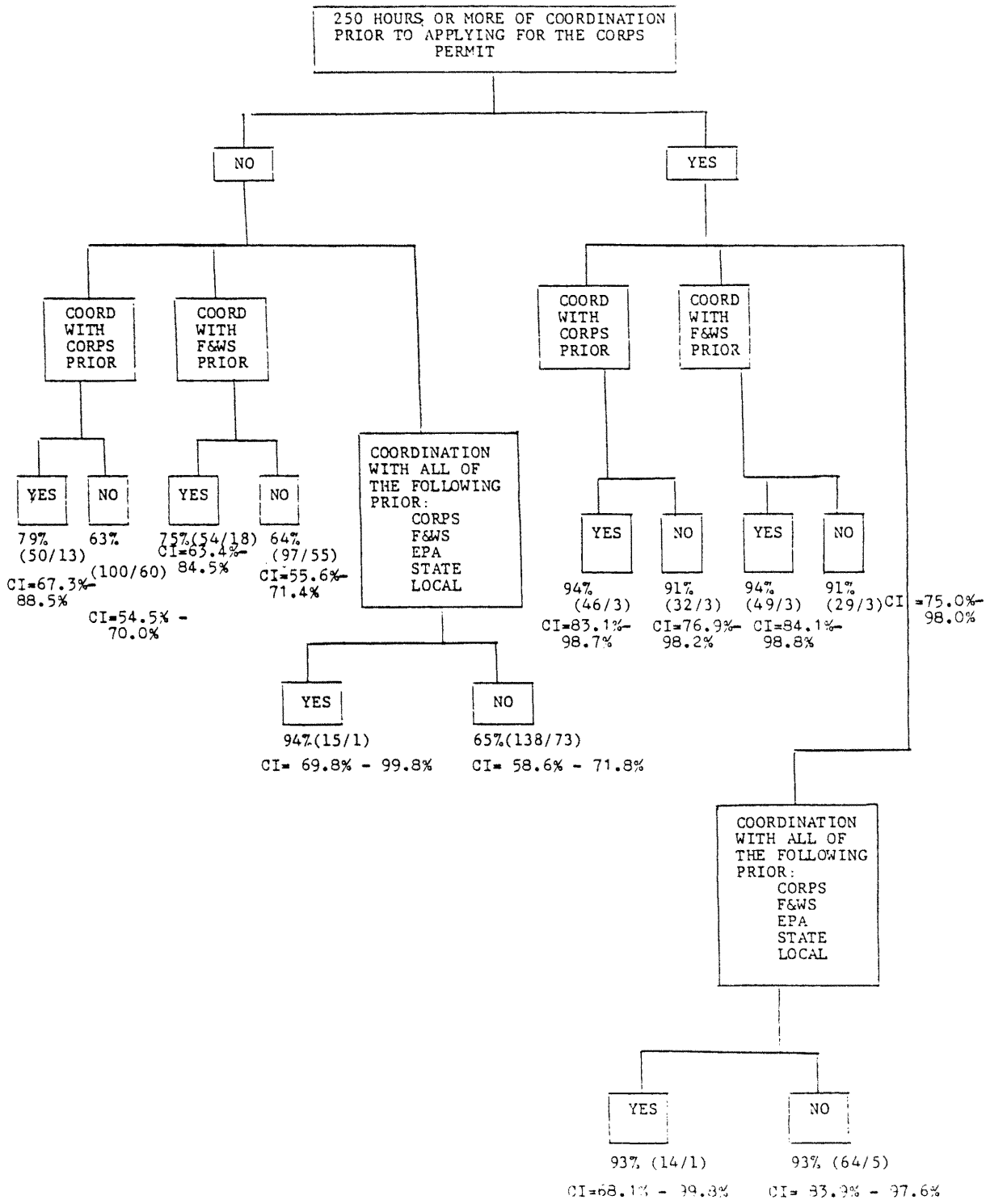


FIGURE 9. MODEL NO. 9

generally about 20 percent higher for the group that spent more than 250 hours in pre-application coordination. The major exception is for applicants who spent less than 250 hours, but still carried out some degree of coordination with all of the primary agencies (EPA, F&WS, state and locals). The success rate for these was 94 percent (15/1). A reasonable explanation for this could be that although a limited amount of time was spent, all agencies were contacted and no unknown and unresolvable obstacles remained at the time of formal application. A number of applicants who followed this path may have discovered unresolvable issues and terminated the process prior to formal application, hence raising the success rate.

Validation again provided similar results. The optimum path was 100 percent (versus 93 percent for the model) and the least optimum path 63 percent (versus 65 percent for the model).

Single Variable Correlations

Success Related to Applicant Coordination Prior to Making Formal Applications

Table 3 indicates that applicant coordination with agencies at any level of government prior to making formal application to the Corps results in an improved success rate. Prior coordination with the U.S. Department of Commerce (National Marine Fisheries Services) yielded the highest success rate (88 percent), but there were only two projects in this category.

TABLE 3. SUCCESS RATE OF APPLICANTS COORDINATING WITH AGENCIES PRIOR TO MAKING FORMAL APPLICATION COMPARED WITH SUCCESS RATE OF APPLICANTS WHO DID NOT COORDINATE

	Prior Coordination		No Prior Coordination		
Agency	Percent Successful	Total Number	Percent Success	Total No.	Signif.*
Corps of Engineers	83.8	142	66.8	226	.001
U.S. EPA	81.2	101	70.5	268	.053
U.S. Fish & Wildlife	84.5	148	66.1	221	.001
U.S. Dept. of Commerce	87.5	24	72.3	343	.165
State	78.8	212	66.2	157	.010
Local Agency	75.1	189	71.7	180	.525
Overall - With Any Agency	75.3	292	66.2	77	.143

*The Chi-square the measure of significance is used for Tables 3 through 12 with an acceptance level of .05.

Prior coordination with the Corps, EPA, and the U.S. F&WS all resulted in success rates between 81 and 85 percent. Prior coordination with state agencies and local agencies resulted in 79 percent and 75 percent success rates, respectively.

The similarity of success rates for prior coordination with EPA and F&WS to prior coordination with the Corps is to be expected as the Corps relies heavily on the opinions of these agencies in making its decisions on permit applications. The exchange of information between these three agencies is to be expected. Therefore, coordination with one is in a sense coordination with all three. However, to maximize the applicant's effectiveness, and to insure that no problems escape the pre-application planning process, coordination with all three might still be advisable.

The lower success rates for state and local coordination prior may reflect the fact that the Corps is not subject to review at the Washington D.C. level if it issues a permit over the objection of a non-Federal agency. Issuance over the objection of another Federal agency can result in elevation of the decision to Washington.

Success Related To Applicant Type

Tables 4 through 6 indicate that certain categories of applicants have significantly higher success rates than others. Table 4 indicates that the success rate for major corporations (Group A) is close to 100 percent (96 percent);

TABLE 4. SUCCESS BY TYPE OF APPLICANT

Applicant Type	Percent Successful	Number of Cases	Signif.
Major Corporation	96.2	26	<.001
Large Business	78.7	183	<.001
Small Business	63.4	93	<.001
Government Agency	82.7	162	<.001
Private Individual	48.6	175	<.001
Private Organization	60.0	10	<.001

for large businesses (Group B) it is 79 percent; and for government agencies 83 percent. But the success rate for private individuals is only 49 percent.

The classification of applicant types allows for some overlap, but is essentially sound. As indicated previously, major corporations are identified as the largest category of business entity in terms of resources available, number of employees, income, etc. Small businesses are the smallest category in terms of this criterion. They are usually owned and operated by one individual and the number of employees is typically only five to ten. Large businesses (Group B) include all that do not fit into either of the previous two categories. The terms government agency, private individual, and private organization are self-explanatory.

In most cases the public notices provided enough information to clearly classify the applicants. A large number of applicants were contacted to define more clearly which category was appropriate. There are possible areas of overlap in classification, particularly at the dividing point between the Group A and Group B large businesses. Overlap between other categories is much less likely. In most cases, the break between categories of applicants was quite well defined and obvious. The correlation of applicant type to success was not a primary objective of this research and was essentially an unexpected discovery. For this reason a fully quantifiable classification system had not been formulated. The general trend indicated by the

data is considered reliable, but further research in this area is recommended.

The data shown in Table 4 imply that there is a significant correlation between the size of the organization (size in terms of staff available and monetary resources available) and success. The private individual generally does not have the resources to "control" the project planning process as the Group A or Group B business, or a large government agency might. Effective mitigation, for example, requires both money and technical expertise. Previous data show that the private individual is at a disadvantage in not having in-house staff and in not using the services of consultants to the same degree as other categories of applicants.

Lack of previous experience is another related explanation of the relative low success rate of individuals. A large organization is much more likely to have in-depth experience with the Corps regulatory process or a related category of regulation. Experience gives insight into the dynamics of inter-agency coordination, and also into how specific impacts can be mitigated. Experience also is valuable in terms of identifying a project site or project plan which will definitely not be acceptable. In many cases this can be done before formal application is made to the Corps. Therefore, for applicants able to immediately identify such projects, the failure rate would be lower. This must also be considered effective application management,

as early termination of such a project can result in substantial savings of time and money.

Table 5 focuses on success by category of applicant, but only for projects which involved work in wetlands. During recent years wetlands have received maximum protection from Federal regulations and guidelines and a project which adversely impacts this resource would have to overcome substantial objections to it and the prospects of success would be small. Yet, Table 5 indicates a 100 percent success rate for major corporations and a 84 percent success rate for large businesses. The success rate for private individuals was 41 percent.

Table 5 suggests that there is a relationship between money available to the applicant and the applicant's success in obtaining a permit (regardless of the resource being impacted). The lowest success rates for private individuals are for the smallest projects in terms of acres of wetland impacted. A relationship can be drawn between smaller projects, where less capital is probably available, and the larger projects where the available capital is likely to be greater. There certainly are other explanations as well. An important but related factor is the amount of land available to the applicant. If it is small, the applicant has less flexibility in terms of re-designing the project to avoid the most sensitive portions of the wetland. Less land would also be available with which to develop acceptable mitigation.

TABLE 5. SUCCESS IN OBTAINING PERMITS FOR WETLANDS WORK BY CATEGORY OF APPLICANT AND SIZE OF TRACT

Percent Successful (Number Successful and Total)

Category of Applicant

Acres of Wetland Involved	Major Corporation	Large Business	Small Business	Government Agencies	Private Individuals	Private Organizations	Totals
1 or less	100(2/2)	91.3(21/23)	71.4 (10/14)	71.4(5/7)	36.4(12/33)	66.7(2/3)	63.4%
1.1 to 5	100(2/2)	82.6(19/23)	46.7 (7/15)	77.3(17/22)	34.8(8/23)	66.7(2/3)	62.5%
5.1 to 10	100(2/2)	85.0(17/20)	66.7 (2/3)	71.4(10/14)	71.4(5/7)	100(1/1)	78.7%
10.1 to 25	100(3/3)	75.0(9/12)	66.7 (2/3)	88.2(15/17)	40.0(2/5)	none	77.5%
25.1 to 50	none	80.0(4/5)	50.0 (1/2)	100(8/8)	0 (0/2)	none	76.5%
50.1 to 100	100(3/3)	100(2/2)	100(4/4)	75.0(6/8)	66.7(4/6)	none	82.6%
100.1 to 250	none	0(0/1)	50.0 (1/2)	50.0(2/2)	100(1/1)	none	66.7%
250.1 to 500	100(2/2)	none	none	100(3/3)	0 (0/2)	none	71.4%
500.1 to 750	none	none	0(0/1)	none	none	none	0
750.1 to 1000	none	none	none	none	none	none	none
1000.1 or more	100(1/1)	none	0(0/1)	100(1/1)	none	none	66.7%
	100 %	83.7 %	62.2%	81.7 %	40.5 %	71.4 %	69.4%

The high success rates for larger applicants and government agencies for work in wetlands indicates that no matter how valuable or significant in environmental terms the wetlands may be, it is usually possible through effective management of the process to obtain the Corps permits. Previous discussions have shown that these larger organizations have significant advantages in terms of in-house staff availability, previous experience, and use of consultants. The objective of the fish and wildlife agencies in protecting the wetland resource is to maximize overall productivity and maintenance of the resource. Aggressive applicant process management focuses on cooperative negotiation with the responsible agencies to develop an overall package which will allow development on the site desired by the applicant but which will also result in a net increase in resource productivity. This mutually beneficial arrangement is possible in almost all situations but requires that the applicant have money and awareness of and a sophisticated understanding of the process and the resources involved.

Table 6 is concerned with success by category of applicant, but only for government agencies. A similar pattern is found within this subset. The success rate declines from the highest rate for Federal agencies (93 percent), down through state (85 percent), county (75 percent) and local (71 percent). Special purposes agencies had a success rate of 92 percent. This pattern can

TABLE 6. SUCCESS IN OBTAINING PERMITS BY GOVERNMENT AND GOVERNMENTAL AGENCIES

Type Agency	Percent Successful	Cases Success/Total	Signif.
Federal	93.3	14/15	.001
State	84.6	33/39	.001
County	75.0	15/20	.001
Local	70.7	29/41	.001
Special	91.5	43/47	.001

probably be attributed to a combination of staff and resource availability and lines of communication.

In general, the Federal and state agencies have larger staffs and better access to in-house technical expertise. The category of "local" agency includes many small towns which may have no more than, for example, one city engineer, if that. The staff available to local agencies may be comparable to the category of "small business", although most small businesses would not have even one engineer. A comparison of success rates between these two categories supports this explanation. The success rate for local agencies is 71 percent and for small businesses 63 percent.

The higher success rate for special agencies might be explained by the fact that many of these, such as sewer districts, are managed and operated primarily by technical people, including those with water quality expertise. Also, the primary mission of these agencies requires construction activity. Their staffs, consequently, might be expected to have considerable experience in dealing with the Corps and other permitting agencies.

Lines of communication are generally better between Federal agencies than they would be between a Federal agency and a local or county agency. States fall somewhere in the middle. Federal agencies are essentially forced to "communicate" with each other by regulations that require mutual compliance. A Federal agency would be more likely to discover that a specific development project was totally

unacceptable prior to applying for a Corps permit than a local agency somewhere in a relatively isolated part of the country. Also, many applications from Federal agencies are either from Department of Defense agencies, which can claim national defense priority, and/or are doing the work on government land, which is already committed to intense development, or are from agencies such as the Fish and Wildlife Service which are doing the work for "habitat improvement". The latter is also true of state fish and wildlife agencies.

Federal and state agencies have another advantage in the size of staff, the pooling of staff experience, and the availability of technical expertise. This is analogous to the "advantage" held by the major corporations and the other large business enterprises.

Success Related to In-House Capability

Table 7 shows the effectiveness of in-house staff. With in-house staff available, the success rate was 84 percent; without in-house staff, only 60 percent. In-house staff provides the applicant with technical expertise necessary to allow for flexibility in project design and to effectively negotiate mitigation. If an applicant does not have a complete understanding of the natural resource systems being impacted, the applicant cannot negotiate matters concerning the preservation and enhancement of that system. A full understanding of the ecological values and interrelationships can be a significant advantage in

TABLE 7. PERMIT SUCCESS RELATED TO IN-HOUSE CAPABILITY

	Percent Successful (#/total)		Significance
In-House Staff Available			
Yes	83.8	(171/204)	<.001
No	59.6	(93/156)	<.001
In-House Staff Includes Specialist In Processing of Permits			
Yes	86.0	(43/50)	.044
No	71.2	(228/320)	.044
Percent Time Project Manager On Project			
None	63.4	(123/194)	<.001
10%	76.2	(48/63)	<.001
25%	79.6	(39/49)	<.001
50%	96.0	(24/24)	<.001
75%	100.0	(12/12)	<.001
90%	95.8	(23/24)	<.001

designing a mitigation package and, in fact, determining that mitigation or compensation can offset the loss of resources resulting from damage being done by the project. An applicant without such technical expertise available is at a marked disadvantage in dealing with the highly trained staff of the Federal and state fish and wildlife agencies.

Table 7 indicates the value of having an employee who is a specialist in processing of permits. Where permit processing specialists were available to applicants, there was an 86 percent success rate. A person with such experience and skills gives an applicant considerable advantage in dealing with the permitting process at all levels of government. This category of expert can keep abreast of changes in regulations and of changing trends in resource valuation. Agencies such as the Corps are usually extremely sensitive to the threat that their actions in the decision-making process may be challenged as being arbitrary and capricious. Consistency is therefore a primary consideration in the administration of regulatory programs. If fully aware of the type of projects being permitted and the degree and type of impacts being allowed by the agency, an applicant has the advantage of knowing all options that are open in terms of site selection and project design.

Personal relationships are as important in the realm of environmental regulation as they are in any aspect of business. A permit processing specialist's friendships with individuals involved in the regulatory process can be of

benefit to the applicant both in terms of maximizing communications and assuring maximum cooperation. This category of expert benefits the applicant both by the expert knowledge he/she has of the process and by the contacts made.

Table 7 also indicates the value of having a project manager in obtaining a permit and that the more time that person can spend on the assignment, the better, particularly if that person is able to devote over one-half of his or her work time to that specific project. While much of the value of such a person in managing the application process comes from knowledge and skills similar to those of the permit processing specialist, this person also is "the" expert on the specific project itself and has primary responsibility to move the construction forward as quickly and as economically as possible. His or her expert knowledge of the project and of the flexibility available in terms of time and money can also help maximize an applicant's path toward success.

Success Related to Use of Consulting Services

Table 8 is concerned with the relative effectiveness of four types of commonly used consulting services. This table is only concerned with the use of consultants to represent the applicant in the regulatory process, and not to perform specific technical tasks. There is some overlap between the use of these services, and this explains why the total for each of the line items exceeds the overall total.

TABLE 8. SUCCESS RELATED TO TYPE CONSULTANT USED TO REPRESENT APPLICANT IN CORPS PROCESS

Type Firm	Percent Successful	Number (Successes/total)	Signif.
Environmental	89.1	(41/46)	.016
Engineering	77.4	(103/133)	.205
Law	66.7	(46/69)	.212
Permit Coordinating	81.8	(9/11)	.767
OVERALL- any one or all of the above	75.0	(141/188)	.552

Table 9 relates to a more specific role for consultant services--their use to coordinate the environmental aspects of the project. There is no overlap in Table 9.

Both tables indicate that environmental expertise (as represented both by environmental firms and engineering firms with environmental specialists) is an important factor in obtaining a permit. The advantages are similar to those discussed in relation to Table 7. In this case the applicant can hire outside experts to design the most acceptable project environmentally and to negotiate the mitigation.

The relatively low success rate for law firms in Table 8 and 9 is difficult to explain, particularly in Table 8. It would be expected that an applicant would be at a disadvantage if a law firm were used to coordinate the technical (environmental) aspects of the project (as 21 did). This aspect requires technical skills and knowledge and not just knowledge of the regulations and the ability to negotiate. If the law firm were the only source of professional advice, and neither it nor the applicant had access to the technical expertise of persons from the environmental sciences, the applicant would be handicapped.

A possible explanation of the low success rate for law firms might be that applicants tend to retain such firms because they have encountered serious legal problems rather than simply environmental problems. Problems with zoning or property rights may have existed which were not resolvable

TABLE 9. SUCCESS RELATED TO TYPE CONSULTANT USED TO CORRDINATE JUST THE ENVIRONMENTAL ASPECTS

Type Firm	Percent Successful (#/total)		Signif.
Engineering with Environmental Capability	82.9	(87/105)	.004
Environmental	83.3	(30/36)	.004
Law Firm	52.4	(11/21)	.004
No Consultant Used	67.0	(118/176)	.004

and which also resulted in the lower success rate. This possibility is worth investigating in any further research.

Time and Experience Related to Success

Previous experience with the Corps of Engineers process and the time spent in coordination prior to applying for the permit are both factors in determining success or failure as indicated by the data in Table 10. An applicant with the experience gained in submitting two or more previous applications to the Corps had a significant advantage. The success rate in these cases was 85 percent versus less than 65 percent for those without this experience. Most of the probable reasons for this difference in the chances of success have been discussed on previous pages: knowledge of the regulatory process; knowledge of agency "consistency" patterns; knowledge of the mitigation process; knowledge of the relative value placed on the resources by the agencies involved; and personal acquaintances with staff of the agencies.

The fact that the significance threshold was reached at two previous applications and not just one, may indicate that this statistic is as much representative of the type of applicant as anything else. The large business enterprises and the larger agencies can be expected to have had more experience with the regulatory process.

Applicants who have spent 250 hours or more in coordination activities prior to applying for the permit

TABLE 10. TIME INVESTMENT AND EXPERIENCE RELATED TO SUCCESS

Previous Experience With Corps Regulatory Process

	Percent Successful	Number & (total)	Signif.
No Previous Applications	62.6	(97/155)	.001
One Previous Application	64.1	(25/39)	.001
Two or More Previous	85.1	(149/175)	.001

had a much higher success rate (88 percent) than those that spent 50 hours or less (69 percent) (Table 11). The higher success rate can be attributed to significant pre-application planning and the fact that these applicants worked with the agencies in planning the project. Given the amount of time spent prior to applying for authorization, the probability of there being many surprises during processing would likely be low. It is also unlikely that an applicant would devote 250 hours or more to pre-application coordination unless there were some indications of a high probability of success. Certainly the applicant would by then know whether there were any unresolvable obstacles.

Success Related to Source of Comments

Table 12 presents data concerned with a slightly different perspective on success versus failure. These data are concerned with the source of objections as a variable in determining success or failure. It identifies the groups and agencies which have been most effective in blocking projects. The successful applicant may be successful because the project has effectively addressed the concerns of these groups. The data indicate that if a state agency objected, the success rate was only 41 percent. The success rates were also low if the EPA objected (47 percent) or if the U.S. F&WS objected (53 percent). On the other end of the spectrum, even with objections from private individuals and environmental/conservation groups, projects still enjoyed a 70 percent success rate.

TABLE 11. TIME SPENT IN COORDINATION PRIOR TO FORMAL APPLICATION RELATED TO SUCCESS

Time	Percent Successful	(Number & Total)	Significance
None	56.0	(14/25)	.001
10 Hours	67.5	(85/126)	.001
50 Hours	69.4	(75/108)	.001
250 Hours	87.8	(43/49)	.001
500 Hours or more	95.8	(46/48)	.001

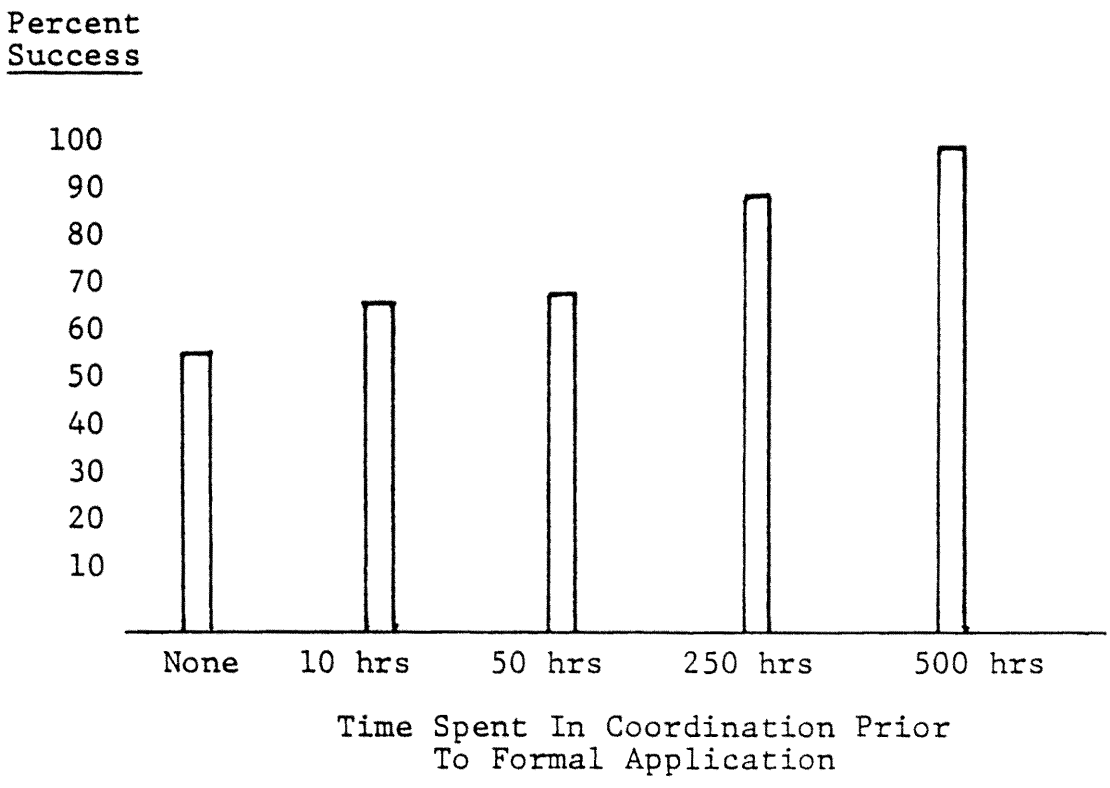


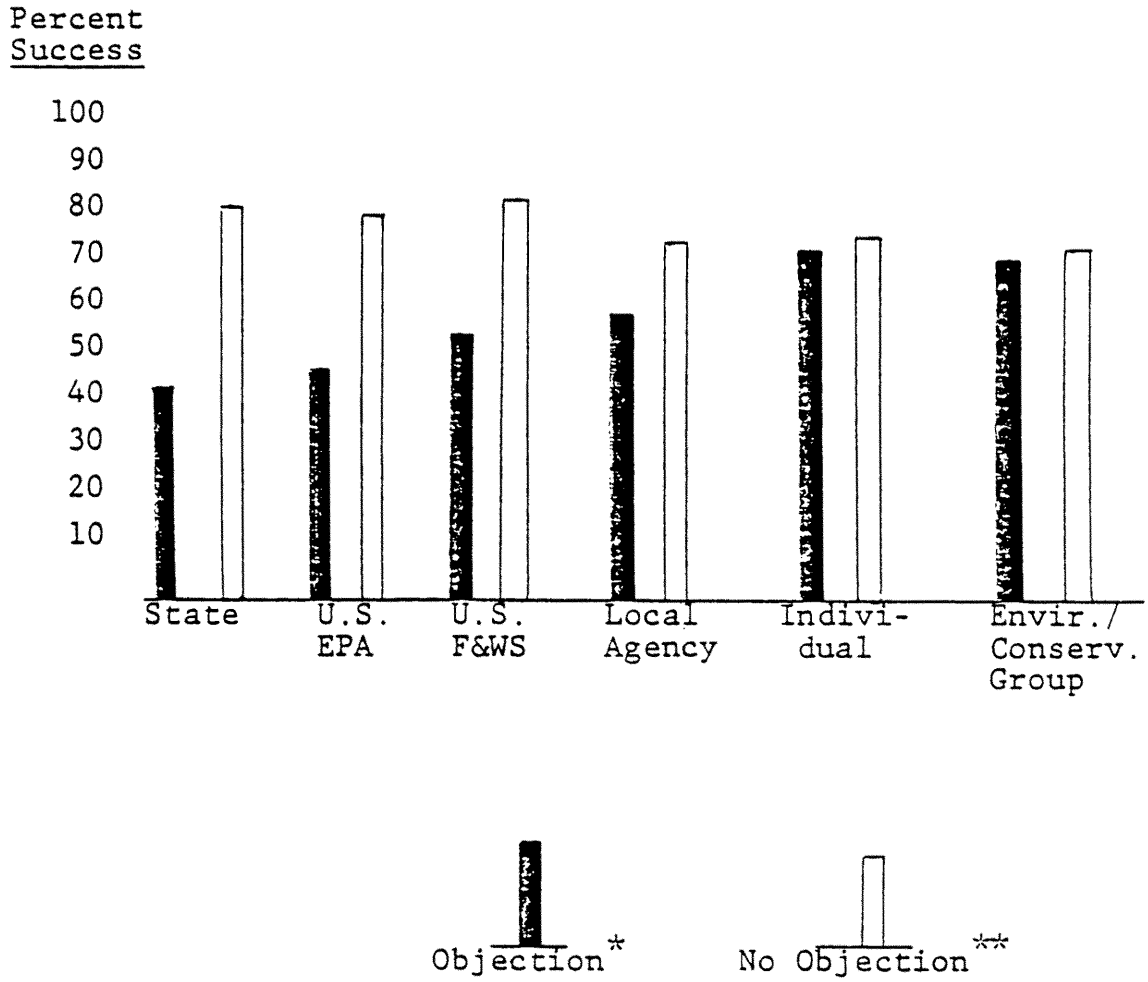
TABLE 12. SUCCESS RELATED TO SOURCE OF COMMENTS

Commentor	Commentor Objected %Success	(#/total)	No Objection %Success	(#/total)	Signif.
U.S. EPA	46.9	(75/160)	78.4	(240/306)	<.001
U.S. Fish & Wildlife	53.4	(117/219)	81.5	(185/227)	<.001
State	41.2	(63/153)	80.1	(213/266)	<.001
Local Agency	58.2	(39/67)	73.1	(357/484)	<.001
Environmtal/ Conserv Grp.	70.0	(63/90)	71.1	(320/450)	.038
Individual	68.6	(109/159)	71.1	(271/378)	.049

Figure 10, which provides a visual comparison, can be interpreted to read that the greater the difference between "no objection" and "objection", the more effective that source is in affecting success or failure. A reasonable explanation of these results is that the larger entities, as is the case if they are the applicant, have in the size of their staff and resource availability, also more influence as an objector. In addition, numerous regulations and NEPA require the Corps to be responsive to the mandate of Federal and state agencies. If another Federal agency objects, for example, they are protecting the same national interest the Corps is mandated to protect.

An objection by a state or Federal agency may also reflect multiple public interest, because these agencies often consider various elements of the physical and social environment. A state is not a single interest entity. The fact that state objections bear the heaviest of all is possibly explained by the necessity for the Corps to be responsive to a regional definition of the overall public interest. In a sense, the Corps permits the state to determine what the public interest is within its boundaries, unless there is a direct conflict with Federal regulations.

The explanation for the essential lack of impact on success versus failure for projects which have drawn objections from individuals and/or environmental/conservation groups, is that these objectors quite often reflect special interest, and not the overall public interest, and they often



*Indicates applicant success rate if the given agency, group, or if an individual objected to to project.

**Indicates applicant success rate if the entity indicated did not object.

FIGURE 10. SUCCESS RELATED TO SOURCE OF COMMENTS

lack the staff and resources to significantly influence the process. For example, an individual might object to a given project because it will detract from her or his view of the mountains. The regulating agency would certainly give consideration to this objection, but would likely not be justified in denying authorization for a multi-million dollar project based on this alone. An environmental organization might object to a project because habitat for a certain bird species was to be destroyed. If that bird species was not specifically protected by Federal or state regulations, and the public was to benefit economically and otherwise from the project, it is unlikely that authorization would not be granted based on this alone.

Distributions For Selected Variables

In addition to the data which have been presented and analyzed on the previous pages, information was obtained on additional variables related to the projects studied. The distribution of projects by region, waterway, by degree of urbanization, by type of authorization, year of final action, and by category of project give the reader another perspective of the projects examined. While some of these factors may also be important in determining whether a project is successful or unsuccessful, these factors were not included in the models which were examined. The variables used in the models are those which are most important when the problem is viewed as one of how applicants can manage

the application process. However, because they may provide insights for future research, they are being presented in this section.

Each table which follows presents five categories of numerical information: (1) Phase I number of projects - this is the total number of projects in the sample fitting each described category; (2) Phase I success rate - this is the percent of Phase I projects which were successful; (3) Phase II number of projects - this is the number of Phase II projects which were analyzed based on questionnaires returned; (4) percent of Phase I returned - this is the percentage of Phase I projects for which questionnaires were returned; and (5) Phase II success rate - this is the percent of Phase II projects which were successful.

Regional Distribution

Table 13 presents the regional distributions. The regions correspond with the Corps division offices. The largest number of projects came from the southwest, which includes southern California. All regions were well represented. The east coast tended to have the lowest overall response rate to the questionnaire. The success rate for the Phase II data versus the Phase I was lower only for the Missouri River region and the south Atlantic region. For the remainder of the regions there was a slightly greater tendency to return the questionnaires for successful projects versus non-successful.

TABLE 13. REGIONAL DISTRIBUTIONS

Region	Phase I No. of Projects	Phase I Success Rate	Phase II No. of Projects	Percent of Phase I Returned	Phase II Success Rate
New England	15	66.7%	6	40.0%	100.0%
North Atlantic	54	74.1%	25	46.3%	80.0%
South Atlantic	90	83.3%	50	55.6%	82.0%
South Pacific	60	76.7%	34	56.7%	85.3%
North Pacific	71	54.9%	50	70.4%	56.0%
Southwest	95	70.5%	53	55.8%	71.7%
Missouri River	41	73.2%	28	68.3%	71.4%
Lower Mississippi	63	74.6%	41	65.1%	80.5%
Ohio River	66	56.1%	36	54.5%	61.6%
North Central	95	66.3%	50	52.6%	74.0%
	650		373		

Distribution by Waterway

Slightly less than 50 percent of the projects studied (311) were on smaller rivers (this excluded the major rivers such as the Mississippi, Missouri, Hudson, and Colorado) (Table 14). The overall success rate for the sample was the highest for projects on the Atlantic Ocean. Inland lakes other than the Great Lakes had the lowest success rate. With the exception of the "other lakes" category, the success rate on projects with returned questionnaires was higher than for the Phase I data in all cases.

Distribution by Degree of Urbanization

Table 15 indicates the general size of the urban areas in which the project was located. Over half or 57.8 percent (376) of the projects were not in urban areas (the 'urban' classification included suburbs in the metropolitan area). The highest success rates were found for projects in areas with a population over one-half million people. The lowest success rate (70.5 percent) was for the rural areas. Overall, from the rural up through the largest category, there was an increasing tendency to return questionnaires for successful projects versus unsuccessful.

Distribution by Type of Authorization

The highest success rate was for projects which required Section 10 and Section 404 authorization (Table 16). These projects also represented over one-half of the total

TABLE 14. DISTRIBUTION BY WATERWAY

Waterway	Phase I No. of Projects	Phase I Success Rate	Phase II No. of Projects	Percent of Phase I Returned	Phase II Success Rate
Pacific Ocean	48	66.7%	34	70.8%	67.6%
Atlantic Ocean	55	87.3%	27	49.1%	92.6%
Gulf of Mexico	43	55.8%	29	67.4%	58.6%
Great Lakes	26	69.2%	15	57.7%	80.0%
Major Rivers	84	76.2%	55	65.5%	81.8%
Other Rivers	311	71.4%	170	54.7%	75.9%
Other Lakes	82	54.9%	43	52.4%	53.5%
Beaufort Sea	1	100.0%	0	0	0
	650		373		

TABLE 15. DISTRIBUTION BY DEGREE OF URBANIZATION

Total Population	Phase I No. of Projects	Phase I Success Rate	Phase II No. of Projects	Percent of Phase I Returned	Phase II Success Rate
2 million or more	21	81.0%	10	47.6%	90.0%
1 million to 2 million	37	70.3%	24	64.9%	79.2%
500,000 to 1 million	20	85.0%	16	80.0%	87.5%
100,000 to 500,000	48	68.8%	21	43.8%	76.2%
less than 100,000	148	67.6%	85	57.4%	74.1%
Rural	376	69.4%	217	57.7%	70.5%
	650		373		

TABLE 16. DISTRIBUTION BY TYPE OF AUTHORIZATION

Type Auth.	Phase I No. of Projects	Phase I Success Rate	Phase II No. of Projects	Percent of Phase I Returned	Phase II Success Rate
Section 10	77	62.3%	40	51.9%	65.0%
Section 404	235	65.1%	141	60.0%	69.5%
Section 10 & 404	338	74.9%	192	56.8%	78.1%
	650		373		

sample. The questionnaires response rate was almost ten percent higher for Section 404 projects than for Section 10 projects.

Distribution by Year of Final Action

Table 17 indicates that the distribution of the projects over the years studied showed relatively equal distribution. The 1979 category includes only October through December of that year (the beginning of fiscal year 1980). The success rates for the early projects tended to be lower. This may reflect the fact that less emphasis by the Corps to expediate all actions in the pre-1980 years allowed low probability of success projects to remain on the books longer.

Distribution by Type of Project

The data indicates that 30.6 percent (199) of the projects studied were commercial in nature (Table 18). The highest success rate for projects representing at least five percent of the total sample was for navigation improvements. This may be explained by the fact that virtually all such projects would be considered to be improving use of the waterway for navigational purposes (clearly water dependent). Public works type projects such as water treatment, water supply, and bridges or roads tended to have higher success rates. This is logical as these projects generally would be considered to serve an overall public need (interest). The lowest Phase I success rate was for industrial projects

TABLE 17. DISTRIBUTION BY YEAR OF FINAL ACTION

Year	Phase I No. of Projects	Phase I Success Rate	Phase II No. of Projects	Percent of Phase I Returned	Phase II Success Rate
1983	159	70.4%	87	54.7%	73.6%
1982	213	69.0%	131	61.5%	75.6%
1981	146	76.0%	79	54.1%	77.2%
1980	117	65.0%	68	58.1%	66.2%
1979	15	53.3%	8	53.3%	71.4%
	650		373		

TABLE 18. DISTRIBUTION BY TYPE OF PROJECT

Type Project	Phase I No. of Projects	Phase I Success Rate	Phase II No. of Projects	Percent of Phase I Returned	Phase II Success Rate
Navigation Improvement	34	85.3%	25	73.5%	88.0%
Marina	52	73.1%	25	48.1%	88.0%
Agricultural	48	60.4%	28	58.3%	64.3%
Mining	45	73.3%	28	62.2%	75.0%
Residential	34	44.1%	19	55.9%	47.4%
Commercial	199	67.8%	100	50.3%	67.0%
Industrial	10	40.0%	5	50.0%	80.0%
Recreational	59	66.1%	37	62.7%	67.6%
Flood Control	71	70.4%	37	52.1%	73.0%
Pipeline	11	81.8%	6	54.5%	83.3%
Bridge or Road	39	84.6%	25	64.1%	88.0%
Water Treatment	11	81.8%	10	90.9%	80.0%
Power	12	75.0%	7	58.3%	85.7%
Sanitary Landfill	4	50.0%	3	75.0%	33.3%
Water Supply	9	100.0%	8	88.9%	100.0%
Habitat Improvement	7	85.7%	6	85.7%	83.3%
Military Exercise	1	100.0%	1	100.0%	100.0%
Land Disposal Dredged Material	2	100.0%	1	50/0%	100.0%
	650		373		

(40.0 percent), but this is represented by only ten projects. This category also had the second lowest response rate to the questionnaires, with the majority returned being for successful actions (80.0 percent).

CHAPTER VII

CONCLUSIONS AND RECOMMENDATIONS

The primary hypothesis of this dissertation is that those being regulated (the applicants) have a high degree of control over the regulatory process. The objective of the research was to describe management by the applicant by quantification of the characteristics. The primary measure of the effectiveness of applicant management was the end result of the regulatory process, the final action. A series of models were developed to identify applicant management paths to success or failure. A number of single variable correlations to success or failure were also presented.

The null hypothesis was presented as "...there is no applicant control over the regulatory process." The data presented in this dissertation indicates that the null hypothesis can be rejected. The Models and the Single Variable Correlations indicate that there are a number of decisions an applicant can make and courses of action which can be taken that do effect success and failure. The data indicates that all of the following show correlation to success:

(1) Applicant coordination with key Federal agencies and state agencies prior to applying for the Corps permit.

(2) The availability of in-house staff and particularly a project manager spending the majority of his/her time managing a specific project.

(3) The use of specific types of consulting services both to represent the applicant in the regulatory process and to coordinate the environmental aspects.

(4) Applicant time spent in the "planning" process prior to applying for the authorization. And related to this, previous experience with the regulatory process.

The models show that certain combinations of applicant action result in a very high probability of success. The models indicate that the following combinations correlate to success:

(1) The availability of in-house staff including an engineer and a project manager.

(2) Retaining an engineering firm with environmental expertise or an environmental firm to coordinate the environmental aspects; coordinating with the U.S. Fish and Wildlife Service prior to applying for the permit; and providing mitigation.

(3) Using in-house staff in combination with consulting services both to represent the applicant and to coordinate the environmental aspects.

(4) Having two or more previous experiences with the Corps process (this experience can be obtained by

the use of an experienced consultant) and spending 250 hours or more in "planning" prior to applying for the Corps permit.

(5) If 250 hours cannot be spent in planning, then using the time which is available to at least contact all of the following prior to applying for the permit: The Corps, the F&WS, the EPA, and the state and local governments.

This study indicates that the applicant can implement a planning process which greatly improves the probability of success. This raises the question of why do not all applicants implement an effective planning process? This dissertation does not provide data to answer that question, but there are several reasonable explanations which might be considered in future studies:

(1) Environmental regulation (in its current form) is a relatively new phenomena. The dynamics are not well understood by many of the people applying for permits. This was particularly true in the first ten years after NEPA (the 1970's), and still holds true today, but to a lesser degree. This means that many applicants did not, or do not, realize that the environmental aspects of development can be dealt with (effectively) through negotiation and compromise just as any other element of business. Efforts to maximize

cooperation and mutual respect with the regulating agencies are as important here as they are in any other realm of the business world.

(2) There is an overriding dislike for regulation. This and the resultant lack of acceptance of regulation, make it difficult to work with the process.

(3) An effective applicant management effort can involve a relatively high expenditure of funds. Even if the money is available, a company, developer, or individual may nevertheless believe that it can be spent better elsewhere. This third part of the explanation relates back to parts "1" and "2".

Recommendations

One of the more interesting correlations shown by this study is that success and failure relate to the type of applicant. Other studies indicate that there may well be an advantage for larger entities over smaller ones in dealing with specific types of environmental regulation. Pashigian indicates that environmental regulation reduced the number of plants but raised average plant size in industries with major clean-up problems (1983). He indicates that plant closing came disproportionately from among smaller plants during the period 1972 to 1977 when abatement costs increased significantly (p. 22). He indicates that while it

cannot be determined that environmental regulation has harmed both large and small plants, it can be shown that small plants have been harmed relative to large plants (p. 23). This scenario is supported by Douglas who indicates that as "...the costs of risk prevention grow; so does the size of the organizations, causing private industry to be organized in larger units in order to afford the price"(1983, p. 183). This dissertation may be the first quantified evidence that the advantage is also with the larger entities in land use oriented environmental regulation.

As explained, this correlation to applicant type is believed reliable, but more work could be done in this area. A very specific and well-quantified applicant classification system could be developed, possibly based on applicant fund availability; and based on that a study could be performed focusing on just success or failure based on applicant type. A study of this type would be well-justified, as verification of this correlation could imply unknown bias in the regulatory system and/or inherent advantages in simply being a certain category of applicant.

Additional research could also be performed concerning regulatory processes dealing with, for example, only hazardous wastes. The research presented in this dissertation deals with a land and water "use" oriented form of environmental regulation where most of the choices are perceived as impacting only economic and "environmental" values. In the regulation of hazardous wastes, the choices may be perceived

as directly impacting human health and longevity. It would be worthwhile to determine if applicant control over the outcome of these regulatory processes is as effective as with the form of regulation dealt with in this dissertation, or if it is, in fact, at all present when there is perception of threat to human life. Also, additional research could be performed to determine the effectiveness of management by the applicant in dealing with environmental regulatory programs at different levels of government such as state and local.

Overall, a greater emphasis on applicant education concerning the workings of the regulatory process is recommended. As indicated, lack of understanding of the process may be a major contributing factor to the heavy workload placed on most agency offices involved in administering environmental regulation. By encouraging more effective management of the process and planning by the applicant, the overall burden on the agencies and the applicants could be lessened.

BIBLIOGRAPHY

Baldwin, Malcom. 1984. Personal Communications. Mr. Baldwin is a former head of the President's Council on Environmental Quality.

Baer, Dinah. 1984. Personal Communications. Ms. Baer is an attorney with the President's Council on Environmental Quality (CEQ), Washington, D.C.

Bardach, Eugene and Kagan, Robert A. 1982. Going By The Book: The Problem of Regulatory Unreasonableness. Temple University Press, Philadelphia.

Baroody, William J. 1983. "Perspectives on Current Developments in Regulation." Regulation, March/April 1983, Vol. 7, No. 2: 6-14.

Biddle, Arthur T. 1982. "AMAX Inc., and the Colorado Joint Review Process." In Dispute Management: A Manual of Innovative Corporate Strategies for the Avoidance and Resolution of Legal Disputes. The Center for Public Resources, Inc., New York.

Boardman, Thomas and Zumbrunnen, James. 1983. Director and Associate Director of the Colorado State University Statistics Laboratory, Fort Collins, CO.

Caldwell, Lynton K. 1970. Environment: A Challenge for Modern Society. Natural History Press, New York.

Council on Environmental Quality. 1976. "Environmental Impact Statements: An Analysis of Six Years Experience By Seventy Federal Agencies." Report of the President's Council on Environmental Quality, Washington, D.C.

Council on Environmental Quality. 1979. "Environmental Quality, 1979." Tenth annual report of the President's Council on Environmental Quality, Washington, D.C.

Council on Environmental Quality. 1980. "Environmental Quality, 1980." Eleventh annual report of the President's Council on Environmental Quality, Washington, D.C.

Council on Environmental Quality. 1982. "Environmental Quality, 1982." Thirteenth annual report of the President's Council on Environmental Quality, Washington, D.C.

Council on Environmental Quality. 1978. "Final Regulations Implementing the Procedural Provisions of the National Environmental Policy Act." 40 CFR 1500-1508. U.S. Government Printing Office, Washington, D.C.

Detwyler, Thomas R. 1971. Man's Impact on Environment. McGraw-Hill, New York.

Douglas, Mary and Wildavsky, Aaron. 1985. Risk and Culture. University of California Press, Berkeley, CA.

Dow Chemical U.S.A. 1984. Various documents and correspondence. Western Division Office, Sacramento, CA.

Draper, Norman R. and Smith, Harry. 1981. Applied Regression Analysis. John Wiley and Sons, New York.

Duerksen, Christopher J. 1983. Environmental Regulation of Industrial Plant Siting. The Conservation Foundation, Washington, D.C.

Evans, Stanton. 1975. Clear and Present Dangers: A Conservative View of America's Government. Harcourt Brace Jovanovich, Inc., New York.

Faludi, Andreas. 1973. A Reader in Planning Theory. Pergamon Press, Oxford.

Freeman, Myrick A. III. 1979. The Benefits of Environmental Improvement: Theory and Practice. Published for Resources for the Future by the Johns Hopkins University Press, Baltimore.

Goode, Bernard. 1983, 1984. Personal Communications. Mr. Goode is Chief of the Regulatory Functions Branch, Office of the Chief of Engineers, U.S. Army Corps of Engineers, Washington, D.C.

Greene, Robert. 1982. "Behavioral Models of State Regulation: A Case Study of the Pennsylvania Public Utility Commission." Doctoral Dissertation, Carnegie-Mellon University. University Microfilms International, Ann Arbor, MI.

Hall, Radford S. 1983. "Conflict Management: An Evaluation of its role in Natural Resource Regulation." Dissertation Proposal. Colorado State University, Fort Collins, CO.

Healy, Robert G. and Rosenberg, John S. 1979. Land Use and the States. The Johns Hopkins University Press, Baltimore.

Lee, Colin. 1973. Models in Planning: Introduction to the Use of Quantitative Models in Planning. Pergamon Press, New York.

McCubbins, Mathew. 1983. "Rational Individual Behavior and Collective Irrationality: The Legislative Choice of Regulatory Form." Abstract. UMI, Ann Arbor, MI.

Pashigian, Peter B. 1983. "How Large and Small Plants Fare Under Environmental Regulation." Regulation, September/October 1983, Vol. 7, No. 5: 19-23.

Portney, Paul R. 1979. Current Issues in U.S. Environmental Policy. The Johns Hopkins University Press, Baltimore.

San Francisco Examiner. 1983. "The Cost of Regulation." 1 October 1983 edition, Hearst Corporation, San Francisco.

Scroggin, Don G. 1983. "The Myths of Environmental Regulation." Environmental Science Technology, Volume 17, No. 9, 1983.

Taylor, John S. 1979. "Environmentalists in the Bureaucracy: Environmental Impact Analysis in the Forest Service and Army Corps of Engineers." Doctoral Dissertation, University of California, Berkeley.

U.S. Army Corps of Engineers. "Developing Permit Application Data Bases for the Corps of Engineers Regulatory Program." Research Report 84-R-4. Fort Belvoir, VA., Institute for Water Resources, 1983.

U.S. Army Corps of Engineers. "Interim Final Rule for Regulatory Programs of the Corps of Engineers." Federal Register, Volume 47, No. 141, 22 July 1982, 33 CFR 320-330. Washington, D.C. United States Government.

U.S. Army Corps of Engineers. "Permit Application Data Bases for the Regulatory Functions Program." Working Paper 82-W1. Fort Belvoir, VA, Institute for Water Resources, 1982.

U.S. Army Corps of Engineers. "Proposal to Amend Permit Regulations for Controlling Certain Activities in Waters of the United States." Federal Register, Volume 48, No. 93, 12 May 1983, 33 CFR 320. Washington, D.C., United States Government.

U.S. Department of the Army. "Environmental Quality: Policy and Procedures for Implementing NEPA." Engineering Regulation 200-2-2. Washington, D.C., Office of the Chief of Engineers, 1980.

U.S. Statutes at Large. "Public Law 91-190 (NEPA)." Volume 83, Part 1. Washington, D.C., United States Government Printing Office, 1969.

West Heidi D. 1982. "An Analysis of California's System of Environmental Regulation." Doctoral Dissertation, University of California, Los Angeles. University Microfilms International, Ann Arbor.

APPENDIX A

VARIABLES

APPENDIX A

Variables

THIS APPENDIX DESCRIBES ALL VARIABLES UTILIZED FOR THE SUBJECT RESEARCH. THE VARIABLE NUMBERS AND THE INDIVIDUAL CODING FOR EACH VARIABLE CORRESPOND WITH THE NUMBERING SYSTEM USED FOR COMPUTER DATA ENTRY.

FOUR ITEMS ARE LISTED FOR EACH VARIABLE. THE FOLLOWING DESCRIBES THESE BY USE OF EXAMPLES:

1. Variable Number: Variable No. 5
2. Variable Name: FINAL ACTION
3. Brief description of the purpose of the variable and/or what it measures and additional explanation if required:
   THE MEASURE OF SUCCESS VERSUS FAILURE. SUCCESS HAS BEEN DEFINED ONLY AS ISSUANCE.
4. The codes indicating the choices available:
   1. Issued
   2. Denied
   3. Withdrawn due to probable denial

Variable No. 1

CORPS OF ENGINEERS DISTRICT:

INCLUDED PRIMARILY FOR ACCOUNTING PURPOSES. AVAILABLE TO DETERMINE IF THERE ARE SIGNIFICANT VARIATIONS FROM DISTRICT TO DISTRICT.

1. New England	11. Los Angeles	21. Little Rock	31. Nashville
2. Baltimore	12. Sacramento	22. Tulsa	32. Pittsburgh
3. New York	13. San Francisco	23. Kansas City	33. Buffalo
4. Norfolk	14. Alaska	24. Omaha	34. Chicago
5. Philadelphia	15. Portland	25. Memphis	35. Detroit
6. Charleston	16. Seattle	26. New Orleans	36. Rock Island
7. Jacksonville	17. Walla Walla	27. St. Louis	37. St. Paul
8. Mobile	18. Albuquerque	28. Vicksburg	
9. Savannah	19. Fort Worth	29. Huntington	
10. Wilmington	20. Galveston	30. Louisville	

Variable No. 2

REGION:

THE REGIONS INDICATED CORRESPOND GEOGRAPHICALLY WITH CORPS OF ENGINEERS DIVISION OFFICES. THERE ARE TYPICALLY THREE OR FOUR DISTRICTS IN EACH DIVISION. VARIABLE HAS BEEN INCLUDED TO DETERMINE IF THERE ARE SIGNIFICANT VARIATIONS BETWEEN DIVISIONS.

1. New England(One District Only)	6. Southwest
2. North Atlantic	7. Missouri River
3. South Atlantic	8. Lower Mississippi
4. South Pacific	9. Ohio River
5. North Pacific	10. North Central

Variable No. 3

WATERWAY LOCATION:

INCLUDED TO DETERMINE IF THERE IS SIGNIFICANT VARIATION RESULTING FROM PROJECT BEING LOCATED ON A CERTAIN TYPE OF WATERWAY. MAJOR RIVER CATEGORY IS DEFINED AS MISSISSIPPI RIVER, MISSOURI RIVER, AND COLORADO RIVER.

1. Pacific Ocean	5. Major River
2. Atlantic Ocean	6. Other River
3. Gulf of Mexico	7. Other Lake
4. Great Lakes	8. Beaufort Sea

Variable No. 4

TYPE OF AUTHORIZATION:

TO DETERMINE IF TYPE OF CORPS AUTHORIZATION IS A SIGNIFICANT FACTOR.

1. Section 10 of the River and Harbor Act of 1899
2. Section 404 of the Clean Water Act
3. Both Section 10 and Section 404

Variable No. 5

FINAL ACTION:

THE MEASURE OF SUCCESS VERSUS FAILURE. SUCCESS HAS BEEN DEFINED ONLY AS ISSUANCE.

1. Issued
2. Denied
3. Withdrawn due to probable denial

Variable No. 6

YEAR OF APPLICATION:

INCLUDED TO DETERMINE IF THERE WAS ANY SIGNIFICANT CHANGE THROUGH TIME. ALSO UTILIZED TO DETERMINE IF THERE WAS A EVEN DISTRIBUTION OF PROJECTS STUDIED OVER TIME.

1. 1983
2. 1982
3. 1981
4. 1980
5. 1979
6. 1978
7. 1977
8. 1976
9. 1975
10. 1974
11. 1973
12. 1972
13. 1971
14. 1970

Variable No. 7

YEAR OF FINAL ACTION:

INCLUDED TO DETERMINE IF THE YEAR OF FINAL ACTION WAS A SIGNIFICANT FACTOR. ALSO TO DETERMINE THAT THERE WAS A EVEN DISTRIBUTION OF PROJECTS BY YEAR OF FINAL ACTION.

1. 1983
2. 1982
3. 1981
4. 1980
5. 1979 (Fiscal Year 1980 began 1 Oct 1979)

Variable No. 8

TIME IN PROCESSING:

TO MEASURE THE TIME IN PROCESSING BY THE CORPS. FROM DATE OF COMPLETE APPLICATION TO DATE OF FINAL ACTION.

1. 120 days or less
2. 121 to 180 days
3. 181 to 270 days
4. 271 days to 1 year
5. 366 days to 1.5 yrs
6. 546 days to 2 years
7. 731 days to 2.5 years
8. 911 days to 3 years
9. 1,096 days to 3.5 yrs
10. 1,277 days to 4 years
11. 1,461 days to 4.5 years
12. 1,642 days to 5 years
13. 1,826 days to 5.5 years
14. 2,007 days to 6 years
15. 2,190 days to 6.5 years
16. 2,373 days to 7 years
17. 2,555 days to 7.5 years
18. 2,738 days to 8 years
19. 2,920 days to 8.5 years

Variable No. 9

ARBITRARY PROJECT SIZE CLASSIFICATION:

THIS VARIABLE USED ONLY FOR ACCOUNTING PURPOSES. No analytical purpose.

1. Major
2. Not Minor
3. Minor

Variable No. 10

ACRES INVOLVED:

A QUANTITATIVE MEASURE OF PROJECT MAGNITUDE. THE NUMBER OF ACRES DIRECTLY INVOLVED IN THE CONSTRUCTION/DEVELOPMENT ACTIVITY.

1. 1 or less
2. 1.1 to 5 acres
3. 5.1 to 10 acres
4. 10.1 to 25 acres
5. 25.1 to 50 acres
6. 50.1 to 100 acres
7. 100.1 to 200 acres
8. 200.1 to 300 acres
9. 300.1 to 400 acres
10. 400.1 to 500 acres
11. 500.1 to 600 acres
12. 600.1 to 700 acres
13. 700.1 to 800 acres
14. 800.1 to 900 acres
15. 900.1 to 1000 acres
16. 1001 or more acres
17. Data Not Available

Variable No. 11

TYPE OF PROJECT BY PROPOSED PURPOSE:

VARIABLE INCLUDED TO DETERMINE IF THERE WERE ANY STRONG CORRELATIONS BASED ON TYPE OF ACTIVITY. USEFULL FOR PROJECT CLASSIFICATION.

1. Navigation Improvement
2. Marina
3. Agricultural
4. Mining
5. Residential
6. Commercial
7. Industrial
8. Recreation
9. Flood Control
10. Pipeline
11. Bridge or Road
12. Water Treatment
13. Power
14. Sanitary Landfill
15. Water Supply
16. Habitat Improvement
17. Not Used
18. Military Exercise
19. Land Disposal Dredged Material

Variable No. 12

AMOUNT OF FILL:

A QUANTITATIVE MEASURE OF PROJECT MAGNITUDE. THE AMOUNT OF FILL MATERIAL REQUIRED FOR CONSTRUCTION ACTIVITY OR THE AMOUNT REMOVED AND DISPOSED IN CORPS JURISDICTION.

1. 1,000 cubic yards(cy) or less
2. 1,001 to 5,000 cy
3. 5,001 to 10,000 cy
4. 10,001 to 25,000 cy
5. 25,001 to 50,000 cy
6. 50,001 to 100,000 cy
7. 100,001 to 250,000 cy
8. 250,001 to 500,000 cy
9. 500,001 to 1,000,000 cy
10. 1,000,001 to 5 million cy
11. Over 5 million cy
12. Not used
13. Not used
14. No fill
15. Data Not Available

Variable No. 13

WATER DEPENDENCY:

VARIABLE HAS BEEN INCLUDED TO DETERMINE IF WATER DEPENDENCY IS A SIGNIFICANT FACTOR. CORPS REGULATIONS INDICATE THAT THIS SHOULD BE CONSIDERED AND THAT WATER DEPENDENCY IS A FACTOR IN FAVOR OF MOST PROJECTS.

1. Water Dependent
2. Water Related
3. Neither

Variable No. 14

REGIONAL DESCRIPTION OF PROJECT LOCATION:

VARIABLE IS INCLUDED TO MEASURE IS THERE IS ANY VARIATION RESULTING FROM LOCATION IN AN URBAN CENTER VERSUS A RURAL AREA.

1. Urban Area
2. Not used
3. Rural Area

Variable No. 15

DEGREE OF URBANIZATION IN PROJECT AREA:

THIS VARIABLE IS A REFINEMENT OF VARIABLE NO. 14. A SPECIFIC MEASURE OF SIZE OF POPULATION IN PROJECT AREA. URBAN AREAS TEND TO HAVE GREATER ORGANIZED INTEREST IN THE "ENVIRONMENT". MAJOR CONSERVATION GROUPS, ETC., ARE USUALLY LOCATED IN THE LARGEST URBAN AREAS. THIS VARIABLE USED TO DETERMINE IF THIS TYPE OF LOCAL INFLUENCE IS A FACTOR.

Variable No. 16

ENVIRONMENTAL DOCUMENTATION:

THIS VARIABLE USED TO DETERMINE IF THERE ARE ANY SPECIFIC TRENDS RELATED TO TYPE OF ENVIRONMENTAL DOCUMENTATION USED. VARIABLE IS ALSO NECESSARY IN CATEGORIZING TIME BECAUSE OF THE BUILT-IN TIME FRAME INVOLVED IN THE EIS PROCESS.

1. Corps Environmental Impact Statement
2. Corps Environmental Assessment
3. Federal, non-Corps Environmental Impact Statement
4. Federal Environmental Impact Statement, but not Project Specific
5. Non-Federal Environmental Report Only
6. Federal, non-Corps EIS In Progress At Time of Application

Variable No. 17

WORK IN WETLANDS:

VARIABLE USED TO MEASURE THE EFFECT OF WORK IN WETLANDS AND THE DEGREE OF WETLANDS INVOLVED IN A SPECIFIC PROJECT. CORPS REGULATIONS AND A PRESIDENTIAL EXECUTIVE ORDER STRONGLY DISCOURAGE WORK IN WETLANDS. THEREFORE A PROJECT INVOLVING IMPACT ON WETLANDS HAS A STRONG INERTIA TOWARD NON-ISSUANCE.

1. No Work In Wetlands
2. 1 Acre or Less
3. 1.1 to 5 Acres
4. 5.1 to 10 Acres
5. 10.1 to 25 Acres
6. 25.1 to 50 Acres
7. 50.1 to 100 Acres
8. 100.1 to 250 Acres
9. 250.1 to 500 Acres
10. 500.1 to 750 Acres
11. Greater than 1,000
12 - 14. Not Used
15. Data Not Available

Variable No. 18

FILL IN OPEN WATER:

FILLING OF AREAS OF OPEN WATER CAN BE CONSIDERED TO GIVE A PROJECT INERTIA TOWARD NON-ISSUANCE. BUT THIS TENDS TO VARY FROM REGION TO REGION. A WATERWAY WHICH SERVES NUMEROUS RECREATIONAL AND WATER QUALITY RELATED FUNCTIONS IN AN URBAN AREA IS VIEWED AS A VALUABLE RESOURCE LOCALLY AND ITS FILLING WOULD BE DISCOURAGED. THIS VARIABLE IS INCLUDED AS A CONTROL.

1. No Fill or Loss of Open Water
2. 1 Acre or Less
3. 1.1 to 5 Acres
4. 5.1 to 10 Acres
5. 10.1 to 25 Acres
6. 25.1 to 50 Acres
7. 50.1 to 100 Acres
8. Greater than 100 Acres

Variable No. 19

IMPACT ON THREATENED OR ENDANGERED SPECIES:

THREATENED OR ENDANGERED SPECIES ARE PROTECTED BY BOTH FEDERAL AND STATE REGULATIONS. IMPACT ON SUCH SPECIES WOULD GIVE A SPECIFIC PROJECT INERTIA TOWARD NON-ISSUANCE. THIS VARIABLE IS INCLUDED AS A CONTROL.

1. No Impact
2. Possible Impact
3. Impact Identified

Variable No. 20

WATER QUALITY IMPACT:

BY DEFINITION VIRTUALLY ALL PROJECTS REQUIRING CORPS AUTHORIZATION ARE CONSIDERED TO HAVE SOME DEGREE OF WATER QUALITY IMPACT. THIS VARIABLE INCLUDED TO IDENTIFY THE TYPE OF IMPACT AND IF WATER QUALITY WAS IDENTIFIED AS REASON FOR NON-ISSUANCE. VARIABLE IS INCLUDED PRIMARILY AS A CONTROL.

1. Point Discharge
2. Non-Point Discharge
3. No Water Quality Impact
4. Water Quality reason for Non-issuance

Variable No. 21

IMPACT ON CULTURAL RESOURCES:

FEDERAL AND STATE REGULATIONS REQUIRE DETAILED EVALUATION IF POTENTIAL EXISTS FOR IMPACT ON CULTURAL RESOURCES. IDENTIFIED IMPACTS GIVE A PROJECT INERTIA TOWARD NON-ISSUANCE. VARIABLE INCLUDED AS A CONTROL.

1. Impact Identified
2. Possible Impact
3. No Impact

Variable No. 22

GEOGRAPHIC EXTENT OF PROJECT IMPACT:

IMPACTS CAN INCLUDE PHYSICAL, ECONOMIC, OR SOCIAL. IDENTIFICATION OF THIS RANGE IS HIGHLY SUBJECTIVE. VARIABLE INCLUDED TO DETERMINE IF ANY PATTERNS ARE EVIDENT.

1. Site Only
2. County-wide
3. Multi-County
4. State-wide
5. National

Variable No. 23

PREDOMINANCE OF IMPACT TYPE:

HIGHLY SUBJECTIVE DETERMINATION. VARIABLE INCLUDED TO DETERMINE IF ANY PATTERNS ARE EVIDENT.

1. Primary
2. Secondary

Variable No. 24

PROJECT SIZE CLASSIFICATION:

THIS IS A PARTIALLY QUANTIFIED MEASUREMENT OF PROJECT MAGNITUDE. INCLUDED TO DETERMINE SAMPLE DISTRIBUTION IN TERMS OF MAGNITUDE. THE ODD NUMBERS INDICATE APPLICATIONS WHICH RESULTED IN NON-ISSUANCE. THE EVEN NUMBERS WERE ISSUED. THE LARGER THE NUMBER THE LARGER THE PROJECT. IN TERMS OF MAGNITUDE, 8=9; 6=7; 4=5; 2=3. THE CRITERIA WAS BASED PRIMARILY ON ACREAGE INVOLVED. BUT ACREAGE WAS TAKEN IN COMBINATION WITH OVERALL DEGREE OF ENVIRONMENTAL IMPACT AND LOCATIONAL FACTORS.

1. (1) Not Used
2. (2)
3. (3)
4. (4)
5. (5)
6. (6)
7. (7)
8. (8)
9. (9)

Variable No. 25

MITIGATION:

A MEASURE OF APPLICANT MANAGEMENT. THE TIMING OF THE MITIGATION IS INCLUDED.

1. Mitigation Provided at time of Application
2. Mitigation Developed During Corps Processing
3. No Mitigation
4. Mitigation Recommended by Federal Agency, Not Provided
5. Data not available

Variable No. 26

DESCRIPTION OF APPLICANT:

THE CLASSIFICATION OF THE APPLICANTS WAS BASED ON INFORMATION IN THE PUBLIC NOTICES, STATEMENT OF FINDINGS, GOVERNMENT AND APPLICANT CORRESPONDENCE, PERSONAL COMMUNICATIONS, AND OTHER RELATED RESEARCH. GROUPS A, B, AND C ARE ALL BUSINESS ENTITIES. GROUP A INCLUDES MAJOR NATIONAL AND INTERNATIONAL CORPORATIONS. THESE ARE THE LARGEST BUSINESS ENTITIES IN TERMS OF RESOURCE AVAILABILITY. GROUP C INCLUDES THE SMALLEST BUSINESS ENTITIES IN TERMS OF RESOURCE AVAILABILITY. THESE ARE PRIMARILY OWNER-OPERATED SMALL BUSINESSES. GROUP B INCLUDES A WIDE RANGE OF APPLICANTS WHICH DO NOT FIT INTO CATEGORIES A OR C. COMPANIES WHICH HAVE MULTIPLE OFFICES, PLANTS, OR OUTLETS AND CAN BE MULTI-STATE. THERE IS A WIDE RANGE OF RESOURCE AVAILABILITY WITHIN GROUP B.

1. Group A
2. Group B
3. Group C
4. Government Agency
5. Conservation Group
6. Private Individual
7. Private Organization

Variable No. 27

DESCRIPTION OF AGENCY AS APPLICANT:

THIS VARIABLE IS A BREAKDOWN OF CHOICE NO. 4 FROM VARIABLE NO. 26. TO ALLOW FOR A COMPARISON OF GOVERNMENT AGENCY PROJECT MANAGEMENT.

1. Federal Agency
2. State Agency
3. County Agency
4. Local Agency
5. Special Agency
6. Not a Government Agency

Variable No. 28

STATE PROJECT IS LOCATED IN:

VARIABLE INCLUDED TO DETERMINE PROJECT REPRESENTATION AMONG THE FIFTY STATES.

1. Alabama
2. Alaska
3. Arizona
4. Arkansas
5. California
6. Colorado
7. Connecticut
8. Delaware
9. Florida
10. Georgia
11. Hawaii
12. Idaho
13. Illinois
14. Indiana
15. Iowa
16. Kansas
17. Kentucky
18. Louisiana
19. Maine
20. Maryland
21. Massachusetts
22. Michigan
23. Minnesota
24. Mississippi
25. Missouri
26. Montana
27. Nebraska
28. Nevada
29. New Hampshire
30. New Jersey
31. New Mexico
32. New York
33. North Carolina
34. North Dakota
35. Ohio
36. Oklahoma
37. Oregon
38. Pennsylvania
39. Rhode Island
40. South Carolina
41. South Dakota
42. Tennessee
43. Texas
44. Utah
45. Vermont
46. Virginia
47. Washington
48. West Virginia
49. Wisconsin
50. Wyoming
51. Puerto Rico

Variable No. 29

IMPACT ON FISHERY:

SIGNIFICANT DISRUPTION OF FISHERY RESOURCES WOULD GIVE A PROJECT INERTIA TOWARD NON-ISSUANCE. VARIABLE INCLUDED TO ISOLATE THIS CATEGORY OF IMPACT.

1. No Impact
2. Possible Impact
3. Impact Identified

Variable No. 30

REASON FOR DENIAL:

VARIABLE IDENTIFIES THE REASON FOR NON-ISSUANCE.

1. Natural Resources
2. Cultural Resources
3. Legal/Zoning
4. Combination
5. Permit Issued
6. Not Known
7. Navigation
8. N/A Phase I
9. Flood Levels
10. Change in Regulations, Permit Not Req.
11. State Water Quality Certificate Denied
12. Other Local Denial
13. Other Federal Denial

Variable No. 31

U.S. ENVIRONMENTAL PROTECTION AGENCY OBJECTION:

USED AS A MEASURE OF PROJECT CONTROVERSY. VARIABLE ALSO USED TO MEASURE EFFECTIVENESS OF SPECIFIC AGENCY OBJECTION IN TERMS OF INFLUENCING THE FINAL ACTION.

1. No Objection
2. Objection
3. Significant Comment, But No Objection
4. Data Not Available
5. No Comments Due to Lack of Funding

Variable No. 32

U.S. FISH AND WILDLIFE SERVICE OBJECTION:

USED AS A MEASURE OF PROJECT CONTROVERSY. VARIABLE ALSO USED TO MEASURE EFFECTIVENESS OF SPECIFIC AGENCY OBJECTION IN TERMS OF INFLUENCING THE FINAL ACTION.

1. No Objection
2. Objection
3. Significant Comment, But No Objection
4. Data Not Available
5. No Comments Due to Lack of Funding

Variable No. 33

OTHER FEDERAL OBJECTION:

USED AS A MEASURE OF PROJECT CONTROVERSY. VARIABLE ALSO USED TO MEASURE EFFECTIVENESS OF OVERALL FEDERAL OBJECTION,OTHER THAN VARIABLES 31 AND 32, IN TERMS OF INFLUENCING THE FINAL ACTION. THIS CATEGORY INCLUDES THE NATIONAL MARINE FISHERIES SERVICE (U.S. DEPARTMENT OF COMMERCE), U.S. DEPARTMENT OF TRANSPORTATION, AND ANY OTHER FEDERAL AGENCY.

1. No Objection
2. Objection
3. Significant Comment,. But No Objection
4. Data Not Available
5. No Comments Due to Lack of Funding

Variable No. 34

STATE OBJECTION:

USED AS A MEASURE OF PROJECT CONTROVERSY. VARIABLE ALSO USED TO MEASURE EFFECTIVENESS OF STATE AGENCY OBJECTION IN TERMS OF INFLUENCING THE FINAL ACTION.

1. No Objection
2. Objection
3. Significant Comment, But No Objection
4. Data Not Available
5. No Comments Due to Lack of Funding

Variable No. 35

LOCAL OBJECTION:

USED AS A MEASURE OF PROJECT CONTROVERSY. VARIABLE ALSO USED TO MEASURE EFFECTIVENESS OF LOCAL AGENCY OBJECTION IN TERMS OF INFLUENCING THE FINAL ACTION.

1. No Objection
2. Objection
3. Significant Comment, But No Objection
4. Data Not Available
5. No Comments Due to Lack of Funding

Variable No. 36

ENVIRONMENTAL AND CONSERVATION GROUP OBJECTION:

USED AS A MEASURE OF PROJECT CONTROVERSY. VARIABLE ALSO INCLUDED TO MEASURE EFFECTIVENESS OF OBJECTIONS FROM THESE CATEGORIES OF INTEREST GROUPS IN TERMS OF INFLUENCING THE FINAL ACTION.

1. No Objection
2. Objection
3. Significant Comment, But No Objection
4. Data Not Available
5. No Comments Due to Lack of Funding

Variable No. 37

PRIVATE INDIVIDUAL OBJECTION:

USED AS A MEASURE OF PROJECT CONTROVERSY. VARIABLE ALSO INCLUDED TO MEASURE EFFECTIVENESS OF OBJECTIONS FROM PRIVATE CITIZENS IN TERMS OF INFLUENCING THE FINAL ACTION.

1. No Objection
2. Objection
3. Significant Comment, But No Objection
4. Data Not Available

Variable No. 38

PROJECT MODIFIED:

A MEASURE OF APPLICANT/AGENCY INTERACTION.

1. Modified
2. Not Used
3. Not Modified
4. Denied Without Modification
5. Recommended by Agency, Not Done
6. Alternative/Modification Originally Provided With Application
7. Not Used
8. Recommended by Non-Agency, Not Done
9. Data Not Available

Variable No. 39

U.S. FISH AND WILDLIFE SERVICE/NATIONAL MARINE FISHERIES SERVICE COMMENT SIMILARITY

VARIABLE INCLUDED TO DETERMINE IF THERE WAS A SIGNIFICANT DUPLICATION OF EFFORT BETWEEN THESE TWO FEDERAL AGENCIES.

1. Comments Identical
2. Some Overlap/Some Difference
3. Different
4. Both Did Not Comment
5. Data Not Available
6. Letters From One or Both, but No Comments

Variable No. 40 (THERE IS NO VARIABLE NO. 40)

Variable No. 41

PREVIOUS EXPERIENCE WITH CORPS OF ENGINEERS REGULATORY PROCESS.

A MEASURE OF APPLICANT MANAGEMENT. TO DETERMINE IF SUCH EXPERIENCE BENEFITS THE APPLICANT. CONSIDERED A MANAGEMENT TOOL BECAUSE IF APPLICANT DOES NOT HAVE THE EXPERIENCE IT CAN BE OBTAINED FROM A CONSULTING FIRM OR BY COMMUNICATIONS WITH OTHERS WHO DO HAVE THE EXPERIENCE.

1. No Experience
2. One Previous Application
3. Two Or More Previous Applications

Variable No. 42

TIME SPENT IN COORDINATING PERMIT AUTHORIZATION PROCESS PRIOR TO FORMAL APPLICATION:

A MEASURE OF APPLICANT MANAGEMENT. TIME SPENT BY APPLICANT AND/OR APPLICANT'S REPRESENTATIVE TO "PLAN" THE PROJECT WITH THE CORPS AND/OR OTHER FEDERAL ENVIRONMENTAL AGENCIES PRIOR TO MAKING FORMAL APPLICATION TO THE CORPS.

1. None
2. 10 Hours
3. 50 Hours
4. 250 Hours
5. 500 Hours

Variable No. 43

TIME SPENT IN COORDINATING PERMIT AUTHORIZATION PROCESS AFTER MAKING FORMAL APPLICATION:

A MEASURE OF APPLICANT MANAGEMENT. IDENTICAL WITH VARIABLE NO. 43 EXCEPT DONE AFTER FORMAL APPLICATION MADE. ALLOWS FOR COMPARISONS TO VARIABLE NO. 42.

1. None
2. 10 Hours
3. 50 Hours
4. 250 Hours
5. 500 Hours

Variable No. 44

RATING APPLICANT EXPERIENCE WITH CORPS REGULATORY PROCESS:

TO ALLOW FOR COMPARISON OF APPLICANT SATISFACTION RELATIVE TO SUCCESS OR FAILURE AND TIME SPENT IN PROCESS. SCALE OF ONE THROUGH TEN WITH TEN EQUAL TO "VERY SATISFIED" AND ONE EQUAL TO "VERY UNSATISFIED".

1. (1)
2. (2)
3. (3)
4. (4)
5. (5)
6. (6)
7. (7)
8. (8)
9. (9)
10. (10)

Variable No. 45

ADVANCE NOTICE TO THE CORPS:

A MEASURE OF APPLICANT MANAGEMENT. TO DETERMINE IF ADVANCE NOTICE TO THE CORPS WAS AN EFFECTIVE MANAGEMENT TOOL AND IF GIVEN AMOUNTS OF TIME ARE MORE EFFECTIVE THAN OTHERS.

1. No Advance Notice
2. One Week Prior to Formal Application
3. One Month Prior
4. Six or More Months Prior

Variable Nos. 46 through 52

OVERALL PROJECT COORDINATION PRIOR TO FORMAL APPLICATION:

A MEASURE OF APPLICANT MANAGEMENT. TO DETERMINE EFFECTIVENESS OF OVERALL PRE-APPLICATION COORDINATION BY THE APPLICANT. TO COMPARE THE EFFECTIVENESS OF COORDINATING WITH ONE AGENCY VERSUS ANY OTHER AGENCY. VARIABLES 46 THROUGH 52 DEAL WITH THE SAME QUESTION BUT WERE SEGMENTED INTO INDIVIDUAL VARIABLES FOR DATA ANALYSIS PURPOSES.

Variable No. 46

OVERALL PROJECT COORDINATION PRIOR TO FORMAL APPLICATION:

1. No..
2. Yes

Variable No. 47

COORDINATION WITH CORPS PRIOR TO APPLICATION:

1. No
2. Yes

Variable No. 48

COORDINATION WITH U.S. FISH AND WILDLIFE SERVICE PRIOR TO APPLICATION:

1. No
2. Yes

Variable No. 49

COORDINATION WITH U.S. ENVIRONMENTAL PROTECTION AGENCY PRIOR TO APPLICATION:

1. No
2. Yes

Variable No. 50

COORDINATION WITH U.S. DEPARTMENT OF COMMERCE PRIOR TO APPLICATION:

1. No
2. Yes

Variable No. 51

COORDINATION WITH STATE AGENCY PRIOR TO APPLICATION:

1. No
2. Yes

Variable No. 52

COORDINATION WITH LOCAL AGENCY (COUNTY OR CITY) PRIOR TO APPLICATION:

1. No
2. Yes

Variable Nos. 53 through 57

AGENT OR CONSULTANT USED TO REPRESENT APPLICANT IN THE CORPS PERMIT REVIEW PROCESS:

A MEASURE OF APPLICANT MANAGEMENT. TO DETERMINE EFFECTIVENESS IN THE USE OF CONSULTANTS BY APPLICANTS AND TO COMPARE TYPES OF CONSULTING SERVICES. VARIABLES 53 THROUGH 57 ARE CONCERNED WITH THIS SAME QUESTION BUT WERE SEGMENTED INTO INDIVIDUAL VARIABLES FOR DATA ANALYSIS PURPOSES.

Variable No. 53

AGENT OR CONSULTANT USED TO REPRESENT:

1. No
2. Yes

Variable No. 54

LAW FIRM USED TO REPRESENT:

1. No
2. Yes

Variable No. 55

ENGINEERING FIRM USED TO REPRESENT:

1. No
2. Yes

Variable No. 56

ENVIRONMENTAL FIRM USED TO REPRESENT:

1. No
2. Yes

Variable No. 57

FIRM THAT SPECIALIZES IN OBTAINING PERMITS FOR CLIENTS USED TO REPRESENT:

1. No
2. Yes

Variable No. 58

DESCRIPTION OF TYPE FIRM USED TO IDENTIFY AND COORDINATE THE ENVIRONMENTAL ASPECTS OF THE PROJECT:

A MEASURE OF APPLICANT MANAGEMENT. TO MEASURE RELATIVE EFFECTIVENESS OF DIFFERENT TYPES OF CONSULTING SERVICES IN TERMS OF MANAGEMENT OF JUST THE ENVIRONMENTAL ASPECTS OF THE PROJECT.

1. None
2. Engineering Firm with Environmental Capability
3. Environmental Firm
4. Law Firm
5. Other

Variable Nos. 59 through 65

EFFECTIVENESS OF IN-HOUSE STAFF AVAILABLE TO APPLICANT:

A MEASURE OF APPLICANT MANAGEMENT. TO DETERMINE EFFECTIVENESS OF HAVING IN-HOUSE STAFF AVAILABLE AND TO DETERMINE RELATIVE EFFECTIVENESS OF DIFFERENT TYPES OF DISCIPLINES. VARIABLES 59 THROUGH 65 ARE CONCERNED WITH THIS SAME QUESTION.

Variable No. 59

ENGINEER AVAILABLE FOR PROJECT DEVELOPMENT AND PERMIT REVIEW PROCESS:

1. No
2. Yes

Variable No. 60

PHYSICAL SCIENTIST AVAILABLE FOR PROJECT DEVELOPMENT AND PERMIT REVIEW PROCESS:

1. No
2. Yes

Variable No. 61

SOCIAL SCIENTIST AVAILABLE FOR PROJECT DEVELOPMENT AND PERMIT REVIEW PROCESS:

1. No
2. Yes

Variable No. 62

BIOLOGICAL SCIENTIST AVAILABLE FOR PROJECT DEVELOPMENT AND PERMIT REVIEW PROCESS:

1. No
2. Yes

Variable No. 63

ATTORNEY AVAILABLE FOR PROJECT DEVELOPMENT AND PERMIT REVIEW PROCESS:

1. No
2. Yes

Variable No. 64

OTHER AVAILABLE FOR PROJECT DEVELOPMENT AND PERMIT REVIEW PROCESS:

1. No
2. Yes

Variable No. 65

IN-HOUSE STAFF AVAILABLE FOR PROJECT DEVELOPMENT AND PERMIT REVIEW PROCESS:

1. No
2. Yes

Variable No. 66

PERCENT OF TOTAL WORK TIME (FOR THAT INDIVIDUAL) THAT WAS SPENT ON PROJECT:

A MEASURE OF APPLICANT MANAGEMENT. TO DETERMINE THE EFFECTIVENESS OF HAVING A PROJECT MANAGER AND TO DETERMINE IF THERE IS A RELATIONSHIP BETWEEN TIME SPENT ON SUBJECT PROJECT AND SUCCESS.

1. No Project Manager
2. 10 Percent of That Individual's Time on Subject Project
3. 25 Percent
4. 50 Percent
5. 75 Percent
6. 90 Percent

Variable No. 67

AVAILABILITY OF IN-HOUSE PERMIT REVIEW SPECIALIST:

A MEASURE OF APPLICANT MANAGEMENT. TO DETERMINE THE EFFECTIVENESS OF HAVING AN INDIVIDUAL AVAILABLE IN-HOUSE WHO SPECIALIZES IN THE PROCESSING OF PERMITS.

1. Yes
2. No

APPENDIX B

QUESTIONNAIRES

APPENDIX B

Questionnaires

THIS APPENDIX PROVIDES EXAMPLES OF THE QUESTIONNAIRES SENT TO APPLICANTS. THE FOLLOWING DESCRIBES THE ITEMS INCLOSED:

INCLOSURE B-1: Basic questionnaire. Sent to all applicants except "Individuals".

INCLOSURE B-2: Sent only to applicants which were "Individuals".

INCLOSURE B-3: Cover letter for both questionnaires.

INCLOSURE B-4: Cover letter sent with second mailing (follow-up on those not received initially).

INCLOSURE B - 1

QUESTIONNAIRE
(Please circle the appropriate responses)

(No._____)

1. The results and recommendations of this study will be available to you at no cost. Please indicate "Yes" if you request that they be sent to you (indicate address changes on the back of this page):

   (1) Yes (2) No

2. Prior to making the subject application to the Corps, did you have any previous direct experience with the Corps permit process:

   (1) None (2) One previous application (3) Two or more

3. For the subject project, estimate the time put into the permit authorization process with the Corps and/or other Federal "environmental agencies" by you or your firm (and your representatives, if appropriate) prior to making formal application to the Corps:

   (1) None (2) 10 hours (3) 50 hours (4) 250 hours (5) 500 or more

   After making application: (1) None (2) 10 hours (3) 50 hours (4) 250 hours (5) 500 or more

4. On a scale of 1 - 10, how would you rate your experience with the Corps in the permit review process in terms of amount of paperwork required, time required, etc.:

   Very Satisfied (10) (9) (8) (7) (6) (5) (4) (3) (2) (1) Very Unsatisfied

5. How far in advance of formal application being made to the Corps was the Corps first consulted concerning the subject project:

   (1) No prior notice (2) Week prior (3) Month prior (4) 6+ months

6. Was the project location and design coordinated with any of the following prior to application being made to the Corps (indicate more than one if appropriate):

   (1) None (2) Corps (3) U.S. Fish & Wildlife (4) U.S. EPA
   (5) U.S. Dept. Commerce (6) State (7) Local (county or city)

7. If you used an agent or consulting firm to represent you in the Corps permit review process, which of the following comes closest to describing the firm (indicate more than one if appropriate):

   (1) None (2) Law firm (3) Engineering firm (4) Environmental firm
   (5) Firm that specializes in obtaining permits for clients

8. If you used a consulting firm to identify and coordinate the environmental aspects of your project, which of the following comes closest to describing the firm:

   (1) None (2) Engineering firm with environmental capability
   (3) Environmental firm (4) Law firm (5) Other _____

OVER PLEASE - 3 QUESTIONS REMAIN ON THE BACK OF THIS PAGE

9. In addition to outside consulting services which may have been used, describe your "in-house" staff, if any, which was available for project development and the permit review process:

   (1) Engineer (3) Physical scientist (3) Social scientist

   (4) Biological scientist (5) Attorney (6) Other_____

10. If one individual in your firm was assigned as project manager for the subject project, approximately what percent of his/her total work time was devoted to the project:

    (1) No project manager assigned (2) 10% (3) 25%

    (4) 50% (5) 75% (6) 90%

11. Does your "in-house" staff include individuals who specialize in just the processing of permits your firm has applied for:

    (1) Yes (2) No

Additional comments, if any:

THANK YOU VERY MUCH FOR YOUR COOPERATION AND ASSISTANCE.

INCLOSURE B - 2

QUESTIONNAIRE
(Please circle the appropriate responses)

1. The results and recommendations of this study will be available to you at no cost. Please indicate "Yes" if you request that they be sent to you (indicate address changes on the back of this page):

   (1) Yes (2) No

2. Prior to making the subject application to the Corps, did you have any previous direct experience with the Corps permit process:

   (1) None (2) One previous application (3) Two or more

3. For the subject project, estimate the time put into the permit authorization process with the Corps and/or other Federal "environmental agencies" by you or your firm (and your representatives, if appropriate) prior to making formal application to the Corps:

   (1) None (2) 10 hours (3) 50 hours (4) 250 hours (5) 500 or more

   After making application: (1) None (2) 10 hours (3) 50 hours (4) 250 hours (5) 500 or more

4. On a scale of 1 - 10, how would you rate your experience with the Corps in the permit review process in terms of amount of paperwork required, time required, etc.:

   Very Satisfied ... Very Unsatisfied

   (10) (9) (8) (7) (6) (5) (4) (3) (2) (1)

5. How far in advance of formal application being made to the Corps was the Corps first consulted concerning the subject project:

   (1) No prior notice (2) Week prior (3) Month prior (4) 6+ months

6. Was the project location and design coordinated with any of the following prior to application being made to the Corps (indicate more than one if appropriate):

   (1) None (2) Corps (3) U.S. Fish & Wildlife (4) U.S. EPA
   (5) U.S. Dept. Commerce (6) State (7) Local (county or city)

7. If you used an agent or consulting firm to represent you in the Corps permit review process, which of the following comes closest to describing the firm (indicate more than one if appropriate):

   (1) None (2) Law firm (3) Engineering firm (4) Environmental firm
   (5) Firm that specializes in obtaining permits for clients

8. If you used a consulting firm to identify and coordinate the environmental aspects of your project, which of the following comes closest to describing the firm:

   (1) None (2) Engineering firm with environmental capability
   (3) Environmental firm (4) Law firm (5) Other_____

THANK YOU VERY MUCH FOR YOUR ASSISTANCE

INCLOSURE B - 3

Colorado Water Resources Research Institute
303/491-6308

Colorado State University
Fort Collins, Colorado
80523

Dear Sir or Madam:

In cooperation with the Colorado Water Resources Research Institute and Colorado State University, a research project is being carried out to provide information on the Federal Regulatory process in relation to water resources use and development. A PRIMARY OBJECTIVE OF THIS RESEARCH IS TO PROVIDE INFORMATION USEFUL TO YOU, THE FORMER APPLICANT (AND QUITE POSSIBLY CURRENT AND FUTURE APPLICANT), IN DEALING WITH THE FEDERAL REGULATORY PROCESS.

A random sample of projects is currently being studied. The decision on issuance of the permit at the Federal level has been made for most of these projects. A project which you made application for with the U. S. ARMY CORPS OF ENGINEERS is one of those which is under study. That project is identified below:

Project:

Corps District Office Application Made To:

Corps Public Notice No. (or Application No.):

Date of Corps Public Notice:

In relation to this project, could you please circle the appropriate responses for the questions on the attached questionnaire.

A STAMPED, ADDRESSED ENVELOPE IS ENCLOSED FOR RETURN MAILING OF THE QUESTIONNAIRE.

Your individual responses are confidential. The subject research is academically oriented and will not directly impact any of the projects which are being studied.

This study cannot be completed without your cooperation in responding to the questionnaire. We realize that your time is valuable and therefore the questionnaire has been designed to minimize the effort required to complete it. The regulatory process cannot be significantly improved without meaningful feedback from you.

We would appreciate your response within 7 calendar days of receipt of this letter, although later responses will be accepted. If you are interested in receiving the results and recommendations of this study, please indicate "Yes" on the questionnaire. Thank you very much for your cooperation.

Barney M. Opton

Barney M. Opton
3153 Padre Street
Lafayette, CA 94549
(415) 944-0466

INCLOSURE B-4

Colorado Water Resources Research Institute
303/491-6308

Colorado State University
Fort Collins, Colorado
80523

Please reference the attached questionnaire. An earlier copy of this questionnaire with return postage was sent to your office or home on 12 August 1983. No response was received. This likely occurred because the original material was not sent directly to your attention.

The attached cover letter is self-explanatory. We would appreciate your response to allow for completion of our data base. If you feel that any of the questions are of a sensitive nature, do not respond to those. However, your responses are confidential. If you prefer to not respond at all, please return the blank questionnaire in the postage-paid envelope.

We realize that because a relatively long period of time may have passed since application was made to the Corps of Engineers, or for other reasons, response to some of the questions may be difficult. However, your closest estimate would be appreciated if you believe it is at all "within the ball park".

Please try to respond within seven calender days of receipt of this letter. Later responses will be accepted through approximately 30 November 1983. Thank you for your cooperation.

Barney M. Opton

APPENDIX C

FREQUENCIES

APPENDIX C

Frequencies

Approximately 35,000 individual data entries were made. This resulted from 650 complete Phase I packages and 373 Phase II questionnaires returned. The percent return rate for Phase II was 57.4 (373/650). The following outlines the frequencies for data available for both Phase I and Phase II. Numbers in parentheses which introduce each table or discussion correspond with the variable numbers indicated in Appendix A. Roman numeral "I" indicates Phase I frequency data and Roman numeral "II" indicates Phase II. The percentages in parentheses indicate percent of return within the given group I or group II and not group I versus group II. For variables 40 through 67 all tables do not equal 373 as applicants were given the option of not responding to individual questions if they believed those questions were of a sensitive nature.

(1) District.

I. All mainland U.S.A. Corps districts were represented. Mean for the 37 districts was 17.56 responses for each. Lowest response for one district was 4 and highest was 30 (two districts). Five districts had less than 14 and 4 had more than 21.

II. All districts represented. Mean was 10.08. Lowest response was 4 and highest 17. Six districts had less than 6 and 3 had more than 14.

(2) Region.

I. All 10 regions were represented. Mean was 65 responses per region.

II. All 10 regions represented. Highest response rates were for the north Pacific (70.4%) and Missouri River (68.3%).

(3) Waterway Location.

I. The majority of responses dealt with projects on rivers (60.7%). The following summarizes Phase I and II:

	I	II
Pacific Ocean	48 (7.4%)	34 (9.1%)
Atlantic Ocean	55 (8.5%)	27 (7.2%)
Gulf of Mexico	43 (6.6%)	29 (7.8%)
Great Lakes	26 (4.0%)	15 (4.0%)
Major Rivers	84 (12.9%)	55 (14.7%)
Other River	311 (47.8%)	170 (45.6%)
Other Lake	82 (12.6%)	43 (11.5%)
Beaufort Sea	1 (0.2%)	0 (0)

(4) Authorization Required.

	I	II
Section 10	77 (11.8%)	40(10.7%)
Section 404	235 (36.2%)	141(37.8%)
Section 10 and 404	338 (52.0%)	192(51.5%)

(5) Final Action.

	I	II
Issued	454 (69.8%)	274 (73.5%)
Denied	167 (25.1%)	89 (23.9%)
Withdrawn	29 (4.5%)	10 (2.7%)

(6) Year of Application.

	I	II
1983	28 (4.3%)	17 (4.6%)
1982	167 (25.7%)	97 (26.0%)
1981	167 (25.7%)	95 (25.5%)
1980	143 (22.0%)	85 (22.8%)
1979	94 (14.5%)	52 (13.9%)
1978	32 (4.9%)	17 (4.6%)
1977	12 (1.8%)	7 (1.9%)
1973 - 1976	7 (1.2%)	3 (0.9%)

(7) Year of Final Action.

	I	II
1983	159 (24.5%)	87 (23.3%)
1982	213 (32.8%)	131 (35.1%)
1981	146 (22.5%)	79 (21.2%)
1980	117 (18.0%)	68 (18.2%)
1979	13 (2.0%)	7 (1.9%)

(8) Time In Processing.

I. 60.3% (391) of the projects studied were ones which had been in processing one year or less.

II. 61.4% of the questionnaires returned were for projects which had been in processing one year or less.

(9) Arbitrary Project Size Classification.

	I	II
Major	228 (35.1%)	155 (41.6%)
Not Minor	417 (64.2%)	216 (57.9%)
Minor	5 (0.8%)	2 (0.5%)

(10) Acres Involved.

	I	II
one or less	100 (15.4%)	51 (13.7%)
1+ to 5	224 (34.5%)	114 (30.6%)
5+ to 10	84 (12.9%)	55 (14.7%)
10+ to 25	82 (12.6%)	45 (12.1%)
25+ to 100	82 (12.6%)	55 (14.7%)
100+ to 1000	52 (7.9%)	37 (9.9%)
more than 1000	15 (2.3%)	9 (2.4%)

(11) Type Project.

I. The largest representation was for commercial projects (199 or 30.2%). The next three largest groups were flood control (71 or 10.9%); recreational (59 or 9.1%); and marina oriented (52 or 8.0%).

II. For questionnaires returned the largest representative group was again commercial projects (100; 26.8%). Flood control and recreation were each represented by 37 returns (9.9% each). Twenty-eight (7.5%) were returned for mining projects.

(12) Amount of Fill.

I. 259 (39.9%) involved filling activity of 5,000 cubic yards or less. 198 (30.5%) involved fills of 100,000 cubic yards or more.

II. 136 (36.5%) were 5,000 cubic yards or less. 67 (18.0%) involved fills of over 100,000 cubic yards.

(13) Water Dependency.

	I	II
Water dependent	278 (42.8%)	163 (43.7%)
Water related	193 (29.7%)	108 (29.0%)
Neither	179 (27.5%)	102 (27.3%)

(14) Regional Description.

	I	II
Urban area	274 (42.2%)	155(41.5%)
Rural area	376 (57.8%)	218(58.4%)

(15) Degree of Urbanization In Project Area.

	I	II
2 million or more	21 (3.2%)	10 (2.7%)
1,999,999 to 1,000,000	37(5.7%)	24 (6.4%)
999,999 to 500,000	20 (3.1%)	16 (4.3%)
499,999 to 100,000	48 (7.4%)	21 (5.6%)
Less than 100,000	148 (22.8%)	85 (22.8%)
Not Urban	376 (57.8%)	217 (58.2%)

(16) Environmental Documentation.

	I	II
Corps EIS	19 (2.9%)	16 (4.3%)
Corps EA	596 (91.7%)	334 (89.5%)
Fed. Non-Corps EIS	19 (2.9%)	11 (2.9%)
Fed. Non-spec. EIS	3 (0.5%)	3 (0.8%)
Local Envir. Report	4 (0.6%)	2 (0.5%)
Fed. Pre-Application EIS	9 (1.4%)	7 (1.9%)

(17) Work In Wetlands.

	I	II
None	332 (51.1%)	191 (51.2%)
One Acre or Less	83 (12.8%)	38 (10.2%)
1.1 to 5 Acres	88 (13.5%)	52 (13.9%)
5.1 to 10 Acres	47 (7.2%)	29 (7.8%)
10.1 to 25 Acres	40 (6.2%)	24 (6.4%)
25.1 to 50 Acres	17 (2.6%)	13 (3.5%)
50.1 to 100 Acres	23 (3.5%)	16 (4.3%)
100.1 to 1,000 Acres	16 (2.5%)	8 (2.1%)
Over 1,000 Acres	3 (0.5%)	2 (0.5%)

(18) Fill In Open Water.

	I	II
None	392 (60.3%)	238 (63.8%)
One Acre or Less	142 (21.8%)	68 (18.2%)
1.1 to 5 Acres	83 (12.8%)	47 (12.6%)
5.1 to 10 Acres	17 (2.6%)	10 (2.7%)
10.1 to 25 Acres	11 (1.7%)	8 (2.1%)
25.1 to 50 Acres	4 (0.6%)	1 (0.3%)
50.1 to 100 Acres	1 (0.2%)	1 (0.3%)

(19) Endangered Species Habitat.

	I	II
No Impact	606 (93.2%)	347 (93.0%)
Possible Impact	37 (5.7%)	23 (6.2%)
Impact	7 (1.1%)	3 (0.8%)

(20) Water Quality Impact.

	I	II
Point Discharge	6 (0.9%)	3 (0.8%)
Non-point Discharge	627 (96.5%)	360 (96.5%)
None	7 (1.1%)	4 (1.1%)
Water Qual. = Denial	10 (1.5%)	6 (1.6%)

(21) Cultural Resources.

	I	II
Impact	13 (2.0%)	6 (1.6%)
Possible Impact	46 (7.1%)	25 (6.7%)
No Impact	591 (90.9%)	342 (91.7%)

(22) Geographic Extent of Impact.

	I	II
Site Only	479 (73.7%)	256 (68.6%)
Within County	126 (19.4%)	89 (23.9%)
Multi-County	35 (5.4%)	23 (6.2%)
Statewide	2 (0.3%)	1 (0.3%)
National	8 (1.2%)	4 (1.1%)

(23) Predominance of Impact Type.

	I	II
Primary	128 (19.7%)	64 (17.2%)
Secondary	522 (80.3%)	309 (82.8%)

(24) Project Classification.

	I	II
4.	51 (7.8%)	25 (6.7%)
5.	80 (12.3%)	39 (10.5%)
6.	249 (38.3%)	139 (37.3%)
7.	86 (13.2%)	47 (12.6%)
8.	154 (23.7%)	109 (29.2%)
9.	30 (4.6%)	14 (3.8%)

(25) Mitigation.

	I	II
Initial	101 (15.5%)	62 (16.6%)
During Corps Process	195 (30.0%)	123 (33.0%)
None	270 (41.5%)	151 (40.5%)
Recom., Not Taken	12 (1.8%)	6 (1.6%)
N/Avail. Phase I	72 (11.1%)	31 (8.3%)

(26) Description of Applicant.

	I	II
Group A	26 (4.0%)	11 (2.9%)
Group B	183 (28.2%)	92 (24.7%)
Group C	93 (14.3%)	49 (13.1%)
Government Agency	162 (24.9%)	123 (33.0%)
Conservation Group	1 (0.2%)	0 (0)
Private Individual	175 (26.9%)	91 (24.4%)
Private Organization	10 (1.5%)	7 (1.9%)

(27) Description of Applicant: Agency Only.

	I	II
Federal	15 (2.3%)	13 (3.5%)
State	39 (6.0%)	33 (8.8%)
County	20 (3.1%)	15 (4.0%)
Local	41 (6.3%)	28 (7.5%)
Special	47 (7.2%)	34 (9.1%)
Non-Agency	488 (75.1%)	250 (67.0%)

(28) State Project is Located In.

I. For Phase I 49 of the 50 States were represented (Hawaii was not). One project was from Puerto Rico. The largest number of projects were in California (51 or 7.8%). The smallest representation was by New Hampshire, North Dakota, and Vermont. These three only had one project each.

II. For Phase II 48 of the States were represented (New Hamshire and Hawaii were not). California again had the largest representation (29 or 7.8%). The average number of projects for the 48 States represented was 7.8. The representation by State generally corresponded with distribution of population by State.

(29) Impact On Fishery.

	I	II
None	82 (12.6%)	45 (12.1%)
Possible	403 (62.0%)	218 (58.4%)
Impact	165 (25.4%)	110 (29.5%)

(30) Reason For Denial.

I. The largest representation was denial for "natural resources" related reasons (100 or 52.4%). A Combination of reasons (18.3%) and legal or zoning problems (5.8%) had the next highest frequencies.

(30) Reason For Denial (continued).

II. Natural resources denials represented 55.5% or 55 of the projects. A combination of reasons was the next largest group with 16 projects (4.3%).

(31) U.S. EPA Objection.

	I	II
No	306(47.1%)	181(48.5%)
Yes	160(24.6%)	97(26.0%)
Comments, No Objection	114(17.5%)	63(16.9%)
Not Available Phase I	70(10.8%)	32(8.6%)

(32) U.S. Fish and Wildlife Objection.

	I	II
No	227(34.9%)	135(36.2%)
Yes	219(33.7%)	129(34.6%)
Comments, No Objection	128(19.7%)	73(19.6%)
Not Available Phase I	71(10.9%)	34(9.1%)
No Comments Due to Funding	5(0.8%)	2(0.5%)

(33) Other Federal Objection.

	I	II
No	390(60.0%)	223(59.8%)
Yes	101(15.5%)	60(16.1%)
Comments, No Objection	86(13.2%)	52(13.9%)
Not Available Phase I	69(10.6%)	35(9.4%)
No Comments Due to Funding	4(0.6%)	3(0.8%)

(34) State Objection.

	I	II
No	266(40.9%)	149(39.9%)
Yes	153(23.5%)	89(23.9%)
Comments, No Objection	172(26.5%)	106(28.4%)
Not Available Phase I	59(9.1%)	29(7.8%)

(35) Local Agency Objection.

	I	II
No	484(74.5%)	284(76.1%)
Yes	67(10.3%)	34(9.1%)
Comments, No Objection	27(4.2%)	20(5.4%)
Not Available Phase I	72(11.1%)	35(9.4%)

(36) Environmental/Conservation Group Objection.

	I	II
No	450 (69.2%)	263 (70.5%)
Yes	90 (13.8%)	49 (13.1%)
Comments, No Obj.	16 (2.5%)	13 (3.5%)
Not Avail. P I	93 (14.3%)	47 (12.6%)
No Comm. Due to Funding	1 (0.2%)	1 (0.3%)

(37) Private Objection.

	I	II
No	378 (58.2%)	221 (59.2%)
Yes	159 (24.5%)	90 (24.1%)
Comments, No Obj.	24 (3.7%)	15 (4.0%)
Not Avail. P I	88 (13.5%)	46 (12.3%)
No Comments Due to Funding	1 (0.2%)	1 (0.3%)

(38) Project Modified During Corps Processing.

	I	II
Yes	101 (15.5%)	65 (17.4%)
No	341 (52.5%)	196 (52.5%)
Denied w/o	99 (15.2%)	48 (12.9%)
Recomm, Not Taken	20 (3.1%)	7 (1.3%)
Alternative/Modif. Prov. with Applic	43 (6.6%)	28 (7.5%)
Recomm by non-agen, Not Taken	2 (0.3%)	2 (0.5%)
Not Avail P I	44 (6.8%)	27 (7.2%)

(39) U.S. F&WS and U.S. National Marine Fisheries Service Comment Similarity.

	I	II
Identical	117 (18.0%)	72 (19.3%)
Very Similar	30 (4.6%)	17 (4.6%)
Different	38 (5.8%)	21 (5.6%)
Both Did Not Comment	299 (46.0%)	178 (47.7%)
Not Avail. P I	146 (22.5%)	75 (20.1%)
Letter, No Comment	20 (3.1%)	10 (2.7%)

(40) No Variable No. "40" was used.

VARIABLES 40 THROUGH 67 WERE ONLY AVAILABLE IF A PHASE II QUESTIONNAIRE WAS RETURNED. THEREFORE THE FOLLOWING FREQUENCIES ONLY SHOW PHASE II DATA.

(41) Previous Experience With Corps Process.

	II
None	155 (23.8%)
One Previous Application	39 (6.0%)
Two or More	175 (26.9%)

(42) Time Spent Prior to Formal Application.

	II
None	25 (3.8%)
10 hours	126 (19.4%)
50 hours	108 (16.6%)
250 hours	49 (7.5%)
500 hours or more	48 (7.4%)

(43) Time Spent After Formal Application.

	II
None	18 (2.8%)
10 hours	96 (14.8%)
50 hours	108 (16.6%)
250 hours	66 (10.2%)
500 hours	68 (10.5%)

(44) No Variable No. "44" was used.

(45) Advance Notice to Corps.

	II
None	86 (13.2%)
One Week	26 (4.0%)
One Month	127 (19.5%)
6+ Months	127 (19.5%)

(46) Project Coordinated Prior to Application.

	II
No	77 (11.8%)
Yes	292 (44.9%)

(47) Coordination With Corps Prior.

	II
No	226 (61.4%)
Yes	142 (38.6%)

(48) U.S. F&WS Coordination Prior.

	II
No	221 (30.0%)
Yes	148 (70.0%)

(49) U.S. EPA Coordination Prior.

	II
No	268 (72.6%)
Yes	101 (27.4%)

(50) U.S. Dept. Commerce Coordination Prior.

	II
No	343 (93.4%)
Yes	24 (6.6%)

(51) State Coordination Prior.

	II
No	157 (42.5%)
Yes	212 (57.5%)

(52) Local Coordination Prior.

	II
No	180 (48.7%)
Yes	189 (51.3%)

(53) Agent Or Consultant Used to Represent.

	II
No	184 (49.4%)
Yes	188 (50.6%)

(54) Law Firm Used to Represent.

	II
No	303 (40.7%)
Yes	69 (59.3%)

(55) Engineering Firm Used to Represent.

	II
No	236 (63.9%)
Yes	133 (36.1%)

(56) Environmental Firm Used To Represent.

	II
No	326 (87.6%)
Yes	46 (12.4%)

(57) Permit Coordinating Firm Used to Represent.

	II
No	361 (97.0%)
Yes	11 (3.0%)

(58) Type Firm Used To Coordinate Just The Environmental Aspects.

	II
None	176 (50.4%)
Engineering with Environmental Capacity	105 (30.0%)
Environmental Firm	36 (10.3%)
Law Firm	21 (6.0%)
Other	11 (3.3%)

(59) Engineer Available In-house.

	II
No	197 (54.7%)
Yes	163 (45.3%)

(60) Physical Scientist Available In-house.

	II
No	332 (92.2%)
Yes	28 (7.8%)

(61) Social Scientist Available In-house.

	II
No	338 (93.8%)
Yes	22 (6.2%)

(62) Biological Scientist Available In-house.

	II
No	296 (82.2%)
Yes	64 (17.8%)

(63) Attorney Available In-house.

	II
No	280 (77.7%)
Yes	80 (22.3%)

(64) Other Available In-house.

	II
No	319 (88.6%)
Yes	41 (11.4%)

(65) In-house Staff Available.

	II
No	156 (43.3%)
Yes	204 (56.6%)

(66) Percent Time Project Manager On Project.

	II
None	194 (52.9%)
10%	63 (17.1%)
25%	49 (13.4%)
50%	25 (6.9%)
75%	12 (3.2%)
90%	24 (6.5%)

(67) Does In-house Staff Include Permit Processing Specialist.

	II
No	320 (86.4%)
Yes	50 (13.6%)

APPENDIX D

DATA ANALYSIS

APPENDIX D

DATA ANALYSIS

The following briefly describes the data analysis techniques used for identification of success rates for individual variables, in model construction, measuring significance, and validation.

Success Rates For Individual Variables

All data analysis was performed using Control Data Corporation (CDC) hardware available at Colorado State University. Identification of success rates for each variable was the focal point for most of the data analysis. Cross tabulation was the primary technique used in identification of the success rates by variable. Each column represented an individual project and each row represented a variable. Variable No. 5, identifying each project as having the permit issued, denied, or withdrawn, designated the project as a success or failure. The computer counted the number of successes for each variable by summing the successes indicated by variable No. 5.

Chi-square was then used to determine the significance for each of the individual success rates. The following formula was used for computation of Chi-square:

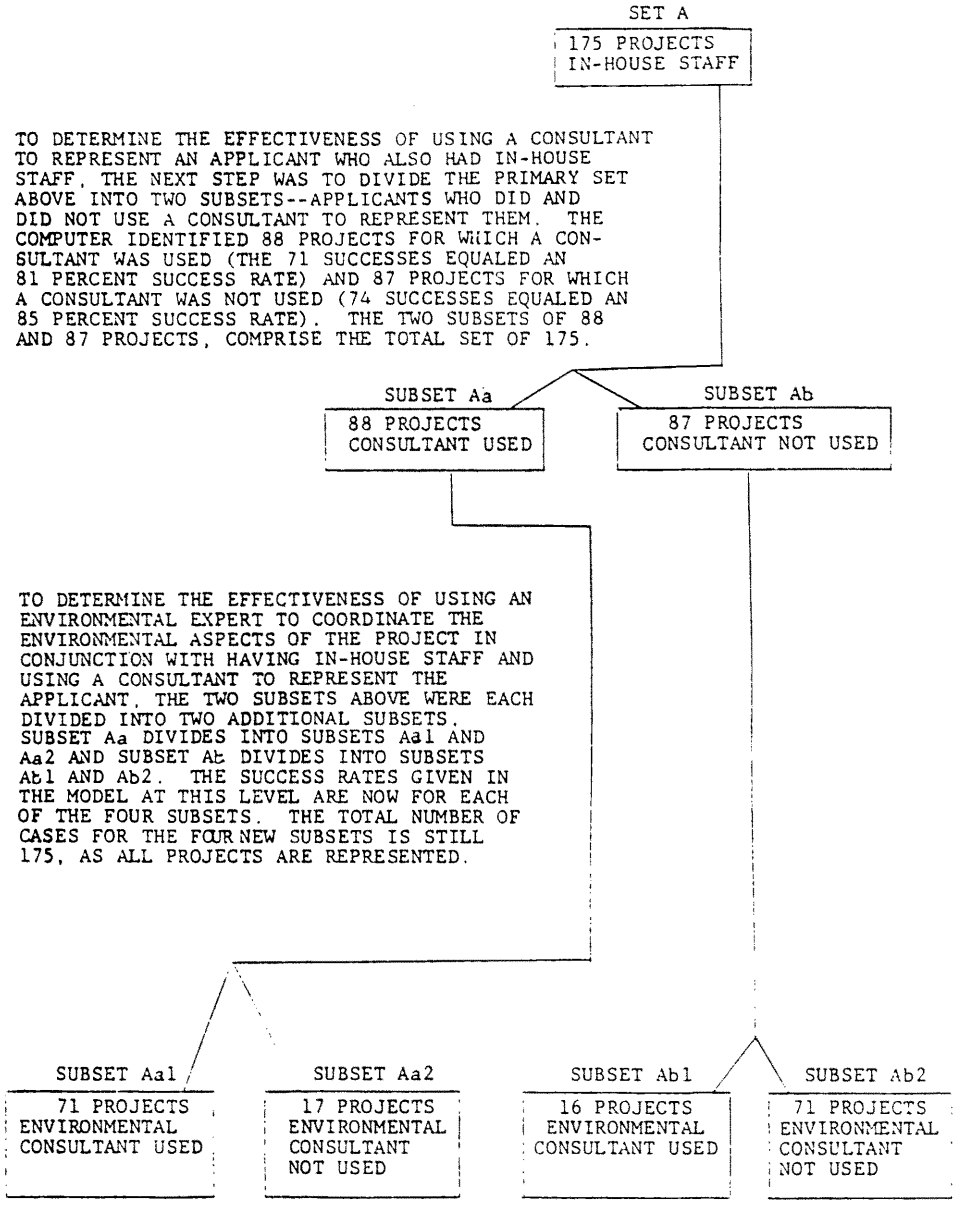
$$\chi^2 \text{ (chi-square)} = \sum_{ij} \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

For this formula, i and j are the rows and columns of an i by j frequency table. O_{ij} and E_{ij} are the observed and expected frequencies for the $_{ij}$th cell of the table.

Model Construction

Following the initial cross-tabulation of success versus non-success by each column of data, a subset of variables was selected which seemed to be important in determining success. Subsequent analyses involved looking at various combinations of variables in this subset to discover which combination would yield high rates of success for a relatively large number of projects. The models were constructed working from two directions--both by building on high success rates shown for combinations of variables by the computer and by intuitive means whereby a model which seemed meaningful was first diagrammed and then tested for success rate by the computer. The nine models presented are the result of testing hundreds of combinations of variables. The diagram on the following page shows by explanation and numerically how one specific model was constructed. Model 5A is used for the example.

THE INITIAL STEP WAS TO IDENTIFY THE PRIMARY SET FROM WHICH MODEL 5A WAS CONSTRUCTED. IT INCLUDED ALL PROJECTS FOR WHICH RETURNED QUESTIONNAIRES INDICATED THAT THE APPLICANT HAD IN-HOUSE STAFF AVAILABLE. THE TOTAL NUMBER OF PROJECTS IN THIS SET WAS 175.



Confidence intervals were used as the measure of significance for the success rates shown for the models. The interval estimates shown have a 95 percent chance of enclosing the true proportion of success (0.05 level of significance). BELBIN is the program used for calculation of the confidence intervals. BELBIN is available through the International Mathematical and Statistical Library (IMSL, Copyright 1978).

Validation

A random sample of 47 projects selected from all of the questionnaires returned was used for validation of the models.

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X-426A	PARSHALL FLUMES OF LARGE SIZE		1961	.50

d. Geomorphic

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CR 69	ENGINEERING AND ECOLOGICAL EVALUATION OF ANTITRANSPIRANTS FOR INCREASING RUNOFF IN COLORADO WATERSHEDS	Kreith	9/75	$ 3.50
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e. Geochemical

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2. PLANNING/EVALUATION METHODOLOGY

a. Valuation

CR 56	EVALUATION AND IMPLEMENTATION OF URBAN DRAINAGE AND FLOOD CONTROL PROJECTS	Grigg, Rice, Bothan, Shoemaker	6/74	9.00
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CR 103	EMPIRICAL APPLICATION OF A MODEL FOR ESTIMATING THE RECREATION VALUE OF WATER IN RESERVOIRS COMPARED TO INSTREAM FLOW	Walsh	12/80	4.00
IS 19	THE ENVIRONMENTAL QUALITY OBJECTIVE OF PRINCIPLES AND STANDARDS FOR PLANNING	McGinnis, Plott, Swanson	8/75	8.00

Report No.	Title	Author	Date	Price
TR 14	ECONOMIC VALUE OF BENEFITS FROM RECREATION AT HIGH MOUNTAIN RESERVOIRS	Walsh, Aukerman, Rud	12/78	$ 4.00
TR 24	THE SURVEY-BASED INPUT-OUTPUT MODEL AS A RESOURCE PLANNING TOOL	McKean	1/81	4.00
TR 44	DIRECT AND INDIRECT ECONOMIC EFFECTS OF HUNTING AND FISHING IN COLORADO - 1981	McKean, Nobe	1/84	5.00

b. System Simulation

CR 2	COMPUTER SIMULATION OF WASTE TRANSPORT IN GROUNDWATER AQUIFERS	Reddell, Sunada	6/69	3.00
CR 53	SYSTEMATIC DESIGN OF LEGAL REGULATIONS FOR OPTIMAL SURFACE-GROUNDWATER USAGE - PHASE I	Morel-Seytoux, Young, Radosevich		
CR 62	FEASIBILITY AND POTENTIAL OF ENHANCING WATER RECREATION OPPORTUNITIES ON HIGH COUNTRY RESERVOIRS	Aukerman	6/75	5.00
CR 68	SYSTEMATIC DESIGN OF LEGAL REGULATIONS FOR OPTIMAL SURFACE-GROUNDWATER USAGE, PHASE 2	Morel-Seytoux	9/75	13.00
CR 82	DEVELOPMENT OF A SUBSURFACE HYDROLOGIC MODEL AND USE FOR INTEGRATED MANAGEMENT OF SURFACE AND SUBSURFACE WATER RESOURCES	Morel-Seytoux	12/77	4.00
CR 87	DEVELOPMENT OF A STREAM-AQUIFER MODEL SUITED FOR DEVELOPMENT	Morel-Seytoux	8/78	4.00
CR 89	SYNTHESIS AND CALIBRATION OF A RIVER BASIN WATER MANAGEMENT MODEL	Shafer, Labadie	10/78	4.00
CR 108	WATERLOGGING CONTROL FOR IMPROVED WATER AND LAND USE EFFICIENCIES: A SYSTEMATIC ANALYSIS	Simpson, Morel-Seytoux, Young	12/80	6.00
CR 112	DAILY OPERATIONAL TOOL FOR MAXIMUM BENEFICIAL USE MANAGEMENT OF SURFACE AND GROUNDWATERS IN A BASIN	Morel-Seytoux, Verdin, Illangasekare	3/82	4.00
CR 125	A RIVER BASIN NETWORK MODEL FOR CONJUNCTIVE USE OF SURFACE AND GROUNDWATER: PROGRAM CONSIM	Labadie, Phamwon, Lazaro	6/83	8.00
IS 33	THE IMPACTS OF IMPROVING EFFICIENCY OF IRRIGATION SYSTEMS ON WATER AVAILABILITY IN THE LOWER SOUTH PLATTE RIVER BASIN	Morel-Seytoux, Illangasekare, Bittinger, Evans	1/79	Free
TR 16	WATER MANAGEMENT MODEL FOR FRONT RANGE RIVER BASINS	Labadie, Shafer	4/79	6.00
TR 18	AN INTERACTIVE RIVER BASIN WATER MANAGEMENT MODEL: SYNTHESIS AND APPLICATION	Shafer	8/79	5.00
S-TB127	A SIMULATION MODEL FOR ANALYZING TIMBER-WATER JOINT PRODUCTION IN THE COLORADO ROCKIES		1975	1.25

c. Analytical Models

Report No.	Title	Author	Date	Price
CR 13	ECONOMICS OF GROUNDWATER DEVELOPMENT IN THE HIGH PLAINS OF COLORADO	Rohdy	6/69	$ 2.50
CR 29	IDENTIFICATION OF URBAN WATERSHED UNITS USING REMOTE SPECTRAL SENSING	Root, Miller	6/71	6.00
CR 40	SELECTION OF TEST VARIABLE FOR MINIMAL TIME DETECTION OF BASIN RESPONSE TO NATURAL OR INDUCED CHANGES	Morel-Seytoux	12/72	4.00
CR 45	MATHEMATICAL MODELING OF WATER MANAGEMENT STRATEGIES IN URBANIZING RIVER BASINS	Walker, Skogerboe	6/73	8.50
CR 83	MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN EASTERN NEW ENGLAND	Doehring, Smith	1/78	7.50
CR 90	MODELS FOR SYSTEM WATER PLANNING WITH SPECIAL REFERENCE TO WATER REUSE	Hendricks, Morel-Seytoux	6/78	6.00
CR 101	AN EMPIRICAL APPLICATION OF A MODEL FOR ESTIMATING THE RECREATION VALUE OF INSTREAM FLOW	Walsh, Ericson, Arosteguy, Hansen	10/80	4.00
CR 103	EMPIRICAL APPLICATION OF A MODEL FOR ESTIMATING THE RECREATION VALUE OF WATER IN RESERVOIRS COMPARED TO INSTREAM FLOW	Walsh	12/80	4.00
CR 108	WATERLOGGING CONTROL FOR IMPROVED WATER AND LAND USE EFFICIENCIES: A SYSTEMATIC ANALYSIS	Simpson, Morel-Seytoux, Young	12/80	6.00
CR 111	INVESTIGATION OF OBJECTIVE FUNCTIONS AND OPERATION RULES FOR STORAGE RESERVOIRS	Yevjevich, Hall, Salas	9/81	4.00
CR 114	PLANNING WATER REUSE: DEVELOPMENT OF REUSE THEORY AND THE INPUT-OUTPUT MODEL, VOL. I: FUNDAMENTALS	Turner, Hendricks	9/80	13.00
CR 115	PLANNING WATER REUSE: DEVELOPMENT OF REUSE THEORY AND THE INPUT-OUTPUT MODEL, VOL. II: APPLICATION	Klooz, Hendricks	9/80	6.00
CR 127	MATHEMATICAL MODELS FOR PREDICTION OF SOIL MOISTURE PROFILES	Morel-Seytoux	7/83	4.00
IS 37	WATER FOR THE SOUTH PLATTE BASIN	Hendricks, Morel-Seytoux, Turner	3/79	Free
IS 40	PROCEEDINGS OF THE WORKSHOP ON INSTREAM FLOW HABITAT CRITERIA	Smith	12/79	6.00
IS 41	EXPLORING WAYS OF INCREASING THE USE OF SOUTH PLATTE WATER	Labadie, Shafer		Free
TR 8	MODELS DESIGNED TO EFFICIENTLY ALLOCATE IRRIGATION WATER USE BASED ON CROP RESPONSE TO SOIL MOISTURE STRESS	Anderson, Yaron, Young	5/77	5.00
TR 14	ECONOMIC VALUE OF BENEFITS FROM RECREATION AT HIGH MOUNTAIN RESERVOIRS	Aukerman, Rud	12/78	4.00
TR 20	DEVELOPMENT OF METHODOLOGIES FOR DETERMINING OPTIMAL WATER STORAGE STRATEGIES	Labadie, Fontane	9/80	3.00
TR 24	THE SURVEY-BASED INPUT-OUTPUT MODEL AS A RESOURCE PLANNING TOOL	McKean	1/81	4.00
TR 26	AN INPUT-OUTPUT ANALYSIS OF SPORTSMAN EXPENDITURES IN COLORADO	McKean	1/81	5.00
TR 34	ENERGY AND WATER SCARCITY AND THE IRRIGATED AGRICULTURAL ECONOMY OF THE COLORADO HIGH PLAINS: DIRECT ECONOMIC-HYDROLOGIC IMPACT FORECASTS (1979-2020)	Young, Conklin, Longenbaugh, Gardner	2/82	8.00
TR 44	DIRECT AND INDIRECT ECONOMIC EFFECTS OF HUNTING AND FISHING IN COLORADO	McKean, Nobe	1/84	5.00

d. Planning Procedure

Report No.	Title	Author	Date	Price
TR 7	MANUAL FOR TRAINING IN THE APPLICATION OF PRINCIPLES AND STANDARDS (Water Resources Council)	Caulfield	12/74	$11.00

3. DEMAND REDUCTION

CR 8	IMPROVING EFFICIENCY IN AGRICULTURAL WATER USE	Kemper, Danielson	6/69	2.00
CR 15	HYDRAULIC OPERATING CHARACTERISTICS OF LOW GRADIENT BORDER CHECKS IN THE MANAGEMENT OF IRRIGATION WATER	Heermann, Evans	6/68	4.00
CR 19	HYDRAULICS OF LOW GRADIENT BORDER IRRIGATION SYSTEMS	Evans, Heermann, Howe, Kincaid	6/70	4.00
CR 20	IMPROVING EFFICIENCY IN AGRICULTURAL WATER USE	Kemper	7/70	4.00
CR 25	EVAPORATION OF WATER AS RELATED TO WIND BARRIERS	Verma, Cermak	6/71	6.00
CR 41	GROUNDWATER RECHARGE AS AFFECTED BY SURFACE VEGETATION AND MANAGEMENT	Klute, Danielson, Linden, Hamaker	12/72	6.00
CR 49	IMPROVEMENTS IN MOVING SPRINKLER IRRIGATION SYSTEMS FOR CONSERVATION OF WATER	Miles	6/73	8.50
CR 52	CONSOLIDATION OF IRRIGATION SYSTEMS: PHASE I - ENGINEERING, LEGAL, AND SOCIOLOGICAL CONSTRAINTS AND/OR FACILITATORS	Skogerboe, Radosevich, Vlachos	6/73	25.00
CR 69	ENGINEERING AND ECOLOGICAL EVALUATION OF ANTITRANSPIRANTS FOR INCREASING RUNOFF IN COLORADO WATERSHEDS	Kreith	9/75	3.50
CR 80	ACHIEVING URBAN WATER CONSERVATION, A HANDBOOK	Flack, Weakley, Hill	9/77	7.00
CR 81	ACHIEVING URBAN WATER CONSERVATION: TESTING COMMUNITY ACCEPTANCE	Snodgrass, Hill	9/77	6.00
CR 94	CONSOLIDATION OF IRRIGATION SYSTEMS: PHASE II - ENGINEERING, ECONOMIC, LEGAL AND SOCIOLOGICAL REQUIREMENTS	Vlachos, Huszar, Radosevich, Skogerboe	5/80	9.00
CR 105	MUNICIPAL WATER USE IN NORTHERN COLORADO: DEVELOPMENT OF EFFICIENCY-OF-USE CRITERION	White, DiNatale, Greenberg, Flack	9/80	5.00
CR 106	URBAN LAWN IRRIGATION AND MANAGEMENT PRACTICES FOR WATER SAVING WITH MINIMUM EFFECT ON LAWN QUALITY	Danielson, Feldhake	5/81	6.00
CR 109	SALT- AND DROUGHT-TOLERANT CROP PLANTS FOR WATER CONSERVATION	Nabors	10/81	6.00
CR 120	THE EFFECTS OF WATER CONSERVATION ON NEW WATER SUPPLY FOR URBAN COLORADO UTILITIES	Ellinghouse, McCoy	12/82	9.00
IS 16	ANNOTATED BIBLIOGRAPHY ON TRICKLE IRRIGATION	Smith, Walker	6/75	Free
IS 26	WATER USE AND MANAGEMENT IN AN ARID REGION (Fort Collins, Colorado and Vicinity)	Anderson, DeRemer, Hall	9/77	6.00
IS 36	CUTTING CITY WATER DEMAND	Flack	5/79	Free
TR 8	MODELS DESIGNED TO EFFICIENTLY ALLOCATE IRRIGATION WATER USE BASED ON CROP RESPONSE TO SOIL MOISTURE STRESS	Anderson, Yaron, Young	5/77	5.00
TR 13	IMPACT OF IRRIGATION EFFICIENCY IMPROVEMENTS ON WATER AVAILABILITY IN THE SOUTH PLATTE RIVER BASIN	Bittinger, Danielson, Evans, Hart, Morel-Seytoux, Skinner	1/79	6.00
TR 28	AN ASSESSMENT OF WATER USE AND POLICIES IN NORTHERN COLORADO CITIES	DiNatale	3/81	6.00
S-TB128	EVALUATING WATER DISTRIBUTIONS OF SPRINKLER IRRIGATION SYSTEMS		1976	.85

Report No.	Title	Author	Date	Price
CR 3	SNOW ACCUMULATION IN RELATION TO FOREST CANOPY	Meiman, Froehlich, Dils	6/69	$ 2.50
CR 9	CONTROLLED ACCUMULATION OF BLOWING SNOW	Rasmussen	6/69	3.50
CR 24	STUDIES OF THE ATMOSPHERIC WATER BALANCE	Rasmussen	8/71	6.00
CR 57	SNOW-AIR INTERACTIONS AND MANAGEMENT OF MOUNTAIN WATERSHED SNOWPACK	Meiman, Grant	6/74	4.00
CR 108	WATERLOGGING CONTROL FOR IMPROVED WATER AND LAND USE EFFICIENCIES: A SYSTEMATIC ANALYSIS	Simpson, Morel-Seytoux, Young	12/80	6.00
CR 114	PLANNING WATER REUSE: DEVELOPMENT OF REUSE THEORY AND THE INPUT-OUTPUT MODEL, VOL. I: FUNDAMENTALS	Turner, Hendricks	9/80	13.00
CR 115	PLANNING WATER REUSE: DEVELOPMENT OF REUSE THEORY AND THE INPUT-OUTPUT MODEL, VOL. II: APPLICATION	Klooz, Hendricks	9/80	6.00
CR 123	ARTIFICIAL GROUNDWATER RECHARGE, SAN LUIS VALLEY, COLORADO	Sunada	5/83	7.00
IS 32	SNOWPACK AUGMENTATION BY CLOUD SEEDING IN COLORADO AND UTAH	Chisholm, Grimes	8/79	5.00
IS 33	THE IMPACTS OF IMPROVING EFFICIENCY OF IRRIGATION SYSTEMS ON WATER AVAILABILITY IN THE LOWER SOUTH PLATTE RIVER BASIN	Morel-Seytoux, Illangasekare, Bittinger, Evans	1/79	Free

5. MANAGEMENT OF HYDROLOGIC EXTREMES

CR 10	ECONOMICS AND ADMINISTRATION OF WATER RESOURCES	Flack	6/69	3.50
CR 16	EXPERIMENTAL INVESTIGATION OF SMALL WATERSHED FLOODS	Smith, Yevjevich, Holland	6/68	3.00
CR 18	EXPERIMENTAL INVESTIGATION OF SMALL WATERSHED FLOODS	Schulz, Yevjevich	6/70	6.00
CR 56	EVALUATION AND IMPLEMENTATION OF URBAN DRAINAGE AND FLOOD CONTROL PROJECTS	Grigg, Rice, Bothan, Shoemaker	6/74	9.00
CR 65	URBAN DRAINAGE AND FLOOD CONTROL PROJECTS: ECONOMIC, LEGAL, AND FINANCIAL ASPECTS	Grigg, Tucker, Rice, Shoemaker	7/75	11.00
CR 85	DEVELOPMENT OF A DRAINAGE AND FLOOD CONTROL MANAGEMENT PROGRAM FOR URBANIZING COMMUNITIES - PART I	Riordan, Grigg, Hiller	9/78	3.00
CR 86	DEVELOPMENT OF A DRAINAGE AND FLOOD CONTROL MANAGEMENT PROGRAM FOR URBANIZING COMMUNITIES - PART II	Riordan, Grigg, Hiller	9/78	8.00
CR 95	DROUGHT-INDUCED PROBLEMS AND RESPONSES OF SMALL TOWNS AND RURAL WATER ENTITIES IN COLORADO: THE 1976-78 DROUGHT	Howe	6/80	5.00
CR 126	INCREASING THE ECONOMIC EFFICIENCY AND AFFORDABILITY OF STORM DRAINAGE PROJECTS	Cochrane, Huszar	9/83	4.00
IS 13	FLOOD PLAIN MANAGEMENT OF THE CACHE LA POUDRE RIVER NEAR FORT COLLINS, COLORADO	Combs, McDonald, Martens, Rowe	8/74	3.75
IS 17	CACHE LA POUDRE RIVER NEAR FORT COLLINS, COLORADO - FLOOD MANAGEMENT ALTERNATIVES - RELOCATIONS AND LEVIES	Koirtyohann, Miller, Pope, Stein	8/75	6.00
IS 24	FACTORS AFFECTING PUBLIC ACCEPTANCE OF FLOOD INSURANCE IN LARIMER AND WELD COUNTIES, COLORADO	James, Kreger, Barrineau	9/77	4.00
IS 27	PROCEEDINGS, COLORADO DROUGHT WORKSHOPS		11/77	Free
IS 44	THE NATIONAL FLOOD INSURANCE PROGRAM IN LARIMER COUNTY, COLORADO AREA	Shoudy	8/80	4.00
S-GS856	RESEARCH DATA ASSEMBLY FOR SMALL WATERSHED FLOODS, PART II		1967	.50

Report No.	Title	Author	Date	Price
CR 62	FEASIBILITY AND POTENTIAL OF ENHANCING WATER RECREATION OPPORTUNITIES ON HIGH COUNTRY RESERVOIRS	Aukerman	6/75	$ 5.00
CR 78	SELECTING AND PLANNING HIGH COUNTRY RESERVOIRS FOR RECREATION WITHIN A MULTIPURPOSE MANAGEMENT FRAMEWORK	Aukerman, Carlson, Hiller, Labadie	7/77	7.00
CR 103	EMPIRICAL APPLICATION OF A MODEL FOR ESTIMATING THE RECREATION VALUE OF WATER IN RESERVOIRS COMPARED TO INSTREAM FLOW	Walsh	12/80	4.00
CR 124	EFFECTS OF WILDERNESS LEGISLATION ON WATER-PROJECT DEVELOPMENT IN COLORADO	Weaver	5/83	8.00
TR 3	IMPLEMENTATION OF THE FEDERAL WATER PROJECT RECREATION ACT IN COLORADO	Spence	6/74	Free
TR 11	FEDERAL WATER RECREATION IN COLORADO: COMPREHENSIVE VIEW AND ANALYSIS	Stefanec	5/78	6.00
TR 12	RECREATION BENEFITS OF WATER QUALITY: ROCKY MOUNTAIN NATIONAL PARK, SOUTH PLATTE RIVER BASIN, COLORADO	Walsh, Ericson, McKean, Young	5/78	5.00

B. WATER QUALITY

1. IDENTIFY AND CONTROL ENTERING POLLUTANTS

CR 14	HYDROGEOLOGY AND WATER QUALITY STUDIES IN THE CACHE LA POUDRE BASIN, COLORADO	Waltz	6/69	6.00
CR 21	WATERFOWL-WATER TEMPERATURE RELATIONS IN WINTER	Ryder	6/70	6.00
CR 54	GEOLOGIC FACTORS IN THE EVALUATION OF WATER POLLUTION POTENTIAL AT MOUNTAIN DWELLING SITES	Burns, McCrumb, Morrison	12/73	11.00
CR 60	RESEARCH NEEDS AS RELATED TO THE DEVELOPMENT OF SEDIMENT STANDARDS IN RIVERS	Gessler	3/75	4.00
CR 67	TOXIC HEAVY METALS IN GROUNDWATER OF A PORTION OF THE FRONT RANGE MINERAL BELT	Edwards, Klusman	6/75	4.00
CR 71	SALT TRANSPORT IN SOIL PROFILES WITH APPLICATION TO IRRIGATION RETURN FLOW	Glas, McWhorter	1/76	6.00
CR 72	TOXIC HEAVY METALS IN GROUNDWATER OF A PORTION OF THE FRONT RANGE MINERAL BELT	Klusman, Edwards	6/76	5.00
CR 79	EVALUATION OF THE STORAGE OF DIFFUSE SOURCES OF SALINITY IN THE UPPER COLORADO RIVER BASIN	Laronne, Schumm	9/77	5.00
CR 84	POLLUTIONAL CHARACTERISTICS OF STORMWATER RUNOFF	Bennett, Linstedt	9/78	8.00
CR 104	DETECTION OF WATER QUALITY CHANGES THROUGH OPTIMAL TESTS AND RELIABILITY OF TESTS	Koch, Sanders, Morel-Seytoux	9/80	5.00
CR 107	ROLE OF SEDIMENT IN NON-POINT SOURCE SALT LOADING WITHIN THE UPPER COLORADO RIVER BASIN	Shen, Laronne, Enck, Sunday, Tanji, Whittig, Biggar	8/81	9.00
IS 25	SURVEILLANCE DATA, PLAINS SEGMENT OF THE CACHE LA POUDRE RIVER, COLORADO, 1970-1977	Morrison	1/78	6.00

Report No.	Title	Author	Date	Price
IS 38	PUBLIC PARTICIPATION PRACTICES OF THE U.S. ARMY CORPS OF ENGINEERS	Crist, Lanier	7/79	$ 4.00
S-GS870	CHEMICAL QUALITY OF GROUNDWATER IN THE PROSPECT VALLEY AREA, COLORADO		1968	.25

2. EFFECTS OF POLLUTANTS

CR 26	WATER TEMPERATURE AS A QUALITY FACTOR IN THE USE OF STREAMS AND RESERVOIRS	Ward, J.	12/71	4.00
CR 31	SEDIMENTATION AND CONTAMINANT CRITERIA FOR WATERSHED PLANNING AND MANAGEMENT	Shen	6/72	6.00
CR 73	PRODUCTION OF MUTANT PLANTS CONDUCIVE TO SALT TOLERANCE	Nabors	7/76	5.00
CR 96	THE PRODUCTION OF AGRICULTURALLY USEFUL MUTANT PLANTS WITH CHARACTERISTICS CONDUCIVE TO SALT TOLERANCE AND EFFICIENT WATER UTILIZATION	Nabors	10/79	4.00
CR 98	THE EFFECT OF ALGAL INHIBITORS ON HIGHER PLANT TISSUES	Kugrens	7/80	3.50
CR 116	EFFECTS OF RELEASES OF SEDIMENT FROM RESERVOIRS ON STREAM BIOTA	Ward, J.	9/82	4.00

3. TREATMENT AND DISPOSAL OF WASTES

CR 1	BACTERIAL RESPONSE TO THE SOIL ENVIRONMENT	Boyd, Yoshida, Vereen, Cada, Morrison	6/69	4.50
CR 2	COMPUTER SIMULATION OF WASTE TRANSPORT IN GROUNDWATER AQUIFERS	Reddell, Sunada	6/69	3.00
CR 28	COMBINED COOLING AND BIO-TREATMENT OF BEET SUGAR FACTORY CONDENSER WATER EFFLUENT	Lof	6/71	6.00
CR 32	BACTERIAL MOVEMENT THROUGH FRACTURED BEDROCK	Morrison, Allen	7/72	6.00
CR 33	THE MECHANISM OF WASTE TREATMENT AT LOW TEMPERATURE, PART A: MICROBIOLOGY	Morrison, Newton, Boone, Martin	8/72	6.00
CR 34	THE MECHANISM OF WASTE TREATMENT AT LOW TEMPERATURE, PART B: SANITARY ENGINEERING	Ward, J., Hunter, Johansen	8/72	6.00
CR 59	A SYSTEM FOR GEOLOGIC EVALUATION OF POLLUTION AT MOUNTAIN DWELLING SITES	Waltz	1/75	4.50
CR 66	INDIVIDUAL HOME WASTEWATER CHARACTERIZATION AND TREATMENT	Bennett, Linstedt	7/75	9.00
CR 77	EVAPORATION OF WASTEWATER FROM MOUNTAIN CABINS	Ward, J.	3/77	9.00
CR 113	A WATER HANDBOOK FOR METAL MINING OPERATIONS	Wildeman	11/81	6.00
CR 121	SOLAR HEATING OF WASTEWATER STABILIZATION PONDS	Klemetson	3/83	5.00
IS 4	PROCEEDINGS, WORKSHOP ON HOME SEWAGE DISPOSAL IN COLORADO	Ward, R.	6/72	Free
IS 9	PROCEEDINGS OF THE SYMPOSIUM ON LAND TREATMENT AND SECONDARY EFFLUENT		11/73	4.00
IS 20	PROCEEDINGS, SECOND WORKSHOP ON HOME SEWAGE DISPOSAL IN COLORADO	Ward, R.	9/75	4.00
IS 29	PROCEEDINGS, THIRD WORKSHOP ON HOME SEWAGE DISPOSAL IN COLORADO - COMMUNITY MANAGEMENT	Ward, R.	7/78	5.00

Report No.	Title	Author	Date	Price
IS 45	PROCEEDINGS, FOURTH WORKSHOP ON HOME SEWAGE DISPOSAL IN COLORADO - STATE/COUNTY COOPERATION IN MANAGING SMALL WASTEWATER FLOWS	Ward, R.	8/81	$ 5.00
IS 49	PROCEEDINGS, FIFTH WORKSHOP ON HOME SEWAGE DISPOSAL IN COLORADO: OPERATION AND MAINTENANCE OF ON-SITE WASTEWATER TREATMENT SYSTEMS	Ward, R.	6/83	5.00
TR 10	EFFICIENCY OF WASTEWATER DISPOSAL IN MOUNTAIN AREAS	Walsh, Soper, Prato	1/78	6.00
TR 17	LAND TREATMENT OF MUNICIPAL SEWAGE EFFLUENT AT HAYDEN, COLORADO	Barbarick, Sabey, Evans	10/77	4.00

C. ECONOMIC IMPACTS

CR 10	ECONOMICS AND ADMINISTRATION OF WATER RESOURCES	Flack	6/69	3.50
CR 12	ECONOMICS AND ADMINISTRATION OF WATER RESOURCES	Nobe	6/69	4.00
CR 13	ECONOMICS OF GROUNDWATER DEVELOPMENT IN THE HIGH PLAINS OF COLORADO	Rohdy	6/69	2.50
CR 58	PRIMARY DATA ON ECONOMIC ACTIVITY AND WATER USE IN PROTOTYPE OIL SHALE DEVELOPMENT AREAS OF COLORADO: AN INITIAL INQUIRY	Gray	6/74	3.00
CR 65	URBAN DRAINAGE AND FLOOD CONTROL PROJECTS: ECONOMIC, LEGAL AND FINANCIAL ASPECTS	Grigg, Tucker, Rice, Shoemaker	7/75	11.00
CR 70	AN ECONOMIC ANALYSIS OF WATER USE IN COLORADO'S ECONOMY	Gray	12/75	6.00
CR 75	PHYSICAL AND ECONOMIC EFFECTS ON THE LOCAL AGRICULTURAL ECONOMY OF WATER TRANSFER TO CITIES	Anderson, Wengert, Heil	10/76	4.00
CR 91	ECONOMIC BENEFITS FROM INSTREAM FLOW IN A COLORADO MOUNTAIN STREAM	Daubert, Young, Gray	6/79	6.00
CR 101	AN EMPIRICAL APPLICATION OF A MODEL FOR ESTIMATING THE RECREATION VALUE OF INSTREAM FLOW	Walsh, Erickson, Arosteguy, Hansen	10/80	4.00
CR 102	MEASURING BENEFITS AND THE ECONOMIC VALUE OF WATER IN RECREATION ON HIGH COUNTRY RESERVOIRS	Walsh, Aukerman, Milton	9/80	4.00
CR 118	ECONOMIC ASPECTS OF COST-SHARING ARRANGEMENTS FOR FEDERAL IRRIGATION PROJECTS: A CASE STUDY	Keleta, Young, Sparling	12/82	4.00
CR 122	ECONOMIC IMPACTS OF TRANSFERRING WATER FROM AGRICULTURE TO ALTERNATIVE USES IN COLORADO	Young	4/83	6.00
CR 126	INCREASING THE ECONOMIC EFFICIENCY AND AFFORDABILITY OF STORM DRAINAGE PROJECTS	Cochrane, Huszar	9/83	4.00
IS 2	ECONOMICS OF WATER QUALITY--SALINITY POLLUTION, Abridged Bibliography	Miller	6/71	12.00
IS 43	AN EVALUATION OF THE CACHE LA POUDRE WILD AND SCENIC RIVER DRAFT ENVIRONMENTAL IMPACT STATEMENT AND STUDY REPORT	Eubanks	8/80	6.00

C. ECONOMIC IMPACTS (cont'd)

Report No.	Title	Author	Date	Price
TR 14	ECONOMIC VALUE OF BENEFITS FROM RECREATION AT HIGH MOUNTAIN RESERVOIRS	Walsh, Aukerman, Rud	12/78	$ 4.00
TR 19	AN ECONOMIC EVALUATION OF THE GENERAL MANAGEMENT FOR YOSEMITE NATIONAL PARK	Walsh	3/80	5.00
TR 24	THE SURVEY-BASED INPUT-OUTPUT MODEL AS A RESOURCE PLANNING TOOL	McKean	1/81	4.00
TR 34	ENERGY AND WATER SCARCITY AND THE IRRIGATED AGRICULTURAL ECONOMY OF THE COLORADO HIGH PLAINS: DIRECT ECONOMIC-HYDROLOGIC IMPACT FORECASTS (1979-2020)	Young, Conklin, Longenbaugh, Gardner	2/82	8.00
TR 44	DIRECT AND INDIRECT ECONOMIC EFFECTS OF HUNTING AND FISHING IN COLORADO - 1981	McKean, Nobe	1/84	5.00
S-545S	SECONDARY ECONOMIC EFFECTS OF IRRIGATION ON THE COLORADO HIGH PLAINS		1971	.80

D. ECOSYSTEM ISSUES

CR 5	SOIL MOVEMENT IN AN ALPINE AREA	Striffler	6/69	2.00
CR 69	ENGINEERING AND ECOLOGICAL EVALUATION OF ANTITRANSPIRANTS FOR INCREASING RUNOFF IN COLORADO WATERSHEDS	Kreith	9/75	3.50
CR 93	APPLICATION OF GEOMORPHIC PRINCIPLES TO ENVIRONMENTAL MANAGEMENT IN SEMIARID REGIONS	Schumm, Bradley, Begin	2/80	4.00
CR 98	THE EFFECT OF ALGAL INHIBITORS ON HIGHER PLANT TISSUES	Kugrens	7/80	3.50
CR 116	EFFECTS OF RELEASES OF SEDIMENT FROM RESERVOIRS ON STREAM BIOTA	Ward, J.V.	9/82	4.00
IS 7	WILDLIFE AND THE ENVIRONMENT, PROCEEDINGS OF THE GOVERNOR'S CONFERENCE, MARCH 1973 (Out of print--available through interlibrary loan)	Swanson	3/73	
IS 10	PROCEEDINGS, WORKSHOP ON REVEGETATION OF HIGH-ALTITUDE DISTURBED LANDS	Berg, Brown, Cuany	7/74	6.00
IS 11	SURFACE REHABILITATION OF LAND DISTURBANCES RESULTING FROM OIL SHALE DEVELOPMENT (Executive Summary)	Cook	6/74	Free
IS 14	BIBLIOGRAPHY PERTINENT TO DISTURBANCE AND REHABILITATION OF ALPINE AND SUBALPINE LANDS IN THE SOUTHERN ROCKY MOUNTAINS	Steen, Berg	2/75	4.00
IS 18	MINIMUM STREAM FLOWS AND LAKE LEVELS IN COLORADO	Rhinehart	8/75	9.00
IS 21	PROCEEDINGS, HIGH ALTITUDE REVEGETATION WORKSHOP NO. 2	Zuck, Brown	8/76	6.00
IS 28	PROCEEDINGS, HIGH ALTITUDE REVEGETATION WORKSHOP NO. 3	Kenny	6/78	6.00
IS 40	PROCEEDINGS OF THE WORKSHOP ON INSTREAM FLOW HABITAT CRITERIA	Smith	12/79	6.00
IS 42	PROCEEDINGS, HIGH ALTITUDE REVEGETATION WORKSHOP NO. 4	Jackson, Schuster	6/80	6.00
IS 48	PROCEEDINGS, HIGH ALTITUDE REVEGETATION WORKSHOP NO. 5	Cuany, Etra	12/82	6.00

Report No.	Title	Author	Date	Price
TR 1	SURFACE REHABILITATION OF LAND DISTURBANCES RESULTING FROM OIL SHALE DEVELOPMENT	Cook	6/74	$11.00
TR 4	VEGETATIVE STABILIZATION OF SPENT OIL SHALE	Harbert, Berg	12/74	4.00
TR 5	REVEGETATION OF DISTURBED SURFACE SOILS IN VARIOUS VEGETATION ECOSYSTEMS OF THE PICEANCE BASIN	Sims, Redente	12/74	5.25
TR 39	SPORTSMEN EXPENDITURES FOR HUNTING AND FISHING IN COLORADO, 1981	McKean, Nobe	1/83	5.00
TR 44	DIRECT AND INDIRECT ECONOMIC EFFECTS OF HUNTING AND FISHING IN COLORADO - 1981	McKean, Nobe	1/84	5.00
SR 2	ENVIRONMENT AND COLORADO - A HANDBOOK		1973	5.00

E. SOCIAL-INSTITUTIONAL-POLICY

1. INSTITUTIONS

CR 10	ECONOMICS AND ADMINISTRATION OF WATER RESOURCES	Flack	6/69	3.50
CR 12	ECONOMICS AND ADMINISTRATION OF WATER RESOURCES	Nobe	6/69	4.00
CR 36	URBAN-METROPOLITAN INSTITUTIONS FOR WATER PLANNING DEVELOPMENT AND MANAGEMENT: AN ANALYSIS OF USAGES OF THE TERM "INSTITUTIONS"	Wengert	9/72	6.00
CR 37	SEARCHING THE SOCIAL SCIENCE LITERATURE ON WATER: A GUIDE TO SELECTED INFORMATION STORAGE AND RETRIEVAL SYSTEMS - PRELIMINARY VERSION	Hogge, Wengert	9/72	6.00
CR 39	INSTITUTIONS FOR URBAN-METROPOLITAN WATER MANAGEMENT: ESSAYS IN SOCIAL THEORY	Wengert	11/72	6.00
CR 44	ECONOMIC, POLITICAL, AND LEGAL ASPECTS OF COLORADO WATER LAW	Radosevich, Nobe, Meek, Flack	2/73	6.00
CR 46	EVALUATION OF URBAN WATER MANAGEMENT POLICIES IN THE DENVER METROPOLITAN AREA	Walker, Ward, R. Skogerboe	6/73	8.50
CR 47	COORDINATION OF AGRICULTURAL AND URBAN WATER QUALITY MANAGEMENT IN THE UTAH LAKE DRAINAGE AREA	Walker, Huntzinger, Skogerboe	6/73	8.50
CR 48	INSTITUTIONAL REQUIREMENTS FOR OPTIMAL WATER QUALITY MANAGEMENT IN ARID URBAN AREAS	Walker, Skogerboe, Ward, R., Huntzinger	6/73	4.00
CR 52	CONSOLIDATION OF IRRIGATION SYSTEMS: PHASE I - ENGINEERING, LEGAL, AND SOCIOLOGICAL CONSTRAINTS AND/OR FACILITATORS	Skogerboe, Radosevich, Vlachos	6/73	25.00
CR 53	SYSTEMATIC DESIGN OF LEGAL REGULATIONS FOR OPTIMAL SURFACE-GROUNDWATER USAGE - PHASE I	Morel-Seytoux, Young, Radosevich	8/73	8.00
CR 55	WATER LAW IN RELATION TO ENVIRONMENTAL QUALITY	Allardice, Radosevich, Koebel, Swanson	3/74	30.00
CR 61	ECONOMIC AND INSTITUTIONAL ANALYSIS OF COLORADO WATER QUALITY MANAGEMENT	Young, Radosevich, Gray, Leathers	3/75	6.00
CR 65	URBAN DRAINAGE AND FLOOD CONTROL PROJECTS: ECONOMIC, LEGAL AND FINANCIAL ASPECTS	Grigg, Tucker, Rice, Shoemaker	7/75	11.00
CR 75	PHYSICAL AND ECONOMIC EFFECTS ON THE LOCAL AGRICULTURAL ECONOMY OF WATER TRANSFER TO CITIES	Anderson, Wengert, Heil	10/76	4.00
CR 85	DEVELOPMENT OF A DRAINAGE AND FLOOD CONTROL MANAGEMENT PROGRAM FOR URBANIZING COMMUNITIES - PART I	Riordan, Grigg, Hiller	9/78	3.00

Report No.	Title	Author	Date	Price
CR 86	DEVELOPMENT OF A DRAINAGE AND FLOOD CONTROL MANAGEMENT PROGRAM FOR URBANIZING COMMUNITIES - PART II	Riordan, Grigg, Hiller	9/78	$ 8.00
CR 88	INSTITUTIONAL ARRANGEMENTS FOR EFFECTIVE WATER MANAGEMENT IN COLORADO	Foss	11/78	5.00
CR 94	CONSOLIDATION OF IRRIGATION SYSTEMS: PHASE II, ENGINEERING, ECONOMIC, LEGAL AND SOCIOLOGICAL REQUIREMENTS	Vlachos, Huszar, Radosevich, Skogerboe	5/80	9.00
CR 118	ECONOMIC ASPECTS OF COST-SHARING ARRANGEMENTS FOR FEDERAL IRRIGATION PROJECTS: A CASE STUDY	Keleta, Young, Sparling	12/82	4.00
CR 124	EFFECTS OF WILDERNESS LEGISLATION ON WATER-PROJECT DEVELOPMENT IN COLORADO	Weaver	5/83	8.00
IS 6	WATER LAW AND ITS RELATIONSHIP TO ENVIRONMENTAL QUALITY: A BIBLIOGRAPHY OF SOURCE MATERIAL	Radosevich, Allardice, Swanson, Koebel	1/73	8.00
IS 12	WATER QUALITY CONTROL AND ADMINISTRATION LAWS AND REGULATIONS	Radosevich, Allen	1974	16.00
IS 15	PROCEEDINGS OF THE SYMPOSIUM ON WATER POLICIES ON U.S. IRRIGATED AGRICULTURE: ARE INCREASED ACREAGES NEEDED TO MEET DOMESTIC OR WORLD NEEDS?	Koelzer	3/75	5.00
IS 18	MINIMUM STREAM FLOWS AND LAKE LEVELS IN COLORADO	Rhinehart	8/75	9.00
IS 29	PROCEEDINGS, THIRD WORKSHOP ON HOME SEWAGE DISPOSAL IN COLORADO - COMMUNITY MANAGEMENT	Ward, R.	7/78	5.00
IS 34	SAN LUIS VALLEY WATER PROBLEMS: A LEGAL PERSPECTIVE	Radosevich, Rutz	1/79	5.00
IS 35	FEDERAL WATER STORAGE PROJECTS: PLUSES AND MINUSES	Howe	6/79	Free
IS 39	ADMINISTRATION OF THE SMALL WATERSHED PROGRAM, 1955-1978, AN ANALYSIS	Fontenot	8/79	4.00
IS 45	PROCEEDINGS, FOURTH WORKSHOP ON HOME SEWAGE DISPOSAL IN COLORADO - STATE/COUNTY COOPERATION IN MANAGING SMALL WASTEWATER FLOWS	Ward, R.	8/81	5.00
IS 46	THE DECLINING ROLE OF THE U.S. ARMY CORPS OF ENGINEERS IN THE DEVELOPMENT OF THE NATION'S WATER RESOURCES	Yoe	8/81	8.00
IS 49	PROCEEDINGS, FIFTH WORKSHOP ON HOME SEWAGE DISPOSAL IN COLORADO - OPERATION AND MAINTENANCE OF ON-SITE WASTEWATER TREATMENT SYSTEMS	Ward, R.	6/83	5.00
TR 3	IMPLEMENTATION OF THE FEDERAL WATER PROJECT RECREATION ACT IN COLORADO	Spence	6/74	Free
TR 9	THE 1972 FEDERAL WATER POLLUTION CONTROL ACT'S AREA-WIDE PLANNING PROVISION: HAS EXECUTIVE IMPLEMENTATION MET CONGRESSIONAL INTENT?	Stark	11/77	6.00
TR 11	FEDERAL WATER RECREATION IN COLORADO: COMPREHENSIVE VIEW AND ANALYSIS	Stefanec	5/78	6.00
TR 31	COMMUNITY AND SOCIO-ECONOMIC ANALYSIS OF COLORADO'S HIGH PLAINS REGION	Burns	2/82	8.00
TR 38	GROUNDWATER QUALITY REGULATION IN COLORADO	Looft	12/82	6.00

Report No.	Title	Author	Date	Price
CR 11	ORGANIZATIONAL ADAPTATION TO CHANGE IN PUBLIC OBJECTIVES FOR WATER MANAGEMENT OF CACHE LA POUDRE RIVER SYSTEM	Hill, Foss, Meek	6/69	$ 4.00
CR 17	AN EXPLORATION OF COMPONENTS AFFECTING AND LIMITING POLICYMAKING OPTIONS IN LOCAL WATER AGENCIES	Hill, Garrison, Foss	11/68	6.00
CR 22	AN EXPLORATION OF COMPONENTS AFFECTING AND LIMITING POLICYMAKING OPTIONS IN LOCAL WATER AGENCIES	Hill, Meek	6/70	4.00
CR 27	LOCAL WATER AGENCIES, COMMUNICATION PATTERNS, AND THE PLANNING PROCESS	Hill, Meek	9/71	6.00
CR 38	WATER QUALITY MANAGEMENT DECISIONS IN COLORADO	Nichols, Skogerboe, Ward, R.	6/72	6.00
CR 52	CONSOLIDATION OF IRRIGATION SYSTEMS: PHASE I - ENGINEERING, LEGAL, AND SOCIOLOGICAL CONSTRAINTS AND/OR FACILITATORS	Skogerboe, Radosevich, Vlachos	6/73	25.00
CR 65	URBAN DRAINAGE AND FLOOD CONTROL PROJECTS: ECONOMIC, LEGAL AND FINANCIAL ASPECTS	Grigg, Tucker, Rice, Shoemaker	7/75	11.00
CR 74	THE RELEVANCE OF TECHNOLOGICAL CHANGE IN LONG-TERM WATER RESOURCES PLANNING	Kraynick, Howe	10/76	4.50
CR 81	ACHIEVING URBAN WATER CONSERVATION: TESTING COMMUNITY ACCEPTANCE	Snodgrass, Hill	9/77	6.00
CR 94	CONSOLIDATION OF IRRIGATION SYSTEMS: PHASE II - ENGINEERING, LEGAL, AND SOCIOLOGICAL REQUIREMENTS	Vlachos, Huszar, Radosevich, Skogerboe	5/80	9.00
CR 95	DROUGHT-INDUCED PROBLEMS AND RESPONSES OF SMALL TOWNS AND RURAL WATER ENTITIES IN COLORADO: THE 1976-78 DROUGHT	Howe	6/80	5.00
CR 119	ECONOMIC ISSUES IN RESOLVING CONFLICTS IN WATER USE	Gray, Young	2/83	4.00
IS 22	IMPLEMENTATION OF THE NATIONAL FLOOD INSURANCE PROGRAM IN LARIMER COUNTY, COLORADO	Landenberger, Whittington	9/76	5.00
IS 24	FACTORS AFFECTING PUBLIC ACCEPTANCE OF FLOOD INSURANCE IN LARIMER AND WELD COUNTIES, COLORADO	James, Kreger, Barrineau	9/77	4.00
IS 27	PROCEEDINGS, COLORADO DROUGHT WORKSHOPS		11/77	Free
IS 38	PUBLIC PARTICIPATION PRACTICES OF THE U.S. ARMY CORPS OF ENGINEERS	Crist, Lanier	7/79	4.00
IS 44	THE NATIONAL FLOOD INSURANCE PROGRAM IN THE LARIMER COUNTY, COLORADO AREA	Shoudy	8/80	4.00
IS 47	SECTION 404 OF THE CLEAN WATER ACT - AN EVALUATION OF THE ISSUES AND PERMIT PROGRAM IMPLEMENTATION IN WESTERN COLORADO	Barnett	8/82	6.00

F. WATER CONVEYANCE AND CONTROL WORKS

CR 6	STABILIZATION OF ALLUVIAL CHANNELS	Bhowmik, Simons	6/69	4.00
CR 7	STABILITY OF SLOPES WITH SEEPAGE	Muir, Simons	6/69	4.00
CR 111	INVESTIGATION OF OBJECTIVE FUNCTIONS AND OPERATION RULES FOR STORAGE RESERVOIRS	Yevjevich, Hall, Salas	9/81	4.00
IS 50	POSSIBLE CAPTURE OF THE MISSISSIPPI BY THE ATCHAFALAYA RIVER	Higby	8/83	5.00
SR 1	DESIGN OF WATER AND WASTEWATER SYSTEMS FOR RAPID GROWTH AREAS (BOOM TOWNS, MOUNTAIN RESORTS)	Flack	7/76	5.00

Report No.	Title	Author	Date	Price
S-496S	FARM IRRIGATION STRUCTURES		1966	$ .50
S-522S	WEED SEED AND TRASH SCREENS FOR IRRIGATION WATER		1966	.35
S-TB61	PARSHALL MEASURING FLUMES OF SMALL SIZES		1957	.25
S-TB120	SELECTION AND INSTALLATION OF CUTTHROAT FLUMES FOR MEASURING IRRIGATION AND DRAINAGE WATER		1976	3.50
S-TB126	A SHUNT-LINE METERING SYSTEM FOR IRRIGATION WELLS		1977	.75
X-426A	PARSHALL FLUMES OF LARGE SIZE		1961	.50

G. WATER DATA, PROJECTIONS, GENERAL INFORMATION

CR 37	SEARCHING THE SOCIAL SCIENCE LITERATURE ON WATER: A GUIDE TO SELECTED INFORMATION STORAGE AND RETRIEVAL SYSTEMS - PRELIMINARY VERSION	Hogge, Wengert	9/72	6.00
CR 46	EVALUATION OF URBAN WATER MANAGEMENT POLICIES IN THE DENVER METROPOLITAN AREA	Walker, Ward, R., Skogerboe	6/73	8.50
CR 60	RESEARCH NEEDS AS RELATED TO THE DEVELOPMENT OF SEDIMENT STANDARDS IN RIVERS	Gessler	3/75	4.00
CR 63	ANALYSIS OF COLORADO PRECIPITATION	Kuo, Cox	6/75	3.00
CR 100	A WATERSHED INFORMATION SYSTEM	Thomsen, Striffler	9/80	5.00
CR 113	A WATER HANDBOOK FOR METAL MINING OPERATIONS	Wildeman	11/81	6.00
IS 1	AN INVENTORY OF ENVIRONMENTAL RESOURCES RESEARCH IN PROGRESS		1/71	Free
IS 2	ECONOMICS OF WATER QUALITY - SALINITY POLLUTION, Abridged Bibliography	Miller	6/71	11.00
IS 3	AN INVENTORY OF ENVIRONMENTAL RESOURCES RESEARCH IN PROGRESS		7/72	Free
IS 5	DIRECTORY OF ENVIRONMENTAL RESEARCH FACULTY, CSU		12/72	Free
IS 8	INVENTORY OF CURRENT WATER RESOURCES RESEARCH AT CSU		7/73	Free
IS 23	INVENTORY OF COLORADO'S FRONT RANGE MOUNTAIN RESERVOIRS	Aukerman, Springer, Judge	5/77	6.00
IS 25	SURVEILLANCE DATA, PLAINS SEGMENT OF THE CACHE LA POUDRE RIVER, COLORADO	Morrison	1/78	6.00
IS 30	THE LARIMER-WELD COUNCIL OF GOVERNMENTS 208 WATER QUALITY PLAN: AN ASSESSMENT AND SUGGESTIONS FOR FUTURE DIRECTIONS	Bryniarski, Carter, Danley, Gurule	8/78	3.00
IS 31	THE DENVER BASIN: ITS BEDROCK AQUIFERS	Bittinger	1/79	Free
IS 34	SAN LUIS VALLEY WATER PROBLEMS: A LEGAL PERSPECTIVE	Radosevich, Rutz	1/79	5.00
IS 35	FEDERAL WATER STORAGE PROJECTS: PLUSES AND MINUSES	Howe	6/79	Free
IS 46	THE DECLINING ROLE OF THE U.S. ARMY CORPS OF ENGINEERS IN THE DEVELOPMENT OF THE NATION'S WATER RESOURCES	Yoe	8/81	8.00
IS 50	POSSIBLE CAPTURE OF THE MISSISSIPPI BY THE ATCHAFALAYA RIVER	Higby	8/83	5.00
TR 2	ESTIMATED AVERAGE ANNUAL WATER BALANCE FOR PICEANCE AND YELLOW CREEK WATERSHEDS	Wymore	8/74	Free
TR 6	COLORADO ENVIRONMENTAL DATA SYSTEMS (Abridged)	Whaley, Dyer	10/72	6.00
TR 12	RECREATION BENEFITS OF WATER QUALITY: ROCKY MOUNTAIN NATIONAL PARK, SOUTH PLATTE RIVER BASIN, COLORADO	Walsh, Ericson, McKean, Young	5/78	5.00
TR 21	THE ECONOMY OF ALBANY, CARBON, AND SWEETWATER COUNTIES, WYOMING - DESCRIPTION AND ANALYSIS	McKean, Weber	1/81	4.00
TR 22	AN INPUT-OUTPUT STUDY OF THE UPPER COLORADO MAIN STEM REGION OF WESTERN COLORADO	McKean, Weber	1/81	5.00
TR 23	The Economy of Moffat, Routt, and Rio Blanco Counties, Colorado - Description and Analysis	McKean, Weber	1/81	4.00

Report No.	Title	Author	Date	Price
TR 25	The Economy of Northwestern Colorado - Description and Analysis	Gray, McKean, Weber	1/81	4.00
TR 26	AN INPUT-OUTPUT ANALYSIS OF SPORTSMAN EXPENDITURES IN COLORADO	McKean	1/81	$ 5.00
TR 27	AN INPUT-OUTPUT STUDY OF THE KREMMLING REGION OF WESTERN COLORADO	McKean, Weber	3/81	4.00
TR 29	AN ECONOMIC INPUT-OUTPUT STUDY OF THE HIGH PLAINS REGION OF EASTERN COLORADO	McKean, Ericson, Weber	2/82	8.00
TR 30	ENERGY PRODUCTION AND USE IN COLORADO'S HIGH PLAINS REGION	McBroom	2/82	8.00
TR 31	COMMUNITY AND SOCIO-ECONOMIC ANALYSIS OF COLORADO'S HIGH PLAINS REGION	Burns	2/82	8.00
TR 34	ENERGY AND WATER SCARCITY AND THE IRRIGATED AGRICULTURAL ECONOMY OF THE COLORADO HIGH PLAINS: DIRECT ECONOMIC-HYDROLOGIC IMPACT FORECASTS (1979-2020)	Young, Conklin, Longenbaugh, Gardner	2/82	8.00
TR 35	THE ECONOMIES OF MESA COUNTY AND GARFIELD, MOFFAT, RIO BLANCO, AND ROUTT COUNTIES, COLORADO	McKean, Weber, Ericson	4/81	5.00
TR 36	THE ECONOMY OF THE POWDER RIVER BASIN REGION OF EASTERN WYOMING: DESCRIPTION AND ANALYSIS	McKean, Weber, Ericson	1/81	4.00
TR 37	AN INTERINDUSTRY ANALYSIS OF THREE FRONT RANGE FOOTHILLS COMMUNITIES: ESTES PARK, GILPIN COUNTY, AND WOODLAND PARK, COLORADO	McKean, Trock, Senf	7/82	6.00
TR 39	SPORTSMEN EXPENDITURES FOR HUNTING AND FISHING IN COLORADO, 1981	McKean, Nobe	1/83	5.00
TR 40	THE ECONOMY OF LINCOLN, SUBLETTE, SWEETWATER AND UINTA COUNTIES, WYOMING, ROCK SPRINGS BLM DISTRICT	McKean, Weber	5/83	5.00
TR 41	THE ECONOMY OF ALBANY, CARBON AND FREMONT COUNTIES, WYOMING, RAWLINS BLM DISTRICT	McKean, Weber	5/83	5.00
TR 42	THE ECONOMY OF BIG HORN, HOT SPRINGS, PARK, AND WASHAKIE COUNTIES, WYOMING, WORLAND BLM DISTRICT	McKean, Weber	5/83	5.00
TR 43	THE ECONOMY OF EASTERN WYOMING, CASPER BLM DISTRICT	McKean, Weber	5/83	5.00
SR 1	DESIGN OF WATER AND WASTEWATER SYSTEMS FOR RAPID GROWTH AREAS (BOOM TOWNS, MOUNTAIN RESORTS)	Flack	7/76	5.00
SR 3	IRRIGATION DEVELOPMENT POTENTIAL IN COLORADO	Whittlesey		5.00
SR 4	PICEANCE BASIN INVENTORY		12/71	11.00
SR 5	A GUIDE TO COLORADO WATER LAW	Fischer, Ray, Rask, Wyatt	9/78	3.50
S-GS870	CHEMICAL QUALITY OF GROUNDWATER IN THE PROSPECT VALLEY AREA, COLORADO		1968	.25
S-GS953	ECONOMIC ANALYSIS OF WATER USE IN BOULDER, LARIMER AND WELD COUNTIES, WITH PROJECTIONS TO 1980		1976	1.00
S-GS757	PUBLIC WATER SUPPLIES OF COLORADO 1959-1960		1961	1.25
S-504S	COLORADO'S GROUNDWATER PROBLEMS		1967	.35
S-512S	GROUNDWATER IN THE BIJOU VALLEY		1961	.25
S-543S	PUMP IRRIGATION ON THE COLORADO HIGH PLAINS		1970	.65
X-470A	GROUNDWATER MANAGEMENT DISTRICT DIRECTOR'S HANDBOOK		1970	.25