Proceedings Paper No. 303

WATER POLLUTION CONTROL
ACTION--REACTION--INACTION

(A View of Several Aspects of PL 92-500,
the Federal Water Pollution Control Act Amendments of 1972)

edited by

John S. Gladwell, Director
Water Resources Research Institute
University of Idaho

and

William H. Funk, Associate Professor
Department of Civil and Environmental Engineering
Washington State University

Proceedings of a joint water resources seminar
of the University of Idaho and Washington State
University, Spring 1974.

INTRODUCTION

Each spring semester the University of Idaho and Washington State University traditionally hold a joint graduate water resources seminar. A theme for the seminar is usually selected in accordance with an issue of importance to the Pacific Northwest.

This year the issue selected was that of the implementation of PL 92-500. We were most fortunate to have as invited guest speakers four gentlemen who discussed various aspects of the problems of implementation:

Mr. Jack D. Lackner, U.S.E.P.A., Washington D.C.

Mr. Thomas E. Cahill, National Commission on Water Quality, Washington D.C.

Mr. Daniel L. Petke, U.S.E.P.A., Region X, Seattle, Washington.

Mr. Glen H. Fiedler, State of Washington Department of Ecology, Olympia, Washington.

In addition to the formal presentation of these speakers, we also include the Q & A session which followed.

Finally, the students in the seminar presented short papers on related subjects of their choosing, commensurate with the interdisciplinary nature of the seminar.

Those of us who, as faculty members and seminar instructors, had the pleasure of being involved in the proceedings, felt that the results were worth wider distribution. We hope that the ideas presented in this document will be of interest and value to the water pollution control profession.

John S. Gladwell, U of I

William H. Funk, W.S.U.

Day L. Bassett, W.S.U.

TABLE OF CONTENTS

TITLE	PAGE
Introduction	ii
A Preface to the University of Idaho/Washington State University Joint Water Resources Seminar on the Subject of the Federal Water Pollution Control Act Amendments of 1972--P.L. 92-500 by John S. Gladwell	1
A Summary of the National Impacts of the FWPCA on Municipalities and Industry by Jack D. Lackner	11
A Look at P.L. 92-500 as Viewed by the National Commission on Water Quality by Thomas E. Cahill	23
P.L. 92-500 - As Viewed by E.P.A. Region X by Daniel L. Petke	41
A Look at P.L. 92-500 by the State of Washington by Glen H. Fiedler	63
A Review of Federal Funding for Treatment Plants Under P.L. 92-500 by Gary Mansell	111
Some Implications of Public Law 92-500 on Small Towns and Communities with a Population of 1,000 or Less by Paul W. Rea	119
Feedlots and Public Law 92-500 by Robert E. Smith	127
The Effect of Public Law 92-500 on the Fruit and Vegetable Processing Industry by Richard Esvelt	133
Relative Economics of Approaching Zero Discharge of Pollutants From Potato Processing Wastes in Idaho by F. Leon Ballard	141
The Prospects of Recycling of Animal Wastes as an Alternative to Discharging Into Navigable Waters by Alden J. Foote	165
Fertilizer Nitrogen and Water Quality as Enacted in P.L. 92-500 by Talib Hussain Chaudhary	171

TITLE PAGE

A Subsystem Approach to Managing Non-Point Sources of Pollutants
by Robert Jay Hasheider 177

Use of Bench Terraces with Tile Outlets
by Abdallah Sadik Bazaraa 187

A PREFACE TO THE UNIVERSITY OF IDAHO/WASHINGTON STATE UNIVERSITY JOINT WATER RESOURCES SEMINAR ON THE SUBJECT OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972--P.L. 92-500

By

John S. Gladwell

INTRODUCTION

Although the intensity of the desire for improved or maintained environmental quality has varied, the concern is clearly not a passing fad. In the United States it is now a national goal. The process of arriving at this goal, however, is not and will not be without its difficulties. For example, I would imagine it would be difficult, if not impossible, to find a person or organization who would not be in favor of a clean and healthy environment. But it is another matter entirely to get a consensus on who must give up some "rights" in order to give someone else some "benefits".

And yet, this is the very problem we face whenever we consider problems of the environment. Because the environment is a common good, social choices must be made. Most are difficult ones. Few are easily quantified. Almost every decision will find an advocate with a convincing reason for an exception. And, almost inevitably, we must fall back on the political process for establishing a policy. And because it is a political process, one in which we consciously attempt to govern ourselves, it can call for a great deal of personal and social discipline. This discipline should be one that does not attempt to cancel our previous progress in its commitment to environmental quality.

Pollution of our waters presents a special social and economic problem because, in general, the immediate cost of the control effort is apparently underwritten by the polluter for the benefit of others. There is a natural reluctance by all of us to incur expenses that are not directly beneficial to us. This is particularly true where we believe our portion of the pollution is small, and it is not immediately obvious that our actions will produce a visible positive consequence.

In an attempt to recognize the fact that society is composed of individuals, many of whom appear to refuse to recognize social costs, laws have been enacted to restrict uses of selected resources and the means of disposing of wastes. These have involved all levels of government. The acceptance of these laws rests ultimately on the public's reaction to what it perceives to be the balance between the costs and benefits resulting from the law's implementation. Hysteria can be short-lived, and if we as engineers and scientists cannot quantify the hazards or social costs (or vice versa, cannot argue successfully against the cry of "environmental degredation"), actions to abate pollution and maintain or improve environmental

---

Director, Water Resources Research Institute, and Professor of Civil Engineering, University of Idaho, Moscow, Idaho.

quality will surely fail. Understandable measures of pollution and indicators of quality are clearly needed for a better understanding by society of the true costs and benefits of controlling the environment.

As the process of establishing pollution control standards and the schedules for complying with those standards proceeds, there should be (1) a forthright and realistic appraisal of exactly what the needs are, (2) an objective analysis of what is and what is not technologically possible (and the associated costs), and (3) a realistic program of research to narrow the gap between needs and possibilities. But we should be honest in our appraisal of the true costs involved. This should include both the energy and resource requirements of the higher standards. The solution of one problem should not, in turn, become a problem in itself.

In the past the people of our country were apparently satisfied to permit a downgrading of portions of our environment in order to enrich their economic lives. At least, there appears to have been a greater reluctance to speak out. However, the times are clearly changing, and with them. . . so are the priorities.

Until only recently it was generally felt that nature had a great deal of usable reserve assimilative capacity--and that we could use it free of charge. Under such an assumption there was little obvious incentive to minimize the environmental burden. But the needs are now being recognized, and the "free lunch" concept is being quickly done away with. The role of science and engineering, although being severely tested by public opinion, has never been more necessary than it is today. Technical advances, when properly combined and coordinated with effective management and public acceptance, should permit a continued flow of goods in our economy without a continuation of so many environmental insults. This will not come about, however, if scientists and engineers continue to accept problems inadequately posed by others. The professions must accept and assess social as well as technical and economic impacts, and evaluate alternatives using more than the conventional criteria. If we are to become truly effective, we must become a part of the process of problem definition, and if our tools are inadequate, we should work to create acceptable ones.

WATER QUALITY LEGISLATION

It is interesting to review briefly the evolution of national water quality legislation. The process began by a series of acts dealing only with specific concerns of navigation, disease and oil discharges in the territorial sea and other tidal navigable waters. One early law, the Refuse Act of 1899, was much later to be reinterpreted as a water pollution abatement statement, particularly in the years 1970-72 before the enactment of the present legislation.

In 1948 an act with a 5-year authorization recognized both the rights and responsibilities of the states in water pollution control. This view has continued and is still congressional policy. The act provided financial assistance to states for comprehensive water pollution control programs, research and waste treatment facilities. A program of construction loans and preliminary planning grants was never implemented, however, because the funds required were never appropriated. The enforcement procedures authorized by this act required a series of notifications of violation and that the offending state's consent to a suit. And thus, enforcement was effectively inhibited--only one hearing was ever held

and no suits were ever brought to court. After a 3-year extension to the first 5-year authorization, the first permanent law was passed.

The 1956 act revised the original concept. It authorized federal construction grants; and in fact, gave impetus to municipal waste treatment. It strengthened the research aspect by including research grants, fellowships and technical training. It authorized a program of basic water quality data collection and dissemination. Establishment and maintenance of state water pollution control programs were backed up by grant authorizations, and it continued the authority for comprehensive programs, technical assistance and interstate cooperation. Finally, it established an enforcement procedure in the case of certain interstate pollution of interstate waters which did not require state consent to a suit.

In 1961 the act was amended to extend the enforcement authority to navigable as well as interstate waters, and could then be applied to intrastate pollution cases on request of the governor of the state. By redefining the term "interstate waters" to include coastal waters, the law was further greatly expanded. Authorizations and dollar ceilings for construction grants were increased; research was accelerated; and regional laboratories were authorized. The amendment also permitted the use of water storage in federal reservoirs for low-flow augmentation to improve water quality, but specifically denied such use as a substitute for adequate treatment or other waste control at a particular source.

In 1965 the act was further amended to provide water quality standards, consisting of water quality criteria, in order to provide water of proper quality for a range of designated uses. States were given the first opportunity to design and adopt these standards (subject to federal approval). Research and demonstration was expanded. Additional grant funds for waste treatment works were authorized, and financial incentives were added for projects conforming to comprehensive metropolitan area plans. With this amendment the national program was elevated and made more prominent with the creation of the Federal Water Pollution Control Administration within the U.S. Department of Health, Education, and Welfare.

In 1966 the agency was transferred to the U.S. Department of the Interior, and the program of construction grants was expanded and redirected. It went from $450 million in FY 1968 to $1.25 billion in FY 1971, although appropriations in the first 2 years' activity fell far short of authorizations. Cost sharing arrangements, under certain conditions, were further increased. Also, reimbursement of state or local funds from future federal fund allotments was authorized up to the full federal share if adequate federal funds were not currently available. Research and demonstration grants were authorized in the area of advanced waste treatment and water purification, joint municipal-industrial treatment, and industrial pollution. Authority was also provided that could require alleged polluters to file a report on the character and quantity of their discharges, and the measures being taken to alleviate the situation.

The 1970 amendment added strong oil pollution control provisions to the basic act. It also provided for a study and report to Congress on hazardous substances other than oil. The act also addressed such other aspects of pollution as sewage from watercraft, mine drainage, lake eutrophication, Great Lakes pollution, manpower requirements and pesticides. In addition, the act required that water quality standards would not be violated was required.

In 1972 the Federal Water Pollution Control Act was amended--but in fact was replaced--by what is clearly the strongest commitment ever considered by Congress to end water pollution. The objective of this act is. . . "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." In order to achieve this objective, the act declares:

(1) it is the national goal that the discharge of pollutants into navigable waters be eliminated by 1985;

(2) it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983;

(3) it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited;

(4) it is the national policy that Federal financial assistance be provided to construct publicly owned waste treatment works;

(5) it is the national policy that areawide waste treatment management planning processes be developed and implemented to assure adequate control of sources of pollutants in each state; and

(6) it is the national policy that a major research and demonstration effort be made to develop technology necessary to eliminate the discharge of pollutants into navigable waters, waters of the contiguous zone, and the oceans."

The act goes on to state Congressional policy recognizing, preserving, and protecting the primary responsibilities and rights of states to prevent, reduce, and eliminate pollution. It is also Congressional policy that the President...

> shall take such action as may be necessary to insure that to the fullest extent possible all foreign countries shall take meaningful action for the prevention, reduction, and elimination of discharge of pollutants and the improvement of water quality to at least the same extent as the United States does under its laws.

The act also emphasizes that public participation shall be encouraged, and that regulations specifying minimum guidelines for such participation shall be developed and published.

Finally, the act declares a national policy which surely without argument should be adopted as a standard for every piece of legislation in every country of the world:

> ...It is the national policy that to the maximum extent possible the procedures utilized for implementing this Act shall encourage the drastic minimization of paperwork and interagency decision procedures, and the best use of available manpower and funds, so as to prevent needless duplication and unnecessary delays at all levels of government.

This is certainly a policy worthy of adoption. The Act, however, is 89 pages of controversial, detailed, complicated, and all-encompassing water legislation. It would appear, as a result that this policy, although worthy of praise, falls far short of fullfillment.

Let us look at some of the more important requirements of the 1972 Act, organized by activity or area of concern (and I use freely, here, the U.S. E.P.A., "Report to Congress-1973"):

Industrial Pollution

* Industries must use "best practicable" water pollution control technology by mid-1977 and the "best available" my mid-1983.
* Discharges of toxic pollutants will be controlled by effluent standards to be issued by 1974.
* Industries must pre-treat effluents that are discharged into municipal treatment systems.

Municipal Pollution

* Federal construction grants up to $18 billion are authorized over the next three years to help local governments build needed sewage treatment facilities.
* An additional $2.75 billion is authorized to reimburse local governments for treatment plants constructed earlier in anticipation of Federal grants.
* The Federal share of treatment facilities costs is increased to 75 percent (the maximum Federal share was 55 percent under previous legislation). An Environmental Financing Authority is established to help State and local governments raise their share of the cost of treatment facilities.
* Secondary treatment will be required for plants approved for construction before mid-1974; "best practicable" treatment will be required for plants approved thereafter.
* Treatment plants must provide a minimum of secondary treatment by mid-1977 and for plants under construction by mid-1978.
* All plants must apply any higher treatment necessary to meet water quality standards by mid-1977.
* All treatment plants will have to use "best practicable" treatment by mid-1983.
* Areawide waste treatment management plans shall be established by mid-1976 in areas with substantial water pollution problems.

Nonpoint Source Pollution

* EPA is required to develop information on (1) the nature and extent of nonpoint sources of pollution and (2) means to control such pollution from a range of activities ... including agriculture.
* States are required to (1) submit reports on nonpoint sources of pollution and (2) recommend control programs.

Water Quality Standards

* States must have adopted water quality standards for intrastate waters and submitted them by April 1973 to EPA approval. EPA is required to set standards if the states fail to do so.
* EPA is required to submit a report to Congress by 1974 on the quality of the Nation's waters.
* The States are required to submit to EPA and the Congress similar reports on waters within their borders by 1975.

A national surveillance system to monitor water quality will be established by EPA in cooperation with other Federal agencies and State and local governments.

Permits and Licenses

* The 1899 Refuse Act permit program is replaced by a new permit system which requires that there be no discharge of any pollutants from any point source.

* Publicly-owned treatment works, certain other municipally controlled discharge points, and commercial, agricultural and industrial dischargers must obtain permits.

Enforcement

* The 1972 law supplanted the former enforcement mechanisms with authority to enforce permit conditions and other requirements of the law through court action or administrative orders. Civil and criminal penalties can be applied to dischargers who violate permits.

* EPA is provided emergency power to seek immediate court injunctions to stop pollution that represents an imminent or substantial danger to health or welfare.

* Dischargers may be required to keep proper records, install and use monitoring equipment, and sample their discharges.

* EPA is provided authority to enter and inspect any polluting facility.

* Any citizen or group of citizens who interests may be adversely affected has the right to take court action against anyone alleged to be violating an effluent standard or limitation, or an order with respect thereto issued to EPA or a State; or against the Administrator for his alleged failure to perform a nondiscretionary act or duty.

It seems quite clear that the United States has hitched its wagon to a strong water quality program. Whether or not the results will equal the intentions must await the genuine commitment that involves both time and money. There are strong arguments for and against it. It appears that we must adopt a wait-and-see attitude.

In looking at the ultimate goal of the 1972 Act--that is, one of no water pollution--one has to be somewhat skeptical. Nevertheless, in practice it is one with a logical approach. I personally would have rather seen an approach and goal designation which said in effect ..."let's see what's possible, and how much the various alternative future conditions might cost." In fact, if you look at the act beyond its stated simple goal, that is precisely what it will be doing. The act establishes a National Study Commission (a rather broad-scoped title which even the Commission doesn't like--it calls itself the National Commission on Water Quality) to look at "costs" as well as "benefits" of actually reaching that goal:

> "...make a full and complete investigation and study of all of the technological aspects of achieving, and all aspects of the total economic, social, and environmental effects of achieving or not achieving, the effluent limitations and goals set forth for 1983..."

The Commission is charged to report to Congress the results of such investigations and studies, together with its recommendations, not later than three years

from the date of the enactment of the Act (October 18, 1972). The main point here is that Congress has established a mechanism for taking a second look at what it has produced. In any case, the real costs and benefits will hopefully have been looked at very carefully. I have great faith in the considered opinion of this broad group of highly respected technical and political men and women--more so than I would a group also charged with implementation.

WHAT CAN WE EXPECT?

I would like to set the stage for what I believe we can expect by telling a short story. It involves a former professor of mine--a fine old, very practical engineer who taught me my undergraduate hydraulics course several years ago. He had an expression that he used when dealing with some of the more esoteric aspects of fluid flow. As he would put it:

...sure, you can set up the differential equations on how this works ... but God in heaven couldn't integrate them!!

As I look at the new water quality act I am sure we could be tempted to recast his expression in terms of the aspect of its implementation. My only reluctance to do so is that many of those very differential equations my former professor was talking about have now been successfully integrated. I'm not sure how much use some of them are getting--but they have been integrated. As I see it, then, we had better not bank too highly on the new act not being implemented, because you may find yourself eating your words ... and with some suggested solutions, even your sludge.

To begin with, it is evident that everyone will be affected by this legislation--directly and indirectly. States are expected to, and will play a major role. If they fail, the federal government will step in. Municipalities will certainly be involved. Industries will be quickly involved. And agriculture will not be without major impact.

In the development of effluent limitations and guidelines, almost everybody is to be involved. The act specifies a number of different industries which will be individually assigned effluent limitations. The list will surely be expanded with time. Likewise, the standards will change with time. Because of this, it is to industries' advantage to take the initiative in this area. It should definitely expect that the provisions of the act and the standards established will be followed through by the enforcing agencies.

States will be busier than ever. Each will be required to classify all river segments as either being water-quality limited or effluent-guidelines limited. (A segment that is effluent guidelines limited would meet established water quality standards with the application of "best practicable" technology for an industry, or secondary treatment for a municipality.) Plans will then be required which will (1) assess the need for publicly owned works, (2) inventory and rank individual discharges, (3) access nonpoint-source pollution and the necessary control measures, and (4) schedule compliance and effluent requirements for point discharges.

Nonpoint sources of water pollution is an area in which a major program of R&D will be applied. Efforts will be directed primarily toward filling in a wealth of ignorance on the nature and means of controlling pollution from at least mining, construction, forestry and agricultural activities. In the process

it may well be discovered in some areas the point sources of pollution are not nearly relatively as important as they might appear to be at first glance.

Many parts of the new act will affect agriculture and the rural sectors of the country. The following summary is taken from "Outlook 73, U.S. Agriculture--Environmental Controls and Economics", by V.W. Davis, et al.:

1. Authorizes comprehensive studies of pollution in estuaries and estuarine zones of the United States. Studies will be cooperative efforts of Agriculture, Army, Water Resources Council, et. al.

2. Authorizes comprehensive study and research programs to determine new and improved methods, and better application of existing methods, for reducing and eliminating pollutants from agriculture, including the legal, economic, and other implications of the use of such methods.

3. Authorizes a comprehensive program of research, investigation, and pilot project implementation to eliminate pollution from sewage in rural areas.

4. Authorizes grants, in consultation with Secretary of Agriculture, for R&D for new and improved methods of reducing, eliminating, or preventing pollution from agriculture and rural sewage and to disseminate information and encourage adoption of these methods.

5. Encourages waste treatment management facilities that provide for recycling of potential sewage pollutants through agriculture and forestry.

6. Authorizes development of areawide waste treatment management plans that include identification of nonpoint sources of pollution from agriculture and forestry, and procedures and methods to control such sources.

7. Specifies that the President, acting through the Water Resources Council, shall complete Level B plans for all basins in the United States by January 1, 1980. Priority is to be based on areawide needs.

8. Specifies that point sources of pollution must apply the "best practical" control technology by July 1, 1977.

9. Specifies that effluent limitations for categories and classes of point sources shall use the best available technology, economically achievable, by July 1, 1983.

10. Specifies that EPA shall enter into agreements with the Secretaries of Agriculture, Interior and Army to maximize the utilization of appropriate programs to achieve objectives of the Act.

11. Specifies that EPA shall develop, in consultation with appropriate agencies (including Agriculture), appropriate guidelines for identifying and evaluating the nature and extend of nonpoint sources of pollution and processes, procedures and methods to control pollution from agriculture and forestry, including runoff from fields.

12. Requires a list of categories of sources that, at minimum, will include feedlots and 26 agriculture-related industries. Regulations establishing standards of performance were to have been published in 1 year.

A number of agricultural and rural type problems must be addressed. Some of these problems require a great deal more research, others, the application of known technology.

1. The problem of irrigation conveyance and application systems, and inefficient cropping practices: U.S. streams carry at least a billion tons of sediment each year. Sediment from farm lands is probably a major contributor of phosphorus to streams and lakes. Over-fertilization results in runoff pollution

of millions of tons annually. Pesticide runoff must be further investigated; we must use less toxic pesticides whenever possible and control their movement toward watercourses. Irrigators must be required to make more effective use of water. The result will eventually be the development of enforceable water quality standards applicable to argicultural activities.

2. The problems of confined animal production operations: Ineffective or non-existent waste treatment practices permit some "slug" feedlot runoffs with BOD_5 in the 10,000-50,000 mg/l range. In addition to the nutrient runoff problem there are those of soil contamination and odors. An industrial approach is required with treatment and recycling of effluents. Use of land disposal systems as secondary and tertiary systems looks inevitable. This may cause problems for lots not located near usable recycling sites. In the long run systems should consider recycling as a means of producing animal feeds or commercial products.

3. The problem of inefficient forestry and logging operations: Logging practices can increase suspended sediment considerably. What are the best techniques--what about clear cutting, controlled burns? What is the future of forest fertilization, irrigation? Organic leachates can severely reduce D.O. in reservoirs and lakes. Can we control benthic toxicity from log storage? There needs to be a concerted movement toward management techniques that minimize the environmental effects.

4. The problem of non-sewered rural wastes: Wastes are largely untreated, septic systems at best. Few long-term effective systems have been demonstrated. With poor techniques pollution of surface and ground waters are definite possibilities.

5. The problem of using agricultural lands for disposal of domestic and industrial effluents and sludges: The technology appears to be available, but needs further development and demonstration. Need to develop principles for quantifying soil loading capacities--we cannot afford to pre-test every site in the world. We need also to study very carefully the concentration of hazardous elements from effluents and sludges in food crops. We need to study various pretreatment procedures for various kinds of effluents and sludges.

6. The problem of naturally occurring pollution: We need to characterize the nature and extent of runoff from natural mineral and biological sources. Evidence is clear that fecal coliform may not be a good indicator of man-caused pollution. What is the BOD of forest cover? Is sediment control possible, or desirable, in the long run? Are forest fires unnatural? What is the effect of natural salt-bearing geologic strata? What would the natural quality of a water body be in the absence of man?

There is little doubt that the implementation of some aspects of the new act will result in substantial additional costs to many farmers and agricultural processors. No longer will the application of pesticides or disposal of manure be permitted without regard to the environment. The social cost will no longer be absorbed by society through a lower quality environment. They will be reflected in prices--and those operations that can efficiently absorb or redirect those added costs will survive. It would appear that everything will be in favor of the larger and more commercial types of operation.

As more and more controls are imposed on agriculture, economic data will grow in importance. Cost effectiveness of various control measures will need to be more intensively studied. Educational, training and research activities of all levels of government will have to be more closely integrated. The development of new technology may well be a major factor in the economic survival of smaller

operations. This will be particularly important if techniques for absorbing large increases in recycled wastes can be developed and marketable byproducts be made available to lessen the pressure on primary product prices.

CONCLUSION

Actual implementation of elements of the Act have been underway now for nearly two years. Problems are unquestionably being faced daily. Deadlines originally imposed by Congress have had to be extended. Levels of funding estimated in the Act were never authorized for spending -- and further studies have indicated that even those estimates may have been grossly conservative. The ultimate goal for 1985 -- the so-called "zero discharge" -- has been argued vehemently. We began to hear that the interpretation is that it, after all, is "only a goal".

And, finally, we all wait for the results of the National Commission on Water Quality study. Depending on your point of view, we expect a display of "reason", or "miracle". In the final analysis we must await the Congress' action on its recommendations.

A SUMMARY OF THE NATIONAL IMPACTS OF THE FWPCA ON MUNICIPALITIES AND INDUSTRY

by

Jack D. Lackner

I was pleased when Dr. Gladwell requested EPA-Washington for a seminar participant to discuss the national impact of the implementation of the Federal Water Pollution Control Act Amendments of 1972. The presentation and discussion today, along with those which you have had or will have with EPA Regional Office staff, state officials, and others should permit you to develop a fairly broad perspective on the implementation of the Act.

One general observation which I would like to make before getting into the subject I will cover today is this: The water pollution control program is a national effort, involving participation of the states and the Federal government. It is important that we recognize this when focussing on specific issues which may evidence controversy in one degree or another. I am personally convinced that the long-term success of effective water pollution control rests in assuring that the states assume the highest level of implementing actions possible. This is recognized in the Act through provision for a strong state role. But the Act also stresses the need for a uniform, national approach to pollution control. The best example of this objective are the requirements for minimum national standards of performance for effluent reduction found in Section 356 of the Act.

Thus, we should expect legitimate differences of opinion regarding the roles of the Federal government and the states. I feel that these differences are constructive, being built into the Act to establish the give-and-take necessary to accomplish national goals, while maintaining latitude necessary to respect unique circumstances found in the various states.

Getting back to today's topic, I will be discussing the national impacts of the FWPCA on municipalities and industry. Most of the material presented is from EPA's recent report The Economics of Clean Water -- 1973.

MUNICIPAL IMPACT

The sewerage systems of the U.S. have been growing for more than a century. The first sanitary sewer was begun in Chicago in 1855, but it was not

---

Mr. Jack Lackner is presently a Senior Program Analyst in the Office of Enforcement and General Counsel; U.S. EPA, Washington, D.C.. Mr. Lackner has a B.S. in Civil Engineering from California State University at Los Angeles and a M.S. in Water Resources Management from the University of Wisconsin, Madlin.

until the 1870's that collecting sewers were complemented by treatment plants. Today, about 65 million Americans are served by sewers; more than 95 percent of them are also served by sewage treatment plants.

While the population served by sewers has more than doubled since 1937, the population discharging untreated wastes into our waterways is little more than one-seventh of what it was then. The number of persons whose wastes receive primary treatment (35 percent biological oxygen demand (BOD_5) removal) has almost tripled over the period. The number whose wastes receive secondary treatment (70 to 90 percent BOD_5 removal) has increased almost sevenfold; such treatment is now provided for the wastes of more than 63 percent of population served by sewerage systems. As a result, the amount of BOD_5 removed in 1971 exceeded the total collected by sanitary sewers in 1957.

This sounds good, however, the growth in sewerage facilities has brought disappointingly marginal results. While one portion of the public sewerage system (treatment facilities) increased by 130 percent the amount of BOD_5 diverted from our waterways, another portion (sanitary sewers) offset this improvement by collecting more BOD_5. Thus there has been a surprisingly small net reduction since 1957 in the oxygen demand introduced into our waterways by the public sanitary sewerage system. This is shown in Table I.

TABLE I

EFFECT OF SANITARY SEWAGE TREATMENT

Year	Collected by sanitary sewers*	Reduced by treatment**	Discharged by treatment plants
	(millions of pounds of BOD_5 per day)		
1957	16.4	7.7	8.7
1962	19.8	10.8	9.0
1968	23.3	15.0	8.3
1973	27.1	18.5	8.6

How much has this historical facilities expansion cost? Between 1855 and 1971, the Nation invested an estimated $58 billion (1972 dollars) in its public sewerage facilities. The bulk of this investment has occurred recently: almost 80 percent since 1929, 60 percent since World War II, and more than 30 percent since 1961. The net investment or replacement value in 1971 was estimated to be $32 billion. Replacing or modernizing this capital stock has absorbed 50 percent of all capital expenditures of sewerage agencies since 1961. Current replacement costs are close to $1 billion annually.

The nation has expended substantial resources, yet net BOD loadings are the same now as in 1957. I believe that in order to maintain the publics support necessary to vigorously pursue the nations clean water program, we

are going to have to reduce the residual loadings to the point where demonstrable improvements in ambient water quality can be shown. We can certainly maintain that ambient water quality would have been substantially worse had the nation not made the waste treatment facilities investment as it has to date. How will we do this and how much will it cost?

The 1972 Amendments require at least secondary treatment for all municipal type waste water treatment facilities. Further, additional treatment is required where necessary to achieve water quality standards. These are the basic requirements which will support achievement of the clean water objectives for municipal type sources. What will it all cost?

NEEDS SURVEY

The estimated total cost of constructing municipal treatment and collection facilities that are eligible for Federal funding under the 1972 Amendments is $60.1 billion (1973 dollars) according to the national survey conducted by the States and EPA in the summer of 1973. About $35.9 billion is for treatment plants and new interceptor sewers ($16.6 billion for secondary treatment required by the 1972 Amendments, $5.7 billion for treatment "more stringent" than secondary to attain water quality standards, and $13.6 billion for new interceptor sewers), $0.7 billion for rehabilitation of sewers to correct infiltration and inflow, $13.6 billion for new interceptor sewers, $10.8 billion for new collector sewers, and $12.7 billion for correction of overflows from combined sewers.

The $35.9 billion estimate for treatment plants and new interceptor sewers is considerably higher than the 1971 Needs Survey estimate of $18.1 billion for a variety of reasons, including:

- All municipal plants must now provide secondary treatment.
- Changing water quality standards require higher levels of secondary treatment (higher removal of organic waste) and special processes for removing phosphorus and nitrates.
- Construction costs rose by almost 20 percent between 1971 and 1973.
- The 1973 Survey's coverage of municipalities and their needs was far more comprehensive than those on which previous estimates of needs were based.
- More municipalities have completed engineering studies upon which to base their estimate of needs.
- States provided better data to the survey than previously because they realized that it would be the basis for allocating construction grant funds.

FISCAL IMPACT ON LOCAL GOVERNMENT

The construction of municipal sewerage systems required by the 1972 Amendments will result in capital expenditures by all levels of government. A projection has been prepared of possible outlays during 1974-1980. It relies heavily on two assumptions: State and local governments will not invest independently of Federal funding, and the $18 billion authorized in the 1972 Amendments be allotted for use in FYs 1973-76. (The actual rate of allotment may be different depending of fiscal policy.)

The total Federal, State and local cash outlay resulting from these assumptions, and from previous outstanding obligations, would total $33.8 billion between 1973 and 1980. Of this total $12.9 billion would be provided by State and local governments. The projected annual cash outlay of approximately $2 billion is almost twice the amount State and local sources supplied in 1970 to build sewerage facilities. A breakdown of these numbers is shown in Table II.

Local governments will probably finance their portion of the projected capital expenditures through a variety of sources, including current general revenues and the issuance of municipal bonds. Several recent reports have indicated that State and local governments may run surpluses in their current general accounts over the next several years. Such surpluses would give States and localities greater flexibility in financing construction projects.

Should localities continue to sell bonds to finance approximately two-thirds of their investment in sewerage construction, sewer bonds will continue to represent just over 5 percent of the overall municipal bond sales. Municipalities should encounter no difficulties in selling such bonds.

As direct result of the projected increase in capital expenditures, the annual cost for localities to provide sewerage services may increase by 66 percent in the next 4 years. This should be viewed against an expenditure on sewerage operations amounting to 1 percent of all current local expenditures in 1970. The increase due to capital expenditures on sewerage would increase the cost of sewerage operation to 1.7 percent of the 1970 level of expenditures.

In conclusion, local governments should have adequate general revenue or municipal bonding capability to finance their share of building sewerage systems.

INDUSTRIAL IMPACT

NONTHERMAL COSTS

The 1972 Amendments require industries to use "best practicable" water pollution control technology by mid-1977 and "best available" technology by mid-1983. The emphasis in this report is on the costs industry will incur in meeting the 1977 standards.

The highest estimate of treatment costs indicates industry (except power plants) will have to invest an additional $11.9 billion (1972 dollars) by 1977 to achieve pollution abatement standards set for that year. Total investment, including capital now in place, will amount to $18.7 billion. At this level of investment, total annual costs, including operation and maintenance, will be $4.5 billion.

The total investment may not be as great as $11.9 billion, however, because this estimate assumes that there will only be moderate reduction of waste water flows and that all abatement will be achieved by end-of-the-line treatment. Requiring treatment of waste water may lead industry to switch to processes that use much less water, resulting in lower control costs. Equally important, industry can change its raw materials, manufacturing processes, or products, and, as a result, achieve the same degree of abatement at less cost than end-of-the-line treatment.

The $11.9 billion estimate is greater than the $8.1 billion in the 1972 Economics of Clean Water because:

- Costs are based on the 1977 standards rather than the earlier industrial waste water guidelines.
- The industry sample is larger-148,000 plants using in excess of 1 million gallons per year rather than 14,500 plants using in excess of 10 million gallons per year.
- The costs of controlling pollution from animal feedlots is included.
- Growth rates are projected for each industry, rather than using the average growth rate for all industry.
- The costs are in 1972 rather than 1971 dollars.

In 1972, industry (excluding animal feedlots, lumber, and leather) invested about $1.0 billion in water pollution control facilities, which is much less than appears to be needed to meet the $11.9 billion estimate of needed investment. If industry adopts less costly control options, of course, the current level of investment may be closer to what is adequate.

THERMAL COSTS

Utility steam-electric power plants account for almost 80 percent of the water used for cooling and condensing purposes in the United States. The

TABLE II

COSTS FOR EXISTING AND PROJECTED PLANTS TO MEET 1977 EFFLUENT STANDARDS (Scenario No. 3)*

SIC code no.	Industry	Total capital needed by 1977	Total O&M costs	Total annual costs	Capital in place 1972	Total capital to be added by 1977	Average capital expenditures needed per year	Capital expenditures 1972	1972 expenditures as % of average annual needs
		(millions of 1972 dollars)							
02	Animal feedlots	1,274	113	247	459	815	204	n.a.	n.a.
20	Food and kindred products	1,718	503	721	325	1,393	348	68	20
22	Textile mill products	860	181	290	74	786	196	10	5
24	Lumber and wood products	1,123	399	541	n.a.	n.a.	n.a.	n.a.	n.a.
26	Paper and allied products	2.006	237	492	597	1,409	352	149	42
28	Chemicals and allied products	2,761	234	585	1,194	1,567	392	214	55
29	Petroleum refining and related industries	1,991	209	290	892	1,099	275	189	69
30	Rubber and miscellaneous plastic products	441	167	223	86	355	89	31	35
31	Leather and leather products	259	53	85	n.a.	n.a.	n.a.	n.a.	n.a.
32	Stone, clay, glass, and concrete products	1,269	26	187	146	1,123	281	43	15
33	Primary metals	2,133	90	361	763	1,370	342	119	35
34	Fabricated metal products	994	56	182	392	602	105	42	40
35	Nonelectrical machinery	774	50	149	171	603	151	53	35
36	Electrical and electronic machinery	631	28	108	159	472	118	36	31
37	Transportation equipment	491	17	79	211	280	70	62	89
	Total	18,725	2,363	4,540	5,469	11,874	2,923	1,016	33

capital expenditures required to meet the 1977 standard for this source of pollution are estimated at $2.3 to $9.5 billion; the 1983 standard will require $4.4 to $15.3 billion, depending upon water quality exemptions provided by Section 316 of the 1972 Amendments.

The estimated increase in the price of electricity will be 0.8 to 3.2 percent for meeting the 1977 water quality standards and an additional 0.9 to 2.9 percent for meeting the 1983 water quality standard depending upon the number of exemptions.

Costs of thermal pollution control were not developed for other industrial segments primarily because of the difficulties of estimating the costs of controlling thermal dischargers from in-house electric power generation and a myriad of industrial processes.

ECONOMIC IMPACT OF INDUSTRY

An overview of 23 industries discharging directly into the Nation's waters indicates that in most cases they will be able to recover the costs of best practicable wastewater treatment by increases in prices. However, individual plants in certain industries will experience difficulties in meeting the requirements. Generally, the profitability of smaller and/or older plants may be so reduced by pollution control that many of them may decide to close prior to 1977.

Secondly, plants located in heavily urbanized areas, especially small older ones, will experience difficulties because they lack the necessary land to use the most cost-effective treatments. In the absence of adequate municipal treatment facilities the 1977 requirements may force many of these plants to close, relocate elsewhere, or be absorbed by more viable firms.

Most of the industries studied are expected to raise prices (regardless of potential closures) with the size of the increase varying among segments of an industry (Table VII-10). The industries expected to experience price increases of less than 1.5 percent are asbestos, dairies, feedlots, flat glass, leather, meatpacking, nonferrous metals, softwood plywood, and wood preserving. Price increases 1.5 to 5 percent are expected to occur in cement, fertilizer, fiberglass, fruits and vegetables, and hardwood plywood. Price increases higher than 5 percent are expected in electroplating, hardboard, inorganic chemicals, organic chemicals, paper, plastics, and synthetics. (The industries underlined also face significant air pollution control costs).

Pollution control costs that cannot be passed on in the form of price increases will result in decreasing profit margins and, in some cases, plant closings. Plant closings are expected in all of the industries with the exception of cement, flat glass, ferroalloys, fiberglass, grain milling, and rubber.

In most of the industries studied, closings will be due primarily to factors unrelated to water pollution control costs, but they will be accelerated by these costs. Dairies, feedlots, fruits and vegetables, and leather are examples of industries in which plant closings will occur unrelated to pollution control expenditures. The maximum direct unemployment would be about 50,000 or 1.5 percent of the estimated total employment in the industries studied of 3.3 million.

Q. How familiar are you with the contracting procedure that was used to establish the effluent guidelines for specific industries being developed by EPA? That's where the greatest source of controversy is with my industrial clients. It's not the fact that they want no guidelines. They claim they are so poor, and I think they are right. The methodology is shoddy and not very well thought out, apparently studied in great haste, and generally just a mess.

A. It is true that the effluent guidelines have engendered a great deal of controversy. But recognize that the FWPCA Amendments plow new ground in this regard: A goal of uniform, industry-wide effluent controls. I believe we should expect a shakedown period with the guidelines. Now, much of the specific controversy deals with the guidelines as <u>proposed</u>. After receiving public comment, the proposed guidelines are then published in final form. I would venture to guess that much of the criticism made of the final effluent guidelines stem from philosophical differences with the effluent guideline approach per se, rather than the technical adequacy of particular guidelines themselves.

But the Congress chose to go the effluent limit approach and EPA is doing its best to implement that approach.

Q. One question that comes up where industry elects to treat effluent jointly with an urban system is whether industry should pay their share of capital cost right away, or should they be charged effluent charges? What is EPA's position on this, do you know?

A. I don't know, I don't have any answer to that question. I know that there has been controversy over the payment guidelines which EPA issued to guide municipalities in charging industry for industrial waste treated in municipal waste treatment plants. I am not familiar with this instance, however. If there is a requirement which requires industry to cough up its capital share right away, it must be due to the following. What would happen if you have an industry and it essentially requires the municipality to incur an investment of 10 million dollars -- which maybe might run for an amortization charge of a million dollars a year -- and the first year the municipality gets their million dollars, and the second year the industry closes. There the municipality is with no means of recovering the remaining 9 million dollars. So if there is that requirement, I suspect that is basically the reason why.

Q. We have some problems here in the agricultural area. Recently two of a group of three irrigation districts had their return effluent turned down, and the third one then takes most of its water from the return flow of the other two with all of the impurities. And most of the return flow of the whole project comes out from the third one. Now the third one then sees itself as being held responsible for the effluent quality only a small part of which it is responsible for. And apparently, they could get no satisfaction from EPA that there is any possibility of their being protected. It can see itself going out of business almost because someone else gave it some unsolved problems. How do you intend to remedy this kind of thing?

A. Well, I know that some situations like this have already occurred in urban areas where, as you know, the definition in the Act is that all point sources of discharge require a discharge permit, and then it goes to the definition of what a point source is. It says that a point source is any discernable, discrete conveyance which discharges into the water. In the urban context it came up that somebody was discharging into an abandoned sewer or storm sewer, which then discharged into a drainage ditch and ended up in either the Chicago River or Lake Michigan. The discharger maintained that he was not discharging into a navigable waterway and therefore, did not require a discharge permit. He further maintained that the problem was the responsibility of the county because it owned the drainage ditch that discharged into the waterway -- which is sort of your third irrigator. Well I understand that this person was required to apply for a discharge permit. His responsibility "backed-up" the pipe so to speak.

Your question brings up the issue of point source vs. non-point source pollution control. Operationally, the Act is concerned with point sources, and we in EPA specifically do not want to get over too much into true non-point sources, such as agricultural runoff. The Congress made a very specific recognition that they would not handle non-point source pollution control at the Federal level at this time. The states are to be given the first crack at approaching non-point source control.

Q. You say Congress is going to look only at point sources?

A. Yes, in an operational sense at the Federal level that is correct.

Q. That's in the Act?

A. Well, the Act encourages states to develop non-point source pollution control programs. For example, in Section 208, Area Wide Waste Treatment Organizations which would be established. It says that in those areas such organizations should establish programs to control non-point source pollution to the extent feasible. Further, I believe the governor is authorized to implement the same requirements statewide, outside of such areas.

If somebody is saying that EPA itself pursuant to the FWPCA is going to start controlling non-point sources at the individual farm, I believe they are in error. However, the states can develop and implement such programs with their own authorities. Recognize that there is a grey area here. It gets down to the difference between a point source and a non-point source, and irrigation is a good example. The runoff from the irrigated plots per se are not necessarily point sources, but the sum total of those when you get back down to the return flow may be a point source.

Q. That is considered in the Act as a Point Source?

A. Yes, I think so.

Q. But there are meetings about point source and non-point source going on now about reaching the deadline for 83. And non-point source deadlines are being mentioned.

A. Where? Here in Idaho, Washington? Well, the states are probably moving in that area. This is going back to the states being responsible

Q I don't wish to labor the point on non-point sources, but we certainly have a major issue here since a number of people are saying that the 1983 deadlines that are responsive to the 1972 amendments Act are not limited to point sources What you re saying is a different impression than many people have got

A Well, I m very certain that this Act through Section 402, the discharger permit program, cannot require farmers to modify their practices to control non-point sources of pollution It simply cannot Now, under certain cases EPA and the Federal Government can encourage certain types of entities to do certain things For example, in federal lands, if somebody has a lease to do something on federal lands, either logging or agriculture, EPA would probably lend some advice to the Federal land management agency with regard to non-point source pollution control And the states have certain programatic obligations to get into the non-point area to some degree But in my view, the states are for the most part in the drivers seat as far as non-point source pollution control goes.

Q. How about if the same question could be asked another way? What if the Water Quality Standards are not met? How would you force the state to do something? For example, sediment If it is not in the Act and unfortunately you were to have high turbidity then, by the standards of the state, how would you enforce this?

A First of all, I don't like to talk in terms of forcing the states to do something. While that might yield some short-term success, improving the Nation's water quality will rest on viable state programs This in turn requires a spirit of respect, cooperation, and compromise between state and Federal interests.

To answer your question, if stream standards are not met due to non-point sources, EPA and the States must work together in devising means to get at the problem.

Q Under the standards the requirement might be that the turbidity will not exceed by 5 parts per million or 20 parts per million . the question probably comes back to "What is natural and what is non-natural?" Because if you consider the various practices, one could say that it is non-natural

A That is right.

Q And there then, of course, you have the standards which were approved by EPA stating what is standard, then if you are not meeting the standards, then EPA could come back at you and say "Gee, you're not meeting standards on this subject."

A Yes. O K , I think this phrases a very germaine issue on the implications of point source vs non-point source pollution What sense does it make to require municipalities and industry to do a hell of a lot of clean-up if you're not going to meet the standards anyway, because of the non-point sources From one perspective, it just doesn t make any sense at all

A LOOK AT PL 92-500 AS VIEWED BY THE NATIONAL COMMISSION ON WATER QUALITY

By

Thomas E. Cahill

The National Commission on Water Quality is composed of fifteen members: five from the Senate, all members of the Public Works Committee and appointed by the President of the Senate; five from the House of Representatives, all members of its Public Works Committee and appointed by the House Speaker; and five members, appointed by the President.

The Commission Chairman is Nelson A. Rockefeller, a public member and former Governor of the State of New York. Co-Vice Chairmen are Senator Edmund S. Muskie, of Maine, and Representative Robert E. Jones, of Alabama. These two were the floor managers of the legislation in their respective houses of Congress.

Other Senate members are: Jennings Randolph of West Virginia, Chairman of the Senate Public Works Committee; Lloyd M. Bentsen of Texas; Howard H. Baker, Jr. of Tennessee; and James L. Buckley of New York.

Other House members are: John A. Blatnik of Minnesota, Chairman of the House Public Works Committee; James C. Wright, Jr. of Texas; William H. Harsha of Ohio; and James R. Grover, Jr. of New York.

Other public members are: Edwin A. Gee, Senior Vice President of Du Pont; William R. Gianelli, former Director of the Department of Water Resources of California and now a private consultant; Ray Kudukis, Director of the Cleveland Department of Public Utilities; and Carl E. Wright, Commissioner of the Arkansas Department of Pollution Control and Ecology.

The Commission's job, spelled out in Section 315 of P.L. 92-500, is to "make a full and complete investigation and study of all the technological aspects of achieving and all aspects of the total economic, social and environmental effects of achieving or not achieving" the July 1, 1983 goals in the Act. Those goals call for a quality of water nationally that "provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water." That means by 1983, municipalities must be employing "best practicable waste treatment technology" and industry must be using "best available technology economically achievable."

Mr. Cahill is presently General Counsel to the National Commission on Water Quality. He was formerly Executive Director of the Western States Water Council which was created by the Western Governors' Conference to effect cooperation among State, Federal, and other water agencies in the eleven western states. He previously served as Special Assistant Attorney General for water matters in the State of Wyoming. Mr. Cahill has a B.S. in political science from Brigham Young University and a J.D. degree from the University of Chicago Law School.

The Commission will also study the impacts of reaching both the 1977 and 1985 goals. The goal calls for a minimum of secondary waste treatment for all municipalities and "best practicable treatment" for all industry nationally by July 1, 1977.

The Commission believes a comprehensive study of the 1983 requirements is not possible without also considering the 1977 requirements. And since the ultimate national goal is elimination of discharge of pollutants into the Nation's navigable waters by 1985, that will also receive careful Commission attention.

The original version of the law, because of far-reaching and perhaps unseen ramifications of the Act, called for the National Academy of Sciences and the National Academy of Engineering to undertake such a study and to report to Congress in two years. The Senate version of the bill made no mention of a study. When the versions went to conference, the conferees agreed on an independent study commission which would report back to Congress in three years.

The staff is divided into four major departments under the Program Director and a Deputy Program Director. These are: a technology section headed by a wastewater engineer; an economic section headed by a water economist; an institutional section headed by an economist with institutional expertise; and an environmental section headed by a limnologist. These department heads will oversee and coordinate the work of the major contractors enlisted by the Commission.

The Act authorized the appropriation of $15 million for the study. The Commission will work closely with environmental, industrial, governmental, and public interest groups. It will hold a series of informal technical meetings with representatives of these interests. Washington-based representatives of these groups have regular access to the staff, Commission members, and contractors. When its report begins to take shape, the Commission plans formal public hearings on its preliminary findings.

The Commission will conduct its study in accordance with the preliminary study outline that has been circulated to the class. In general the study will proceed as follows:

The Commission, using data and reports from the Environmental Protection Agency, the United States Geological Survey, State, regional and local agencies, and other sources, will prepare a description of the current quantity and quality of the Nation's waters. Attention will be given to toxic constituents and those which reflect the biological condition of the water. This statement will establish the baseline against which improvements in the water quality stemming from 1977 and 1983 regulatory requirements will be assessed.

The Commission will assess and identify the current and potential technological capabilities and fiscal and economic costs of achieving effluent reduction or elimination from municipal, industrial and other point and nonpoint sources and will quantify the economic, social and environmental costs of achieving effluent reduction or elimination for the requirements and goals of the Act. Where reduction or elimination of the discharge of pollutants results in residual wastes, costs of disposal of these residuals will be examined. Methods of minimizing or reducing the pollutants from nonpoint sources will also be analyzed.

But when Congress passed this Act they recognized that the Nation didn't have all the answers. The strategy was "let's go for the obvious, let's go for what we can do now, viz. the point sources. But let's recognize that we need to get started in developing non-point source programs also, but let's give the states first whack at it." I think this is a reasonable approach. You cannot do everything at the same time.

Q. You see a lot of erosion around the country such as the one reported in the newspaper last night on just this very thing. I think one of the things here is that we have one of the highest eroded areas in the country here, but there is something else that is rising a question on it and that is that fertilizer has become so doggone expensive and difficult for people to get, and the soil is being rapidly depleted because it is simply being run off, and I think that even without this, we'll see some improvement in farming practices because of it. I think there is probably more encouragement from Region X over here towards solving this problem and probably more interest in this state than there would be in many states. There are being open meetings about it. I wish I'd have kept the piece out of the paper, I'd have brought it in, and it would have helped clarify this. But they are saying that EPA is going to require this. Whether it is a misinterpretation or what, it is showing up in print.

A. That is an interesting area. I'm going to check that out, because certainly the Act does require states to initiate the development of control programs of non-point source of pollution. But, if the state develops a program and starts implementation of it, is that a federal requirement? For example, does a farmer have to go to the State of Washington to get a formal plan approval for non-point source of pollution? Well, what if he didn't do it? Is it a violation of federal law or state law? I have a feeling it would be a violation of state law. And certainly the states are receiving and probably using Federal water pollution control State Program grant monies for this function. But I believe that any specific non-point source requirements which may be placed on farmers by the states are enforceable at the state and not the federal level.

Q. The Study Commission that is going to give its report in the spring of 1976 is going to be mainly directed at non-point sources?

A. I believe that the Study Commission will recommend in any area it chooses. No, both. Basically be directed at point source. You know, the Congress established the 1977 "best practicable" and 1983 "best available" requirements and in some versions of the Bill there was a 1985 no discharge requirement. However, when the final Act was passed, the "no discharge" concept became a "goal". But they used the words "best practicable" which means some of the basic technology is there and you can take it off the "shelf" and use it. They know that is there, so we are requiring that right now. But I believe that the Congress was concerned with what the concept "best available" would entail. But, they decided to put it in the Act and put industry on notice that they are going to have to start marching toward that and ultimately toward the no discharge goal. But they also created a Study Commission and look at the thing and have it report back to them in 3 years and advise whether modifications should be made in these requirements and goals.

Q. If you look at the Act, as I recall, the Section in which the Commission is referred to, really deals with point sources?

A. Yes.

Q. It's a matter again of when do the point sources become a non-point source?

Q. Jack, I just wanted to quote when I did an analysis of this Act on non-point sources, I found that EPA is required to develop information on (1) the nature and extent of non-point sources of pollution, and (2) means to control such pollution from a range of activities, and second, the states are required to (1) submit reports on non-point sources of pollution and (2) recommend control programs, and sort of dies there. I think the important thing is, isn't it, that this is really about the first time we've even started talking about non-point sources of pollution in any sort of a serious manner?

A. That's right. As I said, there is this hesitancy to do very much about non-point source -- the gentleman here that made the remark about these effluent guidelines development process and how you could easily criticize those, just think how easily you might criticize non-point source guidelines. They would vary all over the map. I'm just parroting this, but the judgment of a lot of good people is that we better give the states as much flexibility to innovate in the non-point source area as possible, and this is why we have this thrust now which is to make a requirement for the state water pollution control grant to do something with it. O.K.? Try to develop programs, try to see how far they can go, we'll get the money for that. But let's not tie any federal requirements to it right now. And the bureaucrats being what they are, you know, you could have some guy out in Maine trying blindly to apply some standard which somebody developed through a study here in Pullman. We don't want that.

Q. I think perhaps we've come to a close here, but I wonder if you might comment on the difficulty or ease in comparison of this Act with previous Acts of enforcing so that we get a change in the quality of the streams?

A. Well, that's why we have this Act, pure and simple. The other Act required that the casual link be tied between ambient water quality not meeting a standard and the pipe upstream, and establishing the scientific basis for doing that was difficult and time consuming. Because you had not only that guys pipe, but a lot of other pipes and a lot of other sources of pollution. So the other Act was clumsy to enforce and the result was that the Congress determined that rather than have the ambient stream standards, we'll have pipe effluent standards for which compliance can be readily established.

Data obtained from the analysis of costs of application of the requirements of the Act will be matched with available data on sources discharging into individual river basins to aggregate costs for the Nation.

As a basis for examining economic and other impacts, the Commission will prepare projections of the annual Gross National Product and governmental income and expenditures through 1985. The Commission will also examine private capital and income projections and demands in relation to the demands imposed by the regulatory requirements of the Act. Accruals to the Gross National Product and governmental income as a result of compliance with requirements of the Act will be included in such projections.

Results from the analysis of the costs, benefits, and capabilities of techniques to reduce or eliminate the discharge of pollutants, together with projections of GNP and governmental income and expenditure, will be used to ascertain the economic costs and benefits of achieving or not achieving the requirements of the Act.

The Commission will identify the chemical, physical, and biological composition of water necessary to restore and maintain the integrity of the Nation's waters and to provide for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water. The environmental consequences of achieving or not achieving the 1983 treatment requirements can then be assessed. Impact of the reduction or elimination of pollutants on water quality will also be studied. Because there will be residuals from some effluent reductions, the environmental effect of their disposal will be considered.

Achieving or not achieving the Act's requirements and goals can have social costs and benefits. These impacts will be identified and described.

The Commission will evaluate Federal-State-regional-local institutions and inter-institutional arrangements for water pollution control to analyze their administrative and financial capabilities to accomplish the legislative requirements and goals.

Eight or ten representative river basins with the best available data will be examined in depth to test and validate the projections developed on a national basis. Sociological and environmental, as well as economic, impacts will be characterized and pinpointed wherever possible. Anticipated improvements in water quality resulting from required effluent limitations will be described to identify possible changes that could come from "achieving or not achieving" the requirements and goals of the Act. Special attention will be given to those areas where quantities available for use are restricted or expanded by changes in water quality. Institutional relationships will be evaluated.

Q. A couple of people that I talked to have led me to believe that Nelson Rockefeller has a real personal interest in what is going to happen in the Commission. Could there be any tie-in in this interest and the fact that New York never got back any part of their $2 billion bond from the Federal Government?

A. I think they have the prefinancing aspect of New York's program in hand. I think they've gotten back most of it.

Q. You think so?

A. Yes.

Q. The last time I heard they were still up in the air. I heard they had an ax to grind and that was one of the reasons.....

A. During one of the legislative hearings...Governor Rockefeller had a particular point of view, and he presented this at the hearings. He did not feel that the goals in the Act were reasonable or achievable, and he felt that legislation of that type would undermine the confidence of the public in government in general.

Q. He's not alone in that.

A. ...So, I would say that Governor Rockefeller does have personal interest in the workings of the Commission. He's spent a great deal more time working with the Commission than I expected him to. But I also did not expect him to resign from being governor. He has taken very much of a personal interest, but as to whether he has an ax to grind, I don't know.

Q. You mentioned some residuals from some waste treatment, and I wonder if you could expand on that a little.

A. If you are looking at some of the alternatives, say municipal treatment, there are land disposal possibilities. If you keep the pollutants out of the water, they have to go somewhere. They may end up with sludge, and then there is a land disposal problem. It may end up with some sort of treatment that requires some high energy demands. There may be air quality problems in disposing of the water quality problem, and these are rather broad.

Q. Is there a lot of research being done in this area? I mean, I know there is a big problem with this, like in Spokane because a person contacted us, especially as far as deriving some benefit out of these wastes?

A. I think at least there has been talk of deriving benefits out of the waste. Sludge can be disposed of by burning, which creates methane gas, which then can be used as a self generating type of disposal. There is also land fill waste disposal and the irrigation potential from sewage treatment wastewater reuse -- these have all been talked about.

Q. What about the solid waste line?

A. Of course, there may very well be solid wastes disposal problems in industry, and certainly from municipalities. Solid waste from municipal treatment would probably be in the form of sludge. It is interesting that the Blue Plains Sewage Disposal Plant serving the Washington Metropolitan area ran out of areas to dump their sludge, and they've been in court. Maryland didn't want it. The suburban Sanitary Commission composed of the two-state

area of Maryland and Virginia and the District of Columbia, has been fighting over where to dump the sludge. The judge most recently said "You've got to divide it up". So, it is a concern.

The strong supporters of this legislation say that one of the major reasons for passing the legislation was to try to spur the types of research that are necessary to solve these problems so that technology would jump ahead a little faster than it would through normal circumstances. Whether or not that's happened, is problematic. It may have. The EPA has proposed effluent limitations for, I think, 27 categories of industrial discharge. I don't know how many sub-categories they break down into. They do this for the 1977 goal for the "best practicable" treatment, and for the 1983 goal for "best available" treatment economically achievable. Nobody has yet figured out what those mean. But they say they are going to take the best plant in the industry of any size and force the technology on them and the rest of the industry.

Q. Has the Commission staff or the Commission itself taken any point of view on or reviewed some of the on-going land use planning legislation that is being considered now?

A. No, not as a Commission. Getting back to the job that I left, one of the major efforts prior to my leaving the Western States Water Council was to try to catalog the efforts that the 11 states had made in passing legislation having a bearing on land use. It is rather amazing the amount that has been passed. The Commission itself has not been involved in that legislation or even paid very much attention to it yet. Anyway, I understand it is very likely dead for this year.

Q. Does it look like now from the information you have that the dates specified in the present water quality act will be set back?

A. The date that is talked about the most is the 1977 date, which has a goal of secondary treatment for municipalities. I think there is a general feeling among those who are familiar with the legislation and the state-of-art and the financing that is available, that the 1977 goal will not be met. How far they'll miss it depends on a great many things. It depends a great deal on financing; also it depends on the red tape you have to go through to get a particular project or treatment plant.

Q. Now, so far as industry is concerned, they don't really have the excuse of lack of public financing that the municipalities do, and I've not heard them cast in the same type of problem.

A. Yes, they are. There are a great many of them that are assuming that the 1977 goal for municipalities will not be met.

Q. Is it correct that this Commission is a creature of the Congress and is not part of the Administration?

A. That's right. It is not part of the administration. I don't know how EPA feels about us although they cooperate with us a great deal. We are not there to second-guess EPA, although obviously we have to take a look at the regulations that they promulgate because they have the force of law, particularly on the effluent limitations. We have to start from those limitations to determine

the charge of the Commission. What we intend to do is determine what the impacts will be of achieving or not achieving the goals. We will report to Congress, and then Congress will do what it needs to do.

Q. Well, part of the problem, of course, in ever doing what can be done in the Act is money. Congress authorized something like $18 billion and considerably less than that was approved by OMB. Do you think that this Commission will review the actions of the administration as they impact on the application of the law?

A. I doubt that we will address ourselves directly to the impoundment. Impoundment is not the only deterrent to meeting the goals. Certainly availability of money is one of them, but there have been arguments that the construction industry could not build the plants fast enough. I don't think that's true; I think they probably could. The paper work that is necessary to get a grant for a plant is a major factor. Let me read you an excerpt from a speech of Congressman Jim Wright, who is a member of our Commission from Texas:

> "The Clean Water Program -- the bold initiative of the last Congress, by which we sought urgently to put in motion a massive clean-up of the Nation's streams -- has lagged and faltered for the past 15 months. Cut to less than half its intended size, by a series of arbitrary executive impoundments, the program has been further emasculated by an almost unbelievable proliferation of administrative red tape. Incredible though it may seem, the administration has managed to construct a fantastic maze of baffling guidelines, burgeoning regulations, bewildering paperwork, and ever-changing directives which have brought what was an on-going program to a virtual halt. These 'bureaucratic impoundments' have choked off the flow of funds even more drastically than the overt Presidential impoundments. During the calendar year of 1973 -- a year in which Congress had foreseen the expenditure of some $5 billion in a crash program to help the communities -- only $17.3 million was actually spent."

It goes on to take the acts of the administration apart. This was also reflected in the comments some Senators have made. These have not necessarily been partisan statements.

Q. Obviously when Muskie and Blatnik were on their respective bills, they had the impression that these goals could actually be reached. Do they feel that they had been misled by the people who were advising them?

A. There are three dates involved. The legislative history of the Act itself in addressing the 1985 goal of "no discharge" clearly states that this is not an enforceable goal. It is something to aim for, but it is something that is not expected to be attained.

Q. Nevertheless, you wouldn't want to start the public into thinking that it's down in the Act. I think most people are under the impression that these are achievable goals, and if we don't meet the goals there is immediately going to be a bunch of hair pulling and what have you, especially at the time these deadlines come up. So Rockefeller's point of view about loss of public confidence is well taken. Such is exactly what is the matter. I'm very curious as to where he got the idea that you could make such a grandiose goal even by 1983.

A. I'm not sure. It started out in the Senate Bill setting the fishability-swimability goal for 1981. That was 10 years from when they expected the bill to pass.

Q. In my way of thinking, it makes Muskie even stupider than Blatnik.

A. The House Bill that was passed would not have put the goals into effect without additional legislation. They proposed a study which they wanted to be made by the National Academy of Sciences and the National Academy of Engineers. The goals would have been stated there as principles to be achieved, but not as enforceable goals, and it would have taken additional legislation to put those goals into effect. I've heard that the conference committee met 39 different times -- a record for any major piece of legislation between the House and the Senate. I guess both Houses wanted the Bill passed, and that was the best compromise they agreed upon. Whether or not or how it will be carried out, I guess we'll know in two years. Hopefully the Commission will be able to pinpoint some of the impacts of achieving or not achieving. There is some talk that the Council on Environmental Quality has made a study and it may very well be a part of their next annual report. They say it may be much more cost-effective so far as water quality is concerned to reach only the "best practicable" goal, rather than going on to "best available". There were quite a few different figures as to how much it would cost to meet the 1985 goals while the legislation was being debated. The OMB had a study grant that came out something like $467 billion. Governor Rockefeller, for use in his testimony, had the New York State water quality agency put together some of their figures on discharges just from the City of New York or Metropolitan area of New York. His statement was that in order to have land treatment of all their disposal they would have to buy the five most northern counties of New Jersey. He put a figure on that of something like $3 trillion. There was a rather interesting exchange between Governor Rockefeller and Phillip Hart, who was then a member of the House Public Works Committee. The real problem is that there are not any figures that anybody can look to with any confidence or with any reliability. We hope to be able to give at least an indication of what the cost is going to be to achieve the goals, and if the goals are not achieved, what the environmental costs will be. Then the public or Congress will pick it up.

Q. In a sense, it's kind of a shame that Congress didn't do what your study Commission is going to do before the Act was passed, because really you're not going to have enough time to come up with any new numbers particularly. You only have a year and a half left to...

A. Actually, so far as the studies are concerned, we have only a year, because it will probably take six months to correlate the results from the various areas. That's going to be an interesting project.

Q. When you talk about the economic impact and social impact, you're looking at obvious increases in unemployment and that sort of thing that will have to be cranked in.

A. Yes, so far as the social impacts. And it's very difficult to separate social impact from economic impacts. We'll look at both the cost of achieving and at not achieving, and some of those factors have to do with social impacts -- levels of employment; changes in employment, either within industry or government, and geographically; available leisure and recreational opportunities; health

defects; changing requirements for technical skills; effect on regional development; the general quality of life. These are some of the social aspects.

Q. There might be some good case histories for you to take a look at over in western Montana. You know, in Montana air pollution is one of the greatest dangers of the smelters, and they shut down about eight smelters in western Montana. I think the figure was 2500 people directly affected. I bet there is some real good field data on what the indirect effects of closing down those marginal smelters might have been. Current figures ranging anywhere from an additional 5,000 up to 15,000 to 20,000 people unemployed indirectly.

A. It has a circular, feathering effect. That s an area which I was very much concerned with before -- the impact of developing or not developing a particular area, of regional benefits, shifting technologies, projections as to which region will develop as opposed to another region.

Q. It's been my understanding that they are only going to let municipalities design and build up to a projected 1990 population, and I believe they have held with this 1990 figure even though the state may predict high on this. It seems to me to be pretty uneconomical for a municipality, say its 1983 or even to 1985 to be putting in facilities that are only going to be designed for capacity five years in the future. Amortization doesn t even cover that short a period of time.

A. I think I've heard that too, but I haven't heard any discussions on it. I can't argue with your logic. I think this is true when you look at the difference of the impact upon industry of the 1977 goal of "best practicable" treatment and 1983 "best available" treatment. You have a six-year span there. Actually, I think their thinking is that "best practicable" for industry will pretty much concentrate on end-of-pipe treatment whereas "best available" will involve process changes. We're having a study done by the Conference Board, which used to be the National Industrial Conference Board, as to what effect the effluent limitations will have on water use, and whether or not industry will cut down its water uses if the cost of treating effluents becomes unreasonable. I think probably in about six months we will have some results from that.

Q. The National Water Commission which is the commission that just recently completed its reporting task also addressed some of these water quality questions. This wasn't their main issue, but they did look at questions of water quality and they did address the question of the impact of this legislation as well. They reported on it unfavorably. How does your Commission feel....?

A. We regret what they said.

Q. It would seem that the data that they collected and the reports, etc. that they put together would be as good as what your Commission would be putting together in the same area.

A. I think that the studies they based their findings on did make quite a pitch that the 1972 Act should not have been passed. In fact, they opposed the legislation. I think that that conclusion was based on a study done by Hines at the University of Iowa; also there was some field work done by some state administrators. I know Dwight Metzler from the State of New York and Charlie Roe from the Attorney General's office here in Washington were involved. I read their

study when it first came out, and generally agreed with the conclusions. At that time I was still working in Salt Lake. I don't think they had available to them the type of data that we'll have, mainly because they also did not have the time. A large bit of the study was on the institutional aspects. Their criticisms were on the centralization of the authority in EPA.

Q. I recall one particular figure that they presented on the economics of the 1972 data which pointed toward the marginal returns as compared to the margin of cost involved, and indicating that for the removal of this last 1 or 2% that they're spending billions of dollars...I don't remember the exact number that went into this figure, but it was very costly.

A. Yes, that's right. In the increments above 90 per cent, the costs start sky rocketing. I think that their study was based on figures that were put together by the Office of Management and Budget. It was part of the administration's stand against the legislation, and the basis of the President's veto.

Last spring the administration was asked how much it would cost to achieve these goals, and they responded that they did not have the figures available. Six months later they had figures which show something like $467 billion. I don't know what type of data they had; it was very short and selective; probably OMB put out about 25 pages. I don't know whether or not we'll come up with the same conclusions. I suspect that there will be some areas, some types of treatment, some types of discharges, where we will determine it is not economically feasible to go to the complete elimination. Some of the guidelines that EPA is now proposing have as parts the elimination of discharge of all pollutants. I think the sugar beet processing industry recommends for "best available" technology. Feed lot discharges have to go to holding ponds capable of holding a specified return period rainfall. Quite a few of the effluent limitations that are now coming out do have as "best available" treatment, a complete elimination discharge requirement. In order to arrive at that, some economic studies and impact studies were done. A good number of those studies were done by A. B. Little. Most all of them I have glanced at. Some of the conclusions indicate that they really did not have time to get into the type of study that they thought was necessary to fully document their conclusions. EPA has faced some real hard deadlines. They had a year to formulate effluent limitations for all of the industries. That's a very difficult type of problem. There were 27 categories of industries that they had to formulate limitations on - many of those have been sub-categories and they had to do it in a hurry. I think they have been extremely cautious, or extremely protective in arriving at the numbers they have. Hopefully they are now in the review stage. Final regulations have not been promulgated yet, although I think some of them will be starting soon. The Natural Resources Defense Council argued that the law says "You've got to promulgate these standards; now, get with it!" They settled the case, and agreed upon a revised schedule on effluent limitations. All of them will be promulgated prior to December 31, 1974.

Q. Maybe we should send them to enforce the section of the Act that says they have to provide traineeships...the Act provides for traineeships for institutes of higher education...but of course they have not come through.

Q. I was wondering about your criticizing the economic studies of the National Water Commission on the basis that they evidently were short term studies, the studies that your Commission is coming up with, are they any longer term studies, or are they going to be any better, really?

A. I think we'll have more data available. I'd have to look back at the National Water Commission study, but I'm of the impression that there is basis for the criticism of the economics study of that group.

Q. There also was a special panel on water quality that was at least a couple of years in duration.

A. Yes, and I think that's the one that Dwight Metzler and Charlie Roe were on. I thought they were mainly examining the capabilities of the state to handle the institutional aspects of the program.

Q. I think Hines was probably more institutional in nature, but there were in fact at least three separate studies.

A. I would hope that we could have some better data, some better figures than theirs.

Q. Your contracts are already let then?

A. No, they are not.

Q. Then you are looking at a year and a half....a year?

A. The studies that we let will probably be for a year. We'll have part of the data in a year. Whether or not we can do anything more than they did in that time, remains to be seen, but there are some things that we will have that they did not have. For one thing, they did not have accurate costs of technology, the capabilities of technology. They did not really have a starting point, mainly because EPA has gone through the process of setting the limitations to achieve both the 1977 and 1983 goals. We have those to start from and to work backwards from, or to work from to determine the impacts of meeting those particular numbers. I think we've got some better bases for starting. What we end up with, we'll have to wait and see.

Q. I have a question just on the management of a commission of this size. When you get 10 people who are elected and then five people in non-elected positions on there, what about getting them to agree on things; and second, do you feel that the Congress is really waiting for your report in a positive sense? In other words, are you essentially in the role of a Congressional committee staff that is reporting back to the Public Works Committee...is that the way it works?

A. Our commission will report to Congress. The Public Works Committee will be the ones who pay the most attention to it. But, let me answer your questions in order. The individual commissioners have taken a great interest. During one of their initial meetings, prior to the time that I was hired, they were discussing the problem of meeting the study deadline, and someone suggested that each commissioner needed a staff man on the commission staff to serve as a liaison and keep him informed of what was going on. They agreed that this would be done. They also agreed that that staff man should have other staff responsibilities as well. The liaison would be one of the things he did, and, depending upon his own personal qualifications, he would fit into one of the program areas. I think we now have 13 of those staff liaison men. They serve as a

conduit between the staff and the individual commission members. Some of them are very active with their principles. Others, not so much. A great deal depends upon the interest of the individual commission members.

Q. Were these people hired especially for this commission, or were they on the Congressional staff already?

A. They were hired for this commission. Some of them did come from the committee staff. Blatnik's man was an employee of the House Public Works Committee. Muskie's man was, say, staff. He was on the staff of Senator Stafford of Vermont, who had also been involved in the legislation. One of them owns a newspaper in Texas -- he's Jim Wright's -- and has been deeply involved in politics in Texas for many years. Donna Mitchell, who is the Governor's liaison person, worked for the State of New York in its Washington office and was involved in the legislation for a couple of years prior to its passage. Senator Baker has recently hired his staff assistant -- he's a marine biologist with a law degree. They have various disciplines. So far as getting the commissioners to agree to something, we've had a problem getting the outline plan of study finally agreed upon. It took about five months to do what we'd hoped to get done in two months. But there were very basic policy issues involved in the outline plan of study. We now are filling in the individual parts - the detailed plans of study. Some of the issues keep rearing their heads, but we've got the basic document to go back to as a control, so I would say we will start moving. Now, as to your second question, as to whether or not Congress is waiting for our report. I think it is. Just look at the present Congressional membership on the committee. There are the Chairmen of both of the Public Works Committees; Senator Muskie, who is the Chairman of the Air and Water Pollution Subcommittee, and who was a strong pusher for the Bill; Congressman Bob Jones, who is also a Public Works Subcommittee Chairman; Congressman Blatnik is not running for Congress this fall, so Bob Jones will become Chairman of the Public Works Committee. All of them have spent a good deal of their own personal time on it, so I'm sure they are placing a great deal of importance on what we produce and intend to base some legislative actions on our recommendations. That was part of the basis of my going back there. I met with Governor Rockefeller on two different occasions. He fully intends to utilize the results of this commission for legislative proposals and it's rather hard not to be enthused about it after talking with him. Ask me again in 1976; I might give you a better answer.

Q. At least some of the member associations of the Water Pollution Control Federation have been holding legislative workshops around the country. We had ours already, we were the first ones to have one. Have the results of those resolutions been reaching your commission?

A. Some of them have. I'm not really sure how many workshops have been held. Leo Weaver, who is on the staff of the Federation, has been trying to keep us informed of results. Some of the Commission staff have been at some of those meetings.

Q. That's right....you had a man at our meeting over here in Portland.

A. Is that right? We had several people go to the one held in New England. I've forgotten where else they've held them, and I don't know that we've covered them all, but we are getting the results of those. Outside of the program area we have a liaison section, I guess you'd call it, which is composed

of people who have backgrounds in the environmental organizations, in the industrial organizations and a man who handles liaison between or with the states. I'm not quite sure where Leo's group fits, but yes, we're keeping track of those things. The Conservation Foundation is also holding a series of meetings across the country. Some of the staff members have been at various meetings and some are participating in the program.

Q. I imagine their resolutions would look quite different than ours.

A. I really haven't seen any. I don't know that their meetings would propose resolutions. I think their meetings are to inform people, environmental leaders from a particular region, as to how the Act is working in the state. I don't think that they're resolution oriented, but I could be wrong about that.

Q. I understand that these Senators and Representatives kind of come and go in this Commission. Who is in charge of the overall, day to day operation and responsibility to see that the thing actually gets done and to oversee the different sections?

A. The Executive Director, who is General Clarke, formerly the Chief of the Corps of Engineers.

Q. He answers to the Commission?

A. That's right. And he is a very un-general General. He's a very good man to work with. He's a very competent engineer. He became involved and interested in environmental problems many years ago. He was one of the Commissioners of the District of Columbia when he was in Washington. He instituted programs in the Corps of Engineers mainly on the basis of responding to the public interest, and I think he has done much to alter the image of the Corps as the spoiler of the environment. From what I hear, his best efforts were in raising the morale of those working for the Corps. He did a great deal to change the Corps. He is the man who is generally in charge of the Commission's work.

Q. He has a rather interesting contractual obligation to the Commission that maybe you'd like to tell us about.

A. Well, he retired from being Chief of the Corps of Engineers this summer and had made previous arrangements to go with a consulting firm out of New York. It's a large engineering construction firm. As the Commission was trying to find an executive director, his name continually cropped up. Some others did also, but they were either unavailable or were not what the Commission wanted. I don't think the job was offered to any of them, and it finally narrowed down to General Clarke as the man that they wanted to hire. Since he was already committed to work for this consulting firm, the Commission contracted with the firm for his services over the life of the Commission. He operates on full-time basis on the Commission staff as the director of the staff.

Q. That firm opted-out then on any further contracts?

A. That's right. Part of the contract was that they would have no other involvement. Anyway, they're mainly a construction engineering firm. They obviously do some planning too, but their main income is construction projects. They were the chief engineers on the Dallas Corporate Airport, the whole complex. They also do a lot of foreign work.

Q. I'd like to follow up on the questions brought up before about the business of training. Are you going to be looking into the aspect of available manpower, and if unavailable, what needs to be done?

A. I don't know. The two are certainly connected with the technology problems. It doesn't really help very much to have the best waste treatment plant in the world if there isn't anyone who can run it efficiently. If we do study that problem, however, it will be in a very minor way. At least that's my general impression. I don't think that we will get heavily involved.

Q. I was also interested in what you said originally that your commission.. these aren't your exact words.... that one of the reasons it was established was to get some of the research going that needed to be done.

A. That was the purpose of the legislation really. That's what the Senate staff people tell me. That's why they made the goals so stringent. They felt that this would spur research and development of new processes in the waste treatment field. I expect that we will not do any initial research ourselves, or primary research, mainly because we just don't have time. But I expect that some of our conclusions will be to point out areas where research is needed.

Q. Will you be suggesting ways in which the research could be done?

A. I should think so. But I believe that it's premature to say that. I think if we feel that a particular research program is desirable, it's only doing half the job to say it's desirable without also saying how it might be implemented.

Q. Are you going to be holding any national conferences?

A. Yes. We will be holding different types of public meetings. Shortly after the Governor became the Chairman, he wrote each of the other governors and invited them to appoint a liaison man with the Commission. I think all of the governors have now done that. Just prior to adoption of our plan of study, we held a series of meetings throughout the country with these state liaison people. These were mainly to explain to them what we are doing, to solicit their comments and their suggestions, and also to take advantage of their expertise, because to a large extent they were the people who have been handling the state programs for the past varying number of years in various states. We propose some time later this spring, probably April and May, to hold another series of public meetings. They will not be hearings in the sense that you go some place and listen to people present statements and then nod your head, say yes, and go home. They will be more technical type hearings. Again, we will probably meet with the states. The groups will be small. We will meet with various environmental associations, probably academic institutions, and try to do the same two things: tell them what we're about and try to elicit any suggestions they have. These, too, will be small meetings. Once we get the major portion of the contracting work done and get a draft report out, we hope to hold a more formal group of hearings -- probably in the summer of 1975. We will be holding these public meetings as we feel the need. As I say, there will be a series of them later this summer. There have been several lists of suggested cities, but I am not up-to-date on just exactly where they will be held. Generally they will be held at some central point to take advantage of as big an area as possible. Some of the individual commissioners came to the meetings that we had with the

states. Ray Kudukis was at Chicago; Bill Gianelli was at Denver; Carl Wright was in Dallas.

Q. If I could just continue for a moment, I'm quite concerned both on the training and the research aspects because I think we have too many "conclusions" that have already been made that nobody seems to be really arguing about. OMB takes the attitude that we've got all the trained people we need, and that we really don't have to have any new major programs. Or at least it would seem so the way they cut funds for the training programs. And all this based as far as I can see primarily on the fact that a few years ago we had a surplus of aeronautic-type scientists and engineers (which seems hard to extrapolate to the whole field of science). But facts are that the programs for training are being cut back. And as far as the research efforts that go out, it's hard to figure out just exactly what they feel, except that they seem to be against research in any organized sense. So, it seems to me that these two factors would be very important to your program. I've seen some figures on required manpower that are not going to be met unless there's some encouragement along that line.

A. I think the Act itself recognizes that and makes provisions for that training.

Q. Which is why I asked you initially whether the Commission was going to comment on how it was being implemented by the administration. If they can selectively opt-out certain aspects of the Act, it seems to me that whether it is in the Act or not, it doesn't make much difference.

A. This is complicated. I don't think we will get involved in that very deeply -- in either the impoundment question, or the selective implementation of the Act. That's mainly because our purpose is not to oversee EPA. Our purpose is rather limited, but in some ways, rather broad. We are just to look at the economic, social, and environmental impacts of the Act as a result of achieving or not achieving the goals. That can't be done without overseeing some of the things that EPA is doing, but I think we will try to steer clear as much as we can of the impoundment issues because of political implications. I think we're getting beat around the head enough so far as impoundment is concerned.

Q. It seems to me that they're going to the wrong people when they start griping to EPA about impoundments.

A. I think there's rarely a day that goes by on the floor in either the House or the Senate, that somebody isn't pounding on them....on OMB...for impoundment of one program or another. They're just not getting through. Jim Wright's comments are one example of it. Senator Muskie has made similar comments on it. Governor Rockefeller, while he was still governor, made all kinds of comments about the impoundment problems. It may only be time that will take care of the problem.

Q. It seems to me we haven't really talked about the non-point source in any great detail, which was a very exciting subject of a couple of sessions we've had here. Do you view this as something which will be a major point?

A. I think that the non-point source problem is going to be addressed by the Commission and by the staff. The problem is that the technology for controlling non-point sources is simply not available...or has very limited avail-

ability at a reasonable cost. I think our main efforts in the non-point source area will be to identify whatever technology is available; try to put some type of cost upon it; try to show the effects of either implementing any limitations on it or the practices that you have and try to show the environmental effect. As I understand from the literature that I have seen, the major non-point source problem comes from agricultural runoff whether it's irrigated or non-irrigated.

Q. The actual research data, the basis on those is nonexistent. These conclusions are really...all of the studies that I'm aware of that have been done at least here in Idaho and Utah, have indicated just the opposite.

A. That it's not coming from the irrigated sources?

Q. That's right.

A. This is one of the latest outputs from the EPA "Methods for Evaluating the Extent of Non-Point Source of Pollution Site". I saw this a week or so ago, and the conclusions that they make are what I was basing my statement on.

Q. In irrigation there were some studies done recently by the Agricultural Research Service in eastern Idaho, or southwestern Utah.

A. I don't know what EPA based the figures on; I'm just going by their conclusions. They have representative rates of erosion from various land uses, and where grass land has 240 tons per square mile per year, crop land has 4,800 tons per square mile per year. But, as I said, I don't know what the basis of these figures is.

Q. In this Seminar we just had one of the experts on that particular problem say that the erosion figures had nothing particularly to do with the actual yield to a river. Because the through-flow is different under varying conditions.

A. Because of what?

Q. The actual through-flow. What is eroded off of a slope does not necessarily reach a water body, although it is more likely to get there than what is left.

Q. I believe he said in this area, which is a high erosion area, there was about 10% was what actually got to the rivers? Rather a small amount really.

Q. The man that spoke last week said that the nutrient pollution caused by non-point sources was important and that they figured that in order to control it they'd have to start their control at the sediment control level. The pollution that is there is coming from the sediment, and whatever is causing the sediment movement is causing the pollution. And here again, the ARS studies indicate that sediment and nitrates are not related.

A. Sediments and nitrates? Well, I think it is an established fact that salinity and phosphorous and everything else that comes out in sediment are more of a problem than the nitrates that are leaking through.

Q. Then, if they can control the sediment they will be more successful for water quality than if they try to control more soluable elements?

A. In the Colorado River Basin there is very close attention paid to the non-point source problem. It has been under study for several years, partly because of the Mexican treaty problems, and also because of the salinity standards on the Colorado. The main problem there is an increase in the Mexican allocation--they say that about half of it comes from natural sources and about half of it comes from man-made. They have a list of studies that they have been working on and have had an enforcement conference going for at least 15 or 16 years. They've done some fairly extensive studies on it. They have looked for means of controlling it, and have a program attempting to deal with some of the natural sources, mainly because those are a very visible problem. Mexicans have been screaming for 30 years about what we are doing about their water, but there hasn't been a great deal of work done there. I can't give you the results of all of it. They have split it about half and half between natural and man-made types of problems. Most of the man-made come from irrigated agriculture and also from diversion outside of the basin where there is the salt-concentrating effect. In a river that's 600 or 700 miles long if you take water out of the head water, you don't have the pollution effect.

Q. You probably call it man-made alright, because the salt-concentrating effects of the reservoirs on the Colorado are very significant. Those are various effects. If you had enough reservoirs you might evaporate the whole Colorado River, but it seems to me like in my own research and other water quality modeling on the Colorado....there actual irrigation return flow facts was found to be minimal, at least in the Utah part of the Colorado.

A. Recently Congress held hearings on the salinity problems of the seven states that mainly concerned the Mexican treaty problem. They said there were two basic processes of salt salinity increases in streams. These processes are salt-loading and salt-concentrating. They can act separately or together to increase the salinity in streams. Both natural phenomena and man-made actions account for the river's salinity. The primary source of the natural salinity is the saline shale formations that occur throughout much of the Upper Colorado River. About 20% of the naturally occurring salinity issues from saline springs. They estimated 900,000 tons in the upper basin, and 700,000 tons in the lower basin. Irrigation is the major consumer of water in the basin and is responsible for the largest of the increases in salinity caused by man's activities. Irrigation contributes both to salt-loading and salt-concentration. Municipal and industrial uses on the Colorado are not that bad because there aren't that many. One of the more interesting issues that's going to have to be resolved on the Colorado is the oil shale and coal development that are imminent. They tell me that one of the attorneys for one of the major oil companies that are developing the oil shale are going to utilize the no discharge concept for treatment, mainly because of the potential problems with the effluent.

Q. Their water will be fully consumptive?

A. Yes, apparently oil shale production is a highly water consumptive. It seems to me I've heard that it takes 2 barrels of water to produce one barrel of oil, plus the municipal uses that go along with the production. I've heard various population figures about these oil shale plants, of 50,000 total increase.

Q. This undoubtedly is one of the reasons why Colorado and Utah are asking for release of the moritorium on Northwest waters.

A. I think that's a dead issue! At least it will be for some time. I was involved in that because the council that I worked for was a child of that issue. I don't think any responsible water resource man in the West in the last two or three years has proposed to take Northwest water. For one thing, they can't afford it, if they have to pay for it, and for another thing, the political climate simply has been very much against water resource development in general in the past four or five years. So I don't think anybody seriously proposes it now --maybe sometime in the future.

Q. I think we all kind of wish that they would start proposing diversions again, because if there was anything that ever was beneficial to supporting water resource planning and investigations in the northwest, it was the thought of losing it. It was probably one of the best things that happened to us.

A. No doubt about that. They did that very quickly. Idaho started their state water plan; the Pacific Northwest River Basin Commission was created; the State of Washington started their plan; Oregon started their Ultimate Need Studies; Montana started the state water plan. Don Lane, who was then with the State of Oregon, used to joke with Bill Gianelli from California, that every-time their budget session came around, he invited Bill up to speak so the legislature could hear him start talking about taking water to California....but, as I say, I think at least for the present, it's a dormant subject. It may start up again, but for the present I don't think anybody seriously contemplates it.

PL 92-500 - AS VIEWED BY E.P.A. REGION X

By

Daniel L. Petke

What I'd like to do today, for a few minutes anyway, is hit on some of the major elements of the Federal Water Pollution Control Act and how EPA Region X is going about implementing those provisions in this area. Then, I would very much like to open this session to questions -- and answers, where I can provide them.

One thing I will attempt to stay away from today is the defense of this entire Act; I don't think it's entirely defendable. At one time I was told that the Congress had infinite wisdom, but I think in this particular case the Congress at least put some questions in a lot of people's minds on this score. The Federal Water Pollution Control Act is a very comprehensive piece of legislation, and we in the Region have begun to find out that some of the timing and some of the concepts are almost impossible to implement. I'm thinking in terms primarily of some of the very short deadlines like secondary treatment and best practical treatment by July 1, 1977, and implementing the permit program by December 31 of this year. A number of these types of things we're finding very difficult to cope with and, quite frankly, I don't think we'll meet some of the deadlines of the Act.

Nor am I here to defend in total the actions of the Executive Branch of the Federal Government or the Agency that I work for. Our Agency has had great difficulty in putting together some of the required guidelines and regulations on time and this has resulted in some slippage in implementing the many provisions of the Act. I'm thinking, for example, primarily in terms of the publication of the effluent limitation guidelines which were required to be promulgated by October 18, 1973 -- one year from the date of the enactment of the Act. Our agency has now promulgated some 10 out of about 30 or 31 of the industrial

---

As Chief, Water Programs Branch, with the U.S. Environmental Protection Agency in Seattle, Mr. Petke's responsibilities include general direction of the EPA Region X water supply and water pollution control programs in the States Oregon, Washington, Idaho and Alaska. In that capacity, he has been heavily involved in implementing the many new provisions of the Federal Water Pollution Control Act, which was amended in October of 1972.

Mr. Petke earned a Bachelor of Science degree in Civil/Sanitary Engineering from Oregon State University in 1961. Since then, he has worked in a number of Federal environmental protection programs, including the radiological health, air pollution control, and water pollution control programs. His experience has included several assignments in Washington, D.C., where he also earned a Master of Business Administration degree at American University in 1970.

categories. This has left a great deal of confusion on the part of industry in terms of waste discharge permit program.

So let me back up and say a few things about what we consider to be our primary programs to receive emphasis at this point in time and explain to you some of the things that we have done and intend to do in the near future.

In the area of water quality management and planning there were a number of requirements in the Act, the first of which dealt with water quality standards revision under Section 303(a) of the Act. As you may know, the water pollution control legislation prior to this Act was based primarily on the concept of in-stream water quality standards whereby certain water uses (desirable water uses) were defined on a stream-by-stream basis. Water quality criteria were defined to protect those uses, and plans of implementation were developed to achieve the established water quality criteria. When there was a violation of water quality criteria there were grounds for enforcement against the entities causing those violations. That turned out to be a very unwieldy way of running a water pollution control program, primarily because of the unsatisfactory enforcement provisions of the previous Act. However, the concept of water quality standards is a good concept and it has been retained in the new Act, although you don't hear that much about those water quality standards today.

We were required to go to the State agencies with specific recommendations for revision of their water quality standards, which we did. And all of the states in this Region have taken formal action to revise their water quality standards, to cover not only the interstate waters but essentially all navigable waters. This is another major change in the new legislation, extending the Federal jurisdiction to all navigable waters.

Q. What are the recommendations based on?

A. Our recommendations had to do primarily with upgrading some of the water use classifications. For example, in the State of Washington there were a number of waters that were designated as the "Class C" waters, which are really not high class waters. We worked with the Washington State Department of Ecology to come up with an upgrading of those water use designations. There were a number of minor inconsistencies among the States in the Region in the water quality standards, and that was another area that we worked with the State agencies to resolve. We still have a couple of outstanding inconsistencies: the State of Washington did not entirely go along with our recommendations on the temperature criteria and we have had a number of rather lengthy discussions with the State agency on that. I think we just about have that in back of us now. Oregon has chosen to adopt a dissolved gas standard for the State which is not consistent with those in Idaho and Washington, and we have initiated Federal promulation actions to overcome this problem with the Oregon standard.

Q. The Region is trying to get consistency among States. Is there any attempt to get consistency among Regions as well?

A. Yes, we certainly talk to our other Regions, and I think we have fairly good consistency among all the Regions that are contiguous with this Region. But I don't want to give you the impression that water quality standards now

represent the primary basis on which the program is to be run. That is not true any longer. The enforcement provisions under the new Act do not relate to water quality standards; they relate primarily to enforcement of the waste discharge permits, which in turn are to be written in such a way that the water quality standards are met. There is a provision in the law, for example, that says that achievement of "best practical treatment" is required by July 1977. But it also goes on to talk about achievement of more stringent limitations necessary to achieve water quality standards. Water quality standards are still there; they're still relevant in terms of establishing effluent limitation levels that are required above and beyond the national guidelines. That gets into the concepts of waste load allocation and that sort of thing.

In addition, the State agencies were required under the new Act to set up what is referred to as the 303(e) continuing planning process. This is a water quality management planning effort to be done on the basin-by-basin basis by the State agencies. The States have all now defined their continuing planning process, although we still have a minor problem with the State of Alaska in that regard. They've established basin boundaries, and they've classified and prioritized the stream segments and municipal and industrial sources.

One of the problems with this law, as I see it, is that Congress forced the initiation of a waste discharge permit program and significantly increased the funding of the construction grant program somewhat in the absence of an on-going planning type program. The 303(e) planning process, therefore, is very much in a "catch-up" mode right now. Permits are being written and construction grants are being awarded in a relatively haphazard way. I don't mean to emphasize the word "haphazard," let's say in the absence of well thought out basin plans. You may be aware there was a basin planning effort prior to these events, but it was somewhat different in terms of the way we now view the water quality management function. What we're trying to do right now with the State agencies is to salvage as much of the previous planning effort as possible and to incorporate that input in the 303(e) planning process.

Q. Could you elaborate on what the law is, and what the law requires in these States so other people can be planning what to do?

A. Well, in the very simplest of terms, I think it's a process to be conducted by the State agencies for the management of their program -- to be done on a basin-by-basin basis, but then aggregated up to the State level. It's merely an attempt to identify what the water quality problems are, where they are, what's causing them, and to bring some sense of priority and management plan into the State agency's program. The 303(e) planning process does have a number of outputs which in turn feed into the Section 106 State program grant process, which requires the development of annual State strategies for water quality control. And out of that flow a number of things like the municipal project priority list, which will determine which projects in the State are funded, and in what order. The State strategy also should determine which permits should be issued, and in what priority. It should go beyond that to determine what the effluent limitations are to be in those permits, at least in general terms, if they're to be more stringent than the effluent guidelines. It should also identify some of the other types of programs that are generally categorized as the non-point source control programs, and so on. So, it's really no big deal, although you could make a big deal out of it. And I

think EPA has tended to do that in the development of some of their regulations. Those regulations have still not been finally promulgated and I think they will be simplified because it's quite easy, as we all know, to put a lot of time and effort into planning and very little time and effort into the actual control programs. That's certainly not what Congress intended or what we as an agency feel is appropriate.

Q. Are these plans that have been completed by the States?

A. They are to be completed; they are not completed at this point. Some of the previous planning that had gone on can be used as a primary input for that planning process. But this is a continuous planning process. I don't look at planning as something that gives you a document that you then set on the shelf and forget about. I think that's a big mistake. I think planning should be looked at as a process, and this is the first time I've ever seen the words "continuing" and "process" tied in with the word planning in Federal legislation -- in this field anyway. I think that's a very good step forward in recognizing that.

Q. The planning process that you say is going to be completed fairly soon, is that mostly in respect to the discharge, the enforcement of the discharge permits, or is it the kind of process which is broad enough to, say, include areas that EPA doesn't have any jurisdiction in right now?

A. It is a State planning process. It should be a comprehensive sort of planning activity. It should go beyond the Federal jurisdiction.

Q. So, regardless of the type of pollutants that are coming in, the planning process should be able to incorporate them so that the streams have the water quality that the standards are set for?

A. That's right. That to me is the whole reason for running a control program. And that is stated as one of the basic goals of the Federal Act: to achieve water quality to protect fish, shellfish, wildlife, and recreation in and on the water by July 1, 1983. That to me is what we should be shooting for. That is the basis for the plan, that is the basic objective. And in this Region, particularly, we don't feel that you are going to achieve that water quality with just the control of point sources of pollution. The non-point source influences on water quality can be very significant in many instances, as I think you are all aware. One problem, as I view the Federal law, is that it tends to de-emphasize non-point influences on water quality in favor of the point source control program. There are no real specific enforcement provisions in the law, the Federal law, which will give us a handle on the non-point influences on water quality. The State agencies therefore are going to have to be very much in back of any enforcement programs designed to get at the non-point influences of water quality. I am not too optimistic there either, however, because the Federal requirements have forced so many new changes on the State agencies in terms of getting those permits written, getting those construction grants awarded, getting the planning process going, that the non-point types of programs are getting the back seat today. And I think they will for the next year or two until we get the point source control program implemented, or at least the first cut at it. And again, I think that in this Region that is somewhat unfortunate because we can see where the point source control program will not do the job in many, many areas.

There is another area in the Federal law that we call Section 208, Area Wide Waste Treatment Management Planning. We have, as the law requires, published regulations defining the mechanisms for designating planning areas and planning agencies. And, as the law envisioned, the Governors will make these designations. They have until March 13 of this year to make those designations, and we have been working very closely with the Governors' offices in that particular activity. Again, I'm not personally too pleased with the way our Agency is tending to implement those provisions of the Act. Section 208 provides for 100% Federal funding of planning agencies for two years, and there is a lot of language in Section 208 to get at the non-point problems. Unfortunately, because of a relative lack of funding provided for this Section in the Act, our Agency has defined their selection criteria for their planning areas primarily to encourage this type of planning in urban industrial areas of the country. In the Northwest, that is not where our problems are when you are talking about the non-point influences on water quality. So I am afraid that although there is quite a bit of desirable language in Section 208 relating to the non-point sources, it will not be applied under Section 208 by the local planning agencies, but will again fall back on the shoulders of the State agencies. However, there is no mechanism for Federal funding to the State agencies under 208 except funding provided under Section 106 in the State program grants area. And those funds, as I said, are going into initiating the primary activities of beefing up the construction grant program, the planning program and the waste discharge permitting program.

There seems to be quite a bit of enthusiasm on the part of at least some of the local agencies, like Seattle Metro and some of the major metropolitan areas with regard to Section 208 planning. There also seems to be some reluctance on the part of the State agencies to turn loose the very specific control programs at the local level. And I think there is probably good reason for that, based on the experience that the State agencies have had in the air pollution control program where there has been Federal funding of local air agencies. And there has been, and there remains, friction between the State and local levels in certain instances in terms of basic program policy. So, I think the Governors are rightly somewhat reluctant to make a determination in favor of the local planning agencies under Section 208. We just don't know how it is going to turn out. But we will know in the next couple of weeks.

So those are the areas of water quality management planning that we are dealing with right now. In terms of the waste discharge permit program, the NPDES (National Pollutant Discharge Elimination System) program we have found this to be a very significant and massive kind of administrative problem. The law doesn't really require that permits be written by any specific date, but there is a provision that after a certain date any waste discharger can be sued by private citizens for not having a waste discharge permit if he is going to discharge. That date is December 31, 1974, which is not very far away -- about 10 months from now. That means nationally that some 20,000 to 30,000 individual waste discharge permits will be written for industrial facilities, with something less than that number for municipalities. In this Region we are talking about 2,000 to 3,000 individual permits. Writing a permit, as we are now finding out is not that difficult in many cases. But, believe me, it was difficult to determine what a permit was in the first place and to figure out the mechanisms to get permits written through the review process and to the final issuance. I think we have that pretty much in back of us now.

But as I said before, we are still facing many difficult decisions because we don't have the water quality management planning done to the extent that we have the answers on what the effluent limitations should be for many individual permits. We have had a tendency to write the first ones on the relatively non-controversial entities -- those that clearly would not cause water quality standards violations if they achieved the effluent limitations guidelines requirements. Of course, the other problem we have had is that we haven't had the effluent guidelines on which to base the permit -- and we still don't in many of our industrial categories. That meant that we had to go out on the limb to write the permits without these guidelines and that caused us numerous headaches. This Region, for example, was the first Region in the country to attempt to issue permits for oil drilling platforms. We are doing that up in Alaska in Cooke Inlet. And when we held our hearings up there on the issuance of these permits, we had the oil industry there from everywhere. The industry representatives were quite interested in the stipulations that we had written with these permits. We are now in the process of additional hearings because the industry, in this particular case, is going to appeal some of the provisions that we have written into those permits. They are concerned, and rightly so, that the stipulations we defined in Alaska may very well be used in the Gulf of Mexico and in California, or wherever the offshore platforms operate.

We have not only had the problem of not having the water quality planning as an input to the permit program, but we have had the problem of a lack of national guidelines. We have had the problem of getting the State agencies cranked up to deal with the administrative procedures associated with the Federal program. And we have a significant problem in the many different types of appeal mechanisms that are set out in that permit program.

In the municipal area, as I am sure you have all heard over and over again, we are facing what we refer to as a "funding gap." The "funding gap" meaning that we don't have enough Federal money allocated to provide for the secondary treatment required by July 1, 1977, or the "best practical" waste technology by 1983. We haven't yet even defined this area of best practicable waste treatment technology, and that is causing a lot of problems too.

In this particular Region, EPA has delegated the operation of the permit program to the States of Oregon and Washington. Those are two of the five states that have been delegated the program nationally. The national EPA objective is to delegate that program to as many States as possible as quickly as possible, but it hasn't happened. In some cases the States are standing back and letting EPA issue permits, particularly to the difficult industries, so they won't have to hassle with the industries. Then, I think, later we will see those States develop an interest in running the program. In other cases, for example in the State of Idaho, they just don't have the legal authority that we think is necessay to assume that delegation. They don't have the enforcement provisions that we set out in our regulations as necessary to receive the delegation. Some other states, like the State of Alaska, just don't see where they are ever going to have the resources to operate a program like that and they would rather take limited resources and do what they think is important, which may not necessarily equate to running the Federal permit program. So, EPA is in business of issuing all permits in this Region in the States of Alaska and Idaho, and EPA is in the business of issuing permits to all of the Federal facilities nationwide.

We now have proposed regulations, published for all the 31 industrial categories. Generally there is a comment period ranging from a few months up to 6 months before EPA considers those comments in developing final effluent limitation guidelines.

Q. I wonder if you might briefly go through the procedure of issuing a permit? Who is involved, what kind of negotations, and so forth?

A. You must understand that it may differ, depending upon whether EPA or the State agencies, as in Oregon and Washington, issue the permits. Generally, what we do is obtain a permit application from each of the entities that are required to have a permit. Those completed application forms have quite a bit of data supplied by the waste dischargers. By looking at an application from an entity from a given industrial category, you can usually tell whether it is accurate or grossly inaccurate. In which case we may have to go through several iterations to upgrade that data before we even are in a position to begin drafting a permit. Either our staff or the staff of the State agency then will draw up the permit. Generally we will draft it either with staff from the entity to be permitted or we will draft it and send it to that facility for their review before it ever goes out for public notice. We'll look at those comments. We may, or may not, revise the draft permit based on those comments, and then we will issue a public notice which recieves wide distribution and is published in the press and that sort of thing. Depending upon whether or not you're dealing with a controversial permit, which generally the first ones in a given industrial category are, or whether it's a controversial one from the standpoint of a local situation, we may or may not hold a public hearing on that permit or group of permits. But generally we have been trying to hold public hearings on the first group of permits in a given industrial category. For example, we are dealing right now with a group of about 50 permits for the feedlot industry in the State of Idaho. And we are programming right now a public hearing on some eighteen or nineteen permits in the Boise and Caldwell areas prior to the issuance of those permits. There are several reasons for holding public hearing, but I guess the major reason is to educate the industry involved and the public as to what a permit is, what it says for that industry. One way or another, either through public notice or through public notice and public hearings, there is ample opportunity for those who really care about individual permits to comment on that permit. After a public hearing or after a 30-day period following public notice, the permit is issued. There is also a mechanism whereby the waste discharger can request an adjudicatory hearing. As I said before, we've gotten into that in the oil platform area and the sugar processing area, among others. And that sets up a very lengthy, costly, type of situation that we can not afford to handle, quite frankly. We don't have the legal staff, nor do the State agencies have the legal staff to go into that adjudicatory process. Thus, we're finding that it does pay off to work with the industry prior to the time you try to issue the permit, so that you have a permit that can be lived up to within a reasonable period of time and still be within the constraints that the law sets up.

Q. So that would vary by the particular establishment, the industry?

A. Well, I'd say that the administrative process is basically the same.

Q. But the permit requirements might be different?

A. Oh, yes.

Q. Depending on the internal operations of a particular industry?

A. I'd say depending upon the local situation. Some operators, for example, are already in compliance with the requirements of the effluent limitation guidelines. They really don't have much to do to meet the requirements of the permits. Others have essentially no waste treatment, and they have to start almost from scratch. That means a lengthy design process, it means acquiring the capital to finance the project and this sort of thing. So, yes, we are attempting to tailor individual permits and individual situations in such a way so that the waste discharger can come into compliance. There is a negotation process, if you want to call it that, prior to the issuance of permits.

Q. But you do have the flexibility to do this?

A. We have the flexibility up to the point of needing BPT by July 1, 1977, and it's still early enough to where you have some time to negotiate. We're really not negotiating the treatment requirements as much as we're negotiating the time for compliance. For somebody who's able to comply next year, that's what the permit's going to say. But if the necessary improvements will require the discharger to take up to July 1, 1977 to come into compliance, we have that kind of flexibility. So we're negotiating primarily in time aspects.

Q. But for a given section of river, an industry, by 1977, has to meet certain effluent requirements? Depending on the actual industry that's there, you might give him more time to get to it? And there's no flexibility on what that standard might be at the end of 1977?

A. No, there isn't. The discharger must meet the effluent limitations specified as the BPT for that industry. Where you run into problems are the other requirements where you have to meet more stringent limitations to achieve water quality standards. And that's where a lot of the water quality planning is in a real hangup. The State agency, through it's planning process, will go into a process of analyzing individual streams, or stream segments, and conducting a waste load allocation analysis. This is where you are going to have to go to effluent limitations above BPT; the question is what effluent limitation does that equate to for that given facility. It would be nice and simple if the only thing we had going for us in the way of sources of pollution were the point sources. But as we know, the non-point influences on water quality have to be considered ahead of that too. And controlability and institutional problems in achieving control over these non-point sources sometimes are sticky. So right now most of our permits are being written for BPT, except in those areas where we have quite a bit of water quality data and are in a position to do waste load allocations.

Q. What about those discharges that are intermittent? Is there some flexibility in defining the frequency of those intermittent discharges?

A. There's quite a bit of flexibility written into the guidelines for that type of situation; I'm not really sure what you have in mind specifically

Q. Anything that will result from interruptable sources?

A. I probably am most familiar with the feedlot guidelines in this regard. Those guidelines encompass a zero discharge concept, except during a storm run-off situation. The guidelines require that the feedlots shall have no discharge, except during a one-in-ten-year, 24-hour storm event for BPT. The BAT definition is in terms of the 25-year storm event. So that in a sense exemplifies the intermittent discharge concept. We think that anybody that goes to the trouble of building facilities that are required to intercept and hold a storm event of a 1 in 10-year nature, probably can just as easily go to almost a fail-safe kind of system in most cases. This is why you have to look at these things individually. It depends on whether the owner-operator has the land available to build these facilities; it depends on a lot of different things.

Q. Don't the same concepts apply in the case of municipal storm overflow?

A. The same concepts apply, but a much different kind of problem exists in terms of what you do with the storm overflow, and how you treat it, or whether you treat it.

One of the programs that I mentioned earlier that is becoming so major that it almost scares me is the municipal waste treatment construction grant program. Right now Region X, which encompasses the four states in the Northwest, has been allocated almost a quarter of a billion dollars in the last three fiscal years for construction of municipal waste treatment facilities. I have trouble visualizing numbers like that personally. Some nine billion dollars has been allocated nationally, while Congress authorized $18 billion. Many law suits have been brought with regard to the withholding of the remaining $9 billion. We've lost almost every one of those cases, but are now in the process of appeal. Someday we may get the other $9 billion thrown in our laps, too. In addition to the significant increases in the funding allowances, there are a number of statutory requirements in this Act that we haven't begun to figure out yet in terms of the real world. That's why I say this program almost scares me because we're under a great deal of pressure -- obviously from the municipalities and the State agencies -- to free the construction grants funds and get them out where they can start causing construction of needed waste treatment facilities. But at the same time, we're still struggling with the statutory requirements, of which there are many. There is a facilities planning concept, which isn't really a new concept, but it's becoming more specific under our regulations under Section 201. There is a requirement for infiltration inflow analysis; there are new provisions in the law concerning users charges and industrial cost recovery; there are new provisions for industrial pretreatment. So we're not only struggling with a much expanded program, but with many more projects than we're used to. We're also struggling with quite a bit more in the way of technical requirements before those grants are made. And this has been a real headache for the State agencies, as well as the EPA.

Just a couple weeks ago we published the new Title II regulations -- Title II meaning the construction grant program. Those regulations were massively simplified from the way they read before.

One of the big problems that we're still hassling today and yesterday, and I know we will be next week, is the problem of how you deal with the basic provision

of the law which requires secondary treatment by July 1, 1977 and which has been costed out through the 1973 National "Needs" Survey to some 60 billion dollars nationally. The fact is that we're dealing with a 9 billion dollar allocation, and worse yet we have to tie those grant funds into the municipal permit program. This is a difficult problem. As I said very early today, there's no way all municipalities are going to have secondary treatment in operation by July 1, 1977, unless something changes very drastically.

I think in the last several weeks we've seen a softening on the part of our top management in EPA on this issue. It doesn't represent much of a change in our regional thinking because we've always felt we had this funding problem and we'd have to deal with it when it came right down to it. Is everybody familiar with the Seattle metropolitan situation? This is a situation where there is an existing primary plant located at West Point with Puget Sound moving by rapidly with very high dissolved oxygen levels. And there's a very serious question in many peoples' minds as to the advisability of building a secondary treatment plant at West Point, as opposed to going to the chemical-physical type of arrangement, designed to satisfy the BTWTT requirement. The law says they shall achieve a secondary treatment by July 1, 1977. It would cost Seattle Metro some 50-60 million dollars to put the secondary treatment in, above and beyond the chemical-physical treatment. There's a strong feeling on the part of almost everybody, I guess myself included, that it's like throwing $60 million away. And worse yet, we could use that $60 million in the State of Washington to finance other needed treatment facilities, so there is a bit of irony there. We've just been finessing that problem by not writing the waste discharge permit for Seattle Metro and by holding up additional grants to Seattle Metro, which could be conditioned upon meeting the secondary treatment requirement. But it finally came down to the wire where we had six or eight projects for Seattle Metro that had to be funded. They were for very important projects -- not for the treatment plant, but for interceptors that would avoid significant overflow problems and that sort of thing. The interceptor projects were high on the priority list and we had to make a decision. Our decision was to finess secondary treatment of Seattle Metro's West Point discharge by July 1, 1977. We have many reasons, primarily relating to that funding gap.

On February 11th John Quarles, our Deputy Administrator, visited Seattle and held a press conference. Let me quote something from the Seattle Times statement: "Quarles, in carefully worded sentences, said, 'I think that without wanting to make a flat statement we are looking with favor on the types of plans Metro is proposing for physical-chemical treatment and doing it ahead of biological treatment, and perhaps instead of that.'" Quarles also said that the government "needs to approach these issues with flexibility, common sense, and to show the tax-payers they are getting their money's worth." Last week, Russ Train, the Administrator of our Agency was in Seattle. He also addressed this issue and said, "Spending $50 million on secondary treatment doesn't seem to be a sensible use of funds. Their proposal could lead to BPT, or best practical treatment, and is a good kind of response."

So basically we now have the top management of our Agency in support of what we think is right. However, I think we may very well have opened Pandora's box, because we no more than put this on the front page of the paper, and industry started coming in and saying, "Hey, what's this we hear about not meeting the requirements of the law?" I don't know what's going to happen in this area; we

think we have the defense for our position, but we realize the implications or potential implications of doing something like this.

Q. A resolution that went to the WPCA at the conclusion to the 1973 convention dealt with that very topic, and it was really drafted by Tom Gibbs, so naturally it would address itself to that. I got back all the replies from the Northwest Congressional Delegation and realized that even though everyone of those guys had originally voted for this legislation, everyone of them also supported this concept. So we've got a lot of support in that area. The very people who dumped this thing in your lap to start with was the Congress.

A. Tom Gibbs has spent quite a bit of his time for the last two years lobbying with the Congress on this issue. Tom is the Executive Director of the Seattle Metro for those of you who don't know it. He has not only lobbied for Seattle Metro, but he has gotten together with a number of west coast municipalities which face the same situation at Anchorage, San Francisco, Los Angeles, and Honolulu. There are a number of situations that are very similar to their's.

There seems to be Congressional support for modifying this provision of the Act. We're not in violation of the law until July 1, 1977, but Seattle Metro has some question about whether or not we are in violation of the law by issuing construction grants without that commitment. I think we'll work that out in time. But, as I said earlier, I'm not here to defend the Act; I think that particular provision is wrong in some cases. It's wrong from the standpoint of forcing somebody into this situation where they are absolutely dependent upon federal funding; it's a 75% Federal funding program. It's wrong to force them into that situation without having the funds available. And it's wrong from the standpoint of forcing these requirements in basically an impossible time frame. So, yes, I think probably we are going to see amendments to this law in that particular area.

I'm a little concerned, frankly, about Congress opening up the Federal Water Pollution Control Act on a wholesale amendment basis, however, because there are some good things in that law. It's by far the strongest federal law we've ever had in this area, and some of the good provisions may very well go down along with a few of these other things that probably should. We're a little concerned about that.

Q. When do you think the definition of municipal best practicable treatment will come out?

A. I wish I knew. I know what we're talking about in terms of our draft regulations, but that isn't necessarily what they're going to look finally like. One thing that some of us in Regional offices do, particularly those of us who have been in Headquarters, is spend a lot of time attempting to influence our Headquarters' people on matters of this nature. And rightly so, because the Regional people are out dealing with, and the State people are out dealing with, the real live problems outside of that ivory tower. So we do have a very specific role in trying to influence those definitions. I've recently been directly involved in an effort to influence modification of the definitions for not only BPWTT, but for secondary treatment for municipalities. We're in a situation now with the official secondary treatment definition in which most of the lagoons in this region cannot comply. And I don't know whether I want to see people forced to abandon or upgrade their lagoons, at least right now. We have a lot of primary

treatment plants that ought to be upgraded first. So we have a problem of definition and we have been spending a lot of time attempting to get a better definition, rather than a wholesale revision of the Act.

Q. My question is, and I did ask this of some of my industrial clients, i.e. if the guys know what's coming? They can better coordinate and we can save money if they deny something for 1977, and then you have another revision in the guidelines. If they don't, the taxpayers are paying a hell of a lot more money, and they shouldn't. The guidelines and other things are changing too much.

A. All I can say is that I really feel for the consultants; I feel for the municipalities; I feel for the State agencies; and I feel pretty sorry for myself sometimes, in the situation we're facing. Right now it's a pretty difficult period that we're going through. It is finally beginning to shake down a little bit, but we still have further to go. We have to get these guidelines published and promulgated, and we have to develop our programs in such a way that we can live with them. We're getting there, but not quite as rapidly as Congress originally envisioned when they set out the requirements of the Act.

Q. Let me get your opinion on this since you're in the Region. I know that those guidelines are not defined and they're not legal. Now, with secondary treatments technology, we're talking about 85% BOD removal. Now on BAT, do you think they will keep that plus phosphorous?

A. Right now I guess I'm so close to it that all I can say is I don't know what we're going to do with that definition. I hope we don't arbitrarily say that we think phosphorus removal is right for everybody, for the same reason I don't think secondary treatment is necessarily right for everybody. What we have been trying to do is obtain the flexibility to define the BPWTT requirements at the Regional level -- to define, within some kind of bounds, what BPWTT is in a given local situation. We need such regulations, so we can go to places like Spokane and say that BPWTT is secondary treatment plus nutrient removal. We'll then write them a waste discharge permit that says they shall have that by a certain date, and if they don't comply, then they're in a situation which may lead to enforcement action. (I don't mean to imply that EPA will take these actions, because the State of Washington will issue that permit. And, hopefully, they will enforce it. If they don't enforce it, there is a provision whereby the EPA shall enforce any of the permit stipulations.)

Q. I think the problem you mentioned before about what Seattle Metro can get away with at West Point situation will be brought up. This is the problem we will immediately run into in the city of Spokane, because they will come back and they will say, "Alright, the city of Seattle is much larger and has much more population, but they're allowed to go to primary treatment alone. And here we are over here in Spokane and you're making us go to secondary treatment with maybe some advanced waste treatment procedures for phosphorous and so on." I can immediately see them coming back with that kind of an argument.

A. Well, that isn't exactly what we're doing with Seattle Metro. We're saying they may install chemical-biological treatment and go beyond what you'd get with secondary treatment as far as toxicants and this sort of thing. We're just saying that the biological process itself may not be necessary. Spokane, on

the other hand, doesn't appear to be too enthusiastic for going above their current situation. Seattle is quite committed to BPWTT by 1983, and they have that well planned out. They have a resolution from the city council saying they shall do that. They have that commitment in their hip pocket with some confidence that they will be able to come up with those grants right now for the interceptor projects.

Q. Well, like Lake Washington's situation, you have other small lakes, which are a real recreational asset and it's something physical the people can see. But on the third lower part of Spokane, you have maybe 50 very nice homes down there and that's about it, and so these big algae blooms and anarobic conditions, as far as the city of Spokane is concerned, don't really bother anybody, and so it's a little bit different. But they probably should see the end result that they are polluting not in just Long Lake, but in Nine-mile and the rest of the lakes on down the stream, right into Lake Roosevelt on into the Columbia River.

A. There was a meeting held this morning with the City of Spokane, the Washington Department of Ecology and EPA Region X, and I think that issue has been laid to rest by now. I believe I can say with confidence that Spokane will be required to go to secondary treatment with nutrient removal.

There are many other provisions in the Federal Act which we're also dealing with, but not in any big way from a resource standpoint or necessarily in a priority way. There is significant new language in the Federal Act relating to oil spill prevention. We held a seminar in Seattle Thursday to discuss the new oil spill prevention regulations. By the way, we intend to have another one of those seminars in Boise if anybody here is interested -- I believe on the 12th of March, and probably one in Portland and one in Anchorage as well. This is an interesting program. There's a very difficult aspect, however, in terms of jurisdiction between EPA and the Coast Guard. EPA is charged with control of non-transportation related facilities. The Coast Guard, under the Department of Transportation have issued their own regulations for the other aspects of transportation related oil and hazardous materials control. The Coast Guard is responsible for enforcing the Section 311 provisions when there is an oil spill.

However, I'd like to talk about the preventative side of the oil program. Our regulations now require all non-transportation related, on-shore and off-shore facilities to have what we call a "spill prevention control and countermeasure plan," SPCC plans. The regulations apply generally to bulk storage and handling facilities which have a total storage capacity exceeding 1,320 gallons of oil above ground or 42,000 gallons below ground. They must have one of these plans developed prior to July 11 of this year, and then they have until January 11, 1975 to implement those plans. EPA can go out after July 11 of this year and ask to see those plans; if they are not completed, the entity is technically in violation of the regulation. After January of the next year, if the entity has an oil spill -- oil being defined about as broadly as you can possibly get it, including anything containing oil -- they must send that plan in to the State for review and to EPA for certification. We have authority to force modifications of the plans, if necessary and to force implementation of the plans. There are civil penalty provisions in the Act, which, in this particular case, go as high as $5,000 a day. We're quite excited about what can be done with the regulation and of course industry is quite interested. The participants at our seminar last Thursday showed a tremendous amount of interest, and, surprisingly enough, it was

a very constructive kind of session. I think people are finally coming around, especially now in the day of the energy crisis and particularly in the Northwest in the day of potential significant new development in the petroleum industry. The industry is coming around to say, "O.K., we'll attempt as best we can to avoid spilling that oil," because of the possible negative public reaction. I was pleased to see the reaction of the industry representatives.

There are a number of other programs that deal with the concept of water resource planning and its relationship with water quality management planning. It isn't on one activity. Section 209 requires planning of this nature, and Section 102(b) requires the Administrator of EPA to determine the need for, value of, and environmental impact of storage for water quality control associated with new Federal projects. Our approach to dealing with this problem right now is to try to direct the State's 303(e) planning processes toward dealing with the water resource development type planning. We've had some recent success in that regard, and I think we're going in the right direction on that issue.

We of course are dealing with the National Environmental Policy Act and the whole concept of environmental impact statements. I don't think the new law has significantly changed our responsibilities there, other than the fact that by law we're not required to write environmental impact statements when we issue NPDES permits. I'm not so sure I like that provision, but I certainly understand why it was put into the law. If we were required to write EISs on each permit, we'd never get those permits issued. We are required to pay attention to the environmental impact statement situation for every construction grant that we award. That hasn't been a significant problem so far, because we require an environmental assessment as a part of the grant application procedure. At least in this Region, we've generally been able to avoid environmentally unsound projects by rescoping the project as a result of the environmental assessment rather than getting into a hassle on the other end and then writing the environmental impact statement -- although we have written several EISs in this Region recently.

In the enforcement area right now, we're sort of in the limbo mode as far as the water program goes. Until entities receive waste discharge permits and fail to comply with them, we're not really in a position to do much in the way of enforcement. But we still are active in the oil spill enforcement area under provisions of Section 311.

We made a decision last week, however, to take Federal enforcement action against five seafood processors in Kodiak, Alaska, who are now not in compliance with their waste discharge permits. So, I think you are going to see between the State agencies and EPA a significant kind of enforcement activity, designed not only to achieve compliance with waste discharge permits but to give us a better sense of credibility, if you will, with those who have not yet received permits. How we're going to do that I'm not sure. The whole concept of monitoring compliance on these permits appears to me to be a very difficult problem. Essentially all permits require that a great deal of self-monitoring data be submitted to EPA and the State. Somebody is going to have to look at that self-monitoring and draw conclusions from it. Right now we're equally involved in planning our Fiscal Year 1975 programs, and we have this as one big outstanding issue. It's going to be a very costly effort to identify those entities that are not in compliance and to make the decisions on which ones we're going to go

after in court if necessary. As an agency we really aren't used to operating that way, but the new requirements of the Act will require us to do that. Whenever I say an an agency, I generally mean we and the State agencies, because the State agencies do have the primary rights and responsibilities to control pollution under the Federal Act. And at least in this Region, we very much believe that and we look to the State agencies to be the first contact with people that are not complying with waste discharge permits.

Q. Dan, I have a question. This lays a pretty important question here, since we are talking about more money available, and converting more manpower to the water quality field. Is anybody doing anything about where we are going to get this manpower? You know . . . we at the university keep asking ourselves the question "Where are they going to get this manpower to do all these things?"

A. That's a good question. I share your concern. But I think, quite frankly, the manpower in the field is massively under-utilized right now, and I think one of the things we're going to have to do is figure out a way to utilize the available manpower much more effectively. Certainly we and the State agencies have begun to draw this conclusion about our own programs, just because we aren't going to get additional people and we know we've got a work load that is two to three times what it was a couple of years ago. We will implement these programs. We're getting work out of people that we never would have believed a couple of years ago, because of the pressure we're under. I hope we see the same thing happening in consulting engineering profession. Again, I think there's a lot of room for improvement in the consulting profession. I think a lot of design has been done that was done 100 times before. I think there are many many mechanisms for improvement in the entire system, and I'm quite hopeful that we rise to the occasion. I think I see quite a bit of that going on so far. But I know that doesn't answer your question. We're not going to see significant new manpower brought into this program from the Federal standpoint, either in terms of training or State program grant funds or in terms of Federal staffing.

Q. If it were decided that nine billion dollars more has to be put in, it seems to me, by golly, we're going to need a lot of manpower, that's going to take a lot money.

A. That's always my answer when people talk about the Administration and its impoundment of the funds. I don't necessarily agree that the whole concept of impoundment is a good idea, but in this case my answer is, "we're fortunate that only half of the funds have been allotted," because I don't know what we'd do with the higher level of funding. I think you're right; I don't think the consulting profession can handle that kind of an increased market right now, and fortunately, we're phasing into this thing rather than taking it all at once. I think the system would just break down. I'm sure we'd be able to obligate that money, but I'm just not sure we'd get the same effectiveness out of those funds that we will now in the situation where we are only dealing with half of the authorized funding. So it isn't all bad. And secondly, we are in the process of getting some of the difficult decisions in back of us as a result of the permit program and the water quality planning program. As a result, we are going to end up making better decisions concerning that other nine billion dollars that was impounded because its not available today; we're going to know more about the state of the world or the Region or the State or the locality two years or three years

from now than we do today. I'm not all negative, by a long shot, on the unavailability on the Federal funds, because we're still talking about ten fold increases from what we're used to. Believe me, that's pretty hard to swallow very quickly from our standpoint, and most particularly from the State agencies standpoint, because they have significant new responsibilities in the construction grant program. And certainly the consulting profession is beginning to feel the impact of the many new requirements of the Act.

Q. Now I believe the other way too. Supposing you could spend more money if you had more manpower available. Then why not have more manpower? What's wrong with that, if you need it to do an effective job? Otherwise you'll have some problems because some consultants will be taking jobs they don't know anything about, and have lousy results. Why not devote some effort to producing competent manpower? All these universities are here, the only thing is that they don't have enough students because the support has been withdrawn because it's been there for so long.

A. The decision to do away with the direct training type grants was made on a national basis, and we were'n looking at this specific piece of legislation when that decision was made. It was a much bigger kind of decision. You may be right in this particular instance that we do need additional manpower, and it's unfortunate that grants to the universities for training additional sanitary engineers are in the process of being phased out. But that isn't how that decision was made, I'm pretty sure. On a related matter, we received word from OMB several weeks ago that we're going to phase out our State program grant support. The irony of that decision is that right now we're in the process of cranking up the State agencies to deal with the many new requirements of the Act. We've increased our national grants to the State water pollution control agencies by four fold in the last couple years. And all of a sudden we get word from OMB that we're going to turn that off, in one year. Again that decision wasn't being made on the basis of our problems in the water pollution control field; it's being made for much larger reasons. We as an Agency have already told OMB that we would like the opportunity to discuss the implications of that decision a little further with them.

Q. Could you summarize for us where you stand on the irrigation return flow program?

A. Yes, that's one program I've been personally very interested in. I'll try to summarize for you. Region X is way out ahead of the rest of the Regions and is certainly way out ahead of Headquarters on this program, because about a year ago we saw this coming and we specifically put aside a couple of people that had some experience in this field to develop a program to deal with the irrigation return flow situation as it relates to the permit program. We've had several people involved in putting together what we think a draft permit might look like. We also put together a policy paper and a paper on the rationale for the stipulations in the draft permit. About the first of December, plus or minus a few days, we completed that effort and sent the draft permit and the policy and rationale papers out to some 50 individuals and organizations, including irrigation district managers, university people, and agriculture people -- anybody that we felt might be interested or affected and could provide constructive comment. We got a tremendous response, and it wasn't all negative. I was truly impressed with the time and effort that people took to analyze the draft permit and the rationale paper and to provide constructive comment.

I'd say that the biggest objection to the draft permit revolved around the requirements for monitoring, self-monitoring on the part of the irrigation districts. People didn't seem to be quite as concerned about what we were really going toward with that permit. We didn't attempt to hide where we want to go ultimately with the second phase permit -- we want to build toward control of the application of water and waste of water through the mechanism of the irrigation return flow permits. That didn't seem to be terribly objectionable to the reviewers, although legally it is a significant problem in terms of the Western water law situation. So we were quite pleased at the response.

There was, until very recently, quite a concern about whether or not an irrigation district had the legal authority to impose controls on individual farm units within the district. That's still an outstanding issue, although I read all the comments that came in and nobody has convinced me yet that we should not be issuing permits to the districts, as opposed to the individual farm units. I'd say we took a calculated risk by directing our program on the assumption that the districts had the authority to accept these permits. However, we will end up permitting only about one-tenth of the entities if we issue permits to the districts, rather than to individual farm units, and still accomplish the same or better control. We also think there are significant economies of scale in some cases for the districts to provide the necessary control facilities rather than the individual farmers.

Since we've delegated operation of the NPDES permit programs to Washington and Oregon, we essentially have pulled out of those two States as far as this program is concerned for the time being, and we'll concentrate on our efforts in the State of Idaho where we still have authority. We are working with a group of Idaho irrigation districts which have already shown to us that they can deal effectively with the problems of individual farm units. They have already installed common sedimentation ponds and pump back facilities in some cases and have realized significant water quality improvements. This type of control technology already exists, and they're doing the types of things that we think should be applied in many other situations. So we're working with them on a cooperative basis, and our basic approach quite frankly, is to get permits drafted for those entities that are willing to work with us and to go to public notice and public hearings and to issue permits to those entities. We will then come back to the other entities and say, "Look here, this is what members of your industry are willing to go along with. They have shown they can deal with their problems. Now what's your problem?" Right now I'm very optimistic that we are going to get this in back of us in a way that we don't end up with a huge adjudicatory hearing problem. We can't afford that. Generally the irrigation people want to do what's right. But they don't want to be put out of business in the process, and we don't want to put them out of business.

Q. You still hope to get all the permits issued for all the districts by December 31, 1974?

A. That's our current goal; and it can be done, if we follow through with the program we have laid out right now and don't have any significant hitches. If we get into the adjudicatory hearing process, then there's no way we can make it.

Q. Where do we come in relation to the rest of the Region and nation on this subject?

A. The State of Washington and the State of Oregon and the rest of the nation right now are standing back and watching what we are doing. They are not planning to move forward in a significant way until they see what we are able to pull off. We're very much in the process of defining what will be done in the irrigated agriculture field. Now, I don't mean the salinity type of problems they have in Colorado, for example. That is being handled in Region VIII in Denver. But for our type of irrigation problems, we're very much in the driver's seat for the moment.

Q. Where do you go next on this permit system on which you sent out the draft and wanted the comments back? Are you going to put that into a final form and promulgate that one?

A. We won't promulgate per se. There will not be a nationally adopted effluent limitation guideline in the irrigation return flow area, at least not in the foreseeable future. This is the same situation we've been dealing with all along in the permit program. We went out and wrote seafood processor permits and oil platform permits and pulp and paper permits with no guidelines, and we issued them. We're doing the same thing here, only there's no intent to develop national effluent guidelines for irrigation return flows right now -- it's not even targeted by the Agency. So our next step is to take comments that we received work with the irrigation districts and others to come up with a final draft, go to public notice, go to public hearing -- at least on the first group of permits -- and issue the permits. We hope to simultaneously be working very closely with several Federal agencies, like the Bureau of Reclamation and the Bureau of Indian Affairs, on some major irrigation projects. We may be doing that in the State of Washington, for example, on the Columbia Basin Project or Wapato.

Today I'm optimistic that we will issue permits that will get us going in the right direction. But I don't see the first round of permits as being really meaningful from the standpoint of improving water quality. We will not be restricting existing procedures by limiting the sediment load from the irrigation districts. We can't do that today, because we don't have the data in most cases to define the total load limit from an irrigation district. So the first permits probably will have a concentration limitation, but not a total load limitation. But at the same time we hope to gather, through the self-monitoring requirements, the concentration and flow data necessary to tell us what the load limitations should be in future permits.

Q. You said Idaho would be done and you could get permits issued in Idaho by December 31. What about the rest of the States in the nation sitting watching? Are you going to try to get those done by December 31?

A. Our Agency's goal is to get all major permits issued by December 31, 1974, either by the State agencies where the program has been delegated or by EPA. Quite frankly, I'm not too optimistic about achieving that goal nationally in the irrigation return flow field; I am much more optimistic in most of the industrial and major municipal permit areas. This is one of the categories of industry that has received lower priority nationally, but it has received relatively high priority in our Region because we think it's a significant kind of problem. We've gone out on the limb to try to get those permits issued as soon as possible.

Q. How will your irrigation return flow permits work on a stream that doesn't discharge into any other stream or body of water?

A. I'm not sure I understand what you're getting at.

Q. Well, there are some streams in the country that do not discharge into any other body of water.

A. Are you talking about the concept of navigability?

Q. No, not really. The whole idea behind the irrigation return flow controls is to protect receiving waters isn't it?

A. Navigable waters.

Q. O.K., these streams don't discharge into any of those kinds of receiving waters. They don't discharge into any kind of receiving water at all.

A. If the irrigation districts do not discharge into navigable waters, they're not covered by the permit program. We have that situation with all of our municipal and industrial categories. We're writing permits only for entities which are discharging or have some probability of discharging to navigable waters. But I can tell you, under the Federal Act, Congress made it pretty clear -- if you go back and read the Congressional intent -- that basically all waters are to be considered as navigable. Go back and read the Conference Committee report under the discussion of Section 502, General Definitions, and you will find that Congress intended that EPA should not be bound by any previous definitions of navigability -- meaning the Corps of Engineers kind of determinations and Court determinations. The Congress said that we were to consider navigability in its broadest Constitutional context. So we're looking at navigable waters as being essentially all waters of the United States in the permit program. But when you get right down to an individual entity, then you have to consider your kind of question.

Q. Well, I'm thinking in terms of streams like the Big Lost River in Idaho.

A. Those are navigable waters under the definition.

Q. The Humboldt River in Nevada, the Severe River in Utah, and so on, there are a number of these kinds of rivers.

A. Big Lost River, I know, goes along and then disappears as the river goes down into ground water. But those surface waters are navigable waters the way we're looking at it because the river is used by people in interstate commerce. If anybody in the State of Oregon, for example, goes over there and goes trout fishing, or swimming, or wading, he's engaged in interstate commerce. Thus, those waters are considered under our definitions right now to be navigable waters.

Q. You've got good lawyers?

A. Those were people in Congress that gave us that kind of guidance, not out attorneys. It's very clear in terms of Congressional intent, I think; and our attorneys think that too. We didn't have to stretch the point.

Q. You're essentially using Idaho in the return irrigation flow as a sort of guinea pig in the absence of a lot of technical evidence you indicate. Are you planning to then help them out, or are you issuing a permit and just waiting for them to provide the data and the experience after you've issued the permit?

A. You said two things that bothered me. We're not issuing permits in the absence of technical data. We know a lot about the irrigation return flow situation, and we know a lot about irrigated agriculture. That may not be entirely obvious, but a lot is known and I don't think there's a need for a new national research program in this area. We know what the technology is, we know what the problem is, and we know what some of the solutions are. In individual situations, however, we are aware that we cannot write effluent limitations in terms of a total load limitation, based on available data. This is what we think we should be doing ultimately because what we want to do is say, "Thou shalt not discharge more than S tons of sediment (or suspended solids) per unit time." That kind of limitation will require the irrigators, in many cases, to cut down on water use and at the same time cut down on sediment loads. Although we don't have the necessary information right now to establish suspended solids load limitations, we intend to require a data collection program which will give us better information on individual flows and on suspended solids concentrations. Then, within the next several years, we should have enough information to determine what those total load limitations should be.

Q. One more question on your "goal" to reduce the use of water. Is that really in the law, or by what authority do you get?

A. No, that authority is not provided by the Act.

Q. Then why does EPA feel that it has the authority to do that?

A. EPA has the role to eliminate discharge of pollution or pollutants to navigable waters. We don't intend to write flow limitation stipulations in the irrigation permits, but rather sediment discharge limits. We think that industry can achieve relatively rigid sediment discharge limitations by controlling the application of water in many cases. I think everybody would agree that in many cases the significant sediment problems are caused by putting two, three, or even ten times as much water on the land than is necessary and then letting it run off. We don't care that much about how much water is used, but we do care about the impact of using too much water. First of all, you create runoff problems that aren't necessary, and secondly you use water unnecessarily where it could be used for more beneficial purposes. I'm sure many of you have seen portions of the Snake River in southern Idaho almost completely depleted in the summertime because the waters are being diverted for irrigation purposes. That has it's own secondary and tremendous impact on the water quality for the same river. So, no, we're not trying to limit directly the quantity of water used for irrigation, but that probably is the real and most effective answer to some of these irrigation return flow problems.

Q. You talk about irrigation return flow and the sediment as being related to the water quality generally.

A. We spent a lot of time looking at nutrient and pesticide data and sediment data, and so far we've concluded that if you limit the sediment, you will,

as a result, limit the nutrient and pesticide input because there seems to be a very direct relation between sediment reductions and nutrient and pesticide reductions. So, if you can drop the sediment out in settling ponds, for example, the feeling is that you will drop out most of the nutrient and pesticide load. Therefore, right now we don't envision writing nutrient or pesticide limitations in these permits. This approach, I might add, was not challenged by those who reviewed our initial draft permit and rationale paper.

A LOOK AT PL 92-500 BY THE STATE OF WASHINGTON

By

Glen H. Fiedler

I appreciate the opportunity to be with you today for a discussion of the Federal Water Pollution Control Act Amendments of 1972 from the state viewpoint. Reviewing the rather prestigious list of speakers who have preceded me in this seminar, I have some questions as to my qualifications to appear before you today. I say this because a great deal of my professional experience has been in that element of the state's water resources program related to water quantity and water rights. As such, most people are interested in knowing how much water is available for use rather than how clean it might be. However, over the past several years I have been involved in administration of the Department of Ecology's water quality program and particularly the implementation of the new Federal Act.

The question that has been asked is, what is the Department of Ecology's viewpoint concerning the Federal Water Pollution Control Act of 1972? I think it fair to say though that with respect to those professional people in our agency, who have a long experience in water quality programs, there was a basic resentment to passage of the 1972 Act. This attitude was founded on the strong feeling that the existing water quality program in our state was progressive and responsive to the public needs and that whenever such a comprehensive federal act comes into being with an attendant large budget, the bureaucratic processes and demands can be impossible. So I feel we approached the Act with some apprehension as to just how restrictive the goals, regulations, and guidelines would be and how much freedom we would have in the program to operate and get the job done in a timely manner. In many respects these fears have proven to be well-founded since the amount of paper work and administrative activities have increased inversely in proportion to the productive output.

Mr. Fiedler is a 1951 graduate of the University of Washington, with a B.S. in Civil Engineering. He has been active in the field of water resources development and management for the past 23 years in the State of Washington, through work in state government and with private engineering consultants. At the time of the formation of the Department of Ecology in 1970, he held the position of Assistant Director, Department of Water Resources. His position now with the State of Washington Department of Ecology is that of Supervisor, Division of Water Resources. In that role he has responsibility for the management of the agency's water resources and water quality program.

I would like to take just a few minutes to give you some understanding as to the type of water quality program we had in operation in our state before 1972, then discuss the program transition with initiation of the 1972 Act, and then generally describe the changes and impacts the Act has brought about in our state program. In the interest of time, I will limit my remarks to the three primary areas of the program--permits, construction grants and planning--recognizing that both the state and federal act also cover other elements.

STATE WASTE DISCHARGE PERMIT PROGRAM

Our state has a relatively long history in what we consider to be a successful permit program. This program was initiated in 1955 and requires that a permit be secured from our agency before any commercial or industrial operation discharges solid or liquid waste material into public waters of the state. By 1972 some 1,100 operations were covered by permits which were subject to renewal every five years. More recently, our laws were amended to include municipal discharges under the permit requirement, but this facet of the program was not implemented due to imminence of passage of the Federal Act.

Fundamentally, our permit program was structured around establishing effluent standards directed to obtaining a degree of treatment for each discharger that was practical for the situation. The severity of the pollution problem and best practical technology for pollution abatement were the primary consideration.

The permit program was significantly changed in 1965 with passage of the Federal Water Pollution Control Act which required the establishment and adoption of water quality standards. Our state opposed the concept of this Federal Act because we felt that effluent rather than water quality standards was a more effective pollution abatement tool. But, the 1965 Act required the adoption of water quality standards, so our state complied.

Q. May I ask a quick question? What was the basis of the philosophy, just the ease of enforcement?

A. Not necessarily, I think the philosophy was that you can do a better job on water quality improvement through getting at the discharge rather than looking at . . . .

Q. Well, I mean that boils down to enforcement, doesn't it?

A. Yes, you are essentially correct, and that leads me to an aspect of our enforcement program which probably should be briefly discussed.

We adopted water quality standards for our interstate and coastal waters in 1967, and for the intrastate waters in 1970. Along with those standards our agency developed what was called Implementation and Enforcement Schedules. These schedules set out the requirements and target dates for improvements for all dischargers. Enforcement was achieved through issuance of permits to the industrial and commercial dischargers, and through directive and orders issued to the municipalities. Offers of construction grants were often used in conjunction with the issuance of directives in an attempt at persuasive enforcement. If this failed, orders were issued. In those instances where violations persisted, civil penalties can be invoked of $100 per day for each day of violation of a permit condition or of a directive or order.

CONSTRUCTION GRANT PROGRAM

Our state has operated a construction grant program for municipal wastewater treatment facilities since 1956. In the first years of the program, all funds were received from the federal government and the state acted in a disbursement role. However, in 1968 state matching grant funds were provided through the passage of Referendum 17 by the voters.

The level of federal funding for this program since 1968 in the State of Washington is shown on Attachment I. The first column in this table reflects the fiscal year in which the allotment was made. The percentage of the national allotment our state received is shown in the second column and for the period 1956 through 1972 this percentage was calculated from a formula based strictly upon the population and percapita income for each state as compared to national totals. This relationship changed in 1972 when the distribution of funds first became identified with the respective "needs" of each state. Based upon a survey conducted in 1971 by each state as to its needs for construction of wastewater treatment facilities, the 1972 share of a state in the total national allotment was calculated as to the percentage of state needs related to the total national needs. Frankly, we didn't do our homework in 1971 and our allotment decreased from 1.65% to 0.89%. This percentage carried for two years. However, we did learn by our mistake and through the needs survey conducted in 1973, our percentage recovered to 1.64%.

The third column reflects the amount of money allocated to our state based upon our percentage of the national total. The fourth column indicates the matching ratio of federal, state and local funds, while the fifth column shows the source of the 15% state grant funds.

Up until 1972 the eligible features of projects proposed for funding with federal and state funds were treatment plants, outfall lines, interceptors and lift stations.

PLANNING PROGRAM

The third program element that I wish to briefly touch upon is the planning side of our program prior to 1972. This program centered around the preparation of sewage drainage basin plans.

State legislation enacted in 1967 provided that our agency was to prepare and adopt comprehensive water pollution control and abatement plans for the various drainage basins within the state. Importance of this planning activity was added by the 1969 legislature when it provided that no grants for municipal wastewater facilities were to be awarded after July 1, 1974 unless the project was found to be consistent with a completed and previously adopted plan In the face of this 1974 deadline, the department embarked upon a substantial planning program which is now nearing completion.

With this background as to our past state water quality program, I would like to now turn to the impacts of Public Law 92-500 upon this program

I think it can be said that the general concept and intent of the Federal Act was fairly consistent with our views -- to a large degree because many state people worked closely with the congressional committees during the bill drafting process. Jim Behlke of our department and Charles Roe of the attorney general's office spent many days in Washington, D.C., attempting to orient this legislation to the state viewpoint. Although the Act may reflect input from many state water quality administrators throughout the nation, in retrospect the total program which was developed might be characterized as a voracious monster which was not only late in arriving at the dinner table, but then found it could not afford the price of the meal. I feel this statement is justified when we recognize that many of the key milestone dates in the Act: i.e., all permits issued by December 31, 1974, basin planning completed by July, 1975, secondary treatment for municipal works by mid-1977, etc., are completely unrealistic when viewed from the allotment funding levels. Critical in this respect is the fact that of the $18 billion authorized by Congress for construction grant purposes for the 1973-75 period, $9 billion was impounded. To the State of Washington, this represents a loss of $102 million of construction funds over the three-year period.

In my opinion, one of the strong points of the Federal Act from the administration and implementation standpoint is Section 106 of Title I. At least it appears to me that the thrust

of this section is to move the program in the right direction from a planning standpoint. One of the first activities required of a state is to develop a continuous planning process. This process requires that the state make an annual assessment of its water quality problems and rank them in a relative order of priority for planning and pollution abatement purposes. This process then identifies the priorities for implementation of the various program elements -- permit issuance, plan preparation, construction grant awards -- during a given year.

Attachment II is an excerpt from the most recent revision to our FY 1974 continuing planning process submittal to EPA. As you will note from the first two pages, we have divided the state into 23 basin planning areas, which areas have been further broken into about 154 basin segments. These segments were defined as areas in which the water quality problems were somewhat consistent as to cause and severity. The segments were then classified as being effluent limiting or water quality limiting. Those segments listed as effluent limiting are those in which the present water quality is above the water quality standards or can be expected to exceed the standards with the application of BPT and/or secondary treatment for all point source discharges. Water quality limiting segments are those in which the present water quality is below the standards and specified criteria are not expected to be achieved with the application of BPT and/or secondary treatment for all point discharges. We further divided the water quality limiting class into sub-units based upon the problems needing correction, such as: point sources, dissolved gas, non-point source, sulfite waste liquor, etc. From these designations other factors such as the severity of the pollution problem in a segment and the population affected, a segment ranking list is prepared. This list is then to guide the direction of our planning effort, permit issuance, monitoring, award of construction grants and all other program elements. Unfortunately, it is not working out this way since although we may have identified our needs, other features of the 1972 Act are requiring action before planning can get underway. A good example of this is the issuance of permits. It is rather futile to schedule the issuance of permits through a sophisticated procedure if all permits must be issued by December 31, 1974 anyway. However, I believe the concept of the continuing planning process as a logical and sequential approach to putting the program emphasis in the state where it is most needed is a good one and will be of greater value in future years.

As an additional point of information concerning the attachment, the basin maps shown on pages 23 through 31 are included only as examples of the manner of classifying segments in certain basins in eastern Washington.

Q. When was this done?

A. This was done just about one year ago It was updated in January of 1974, and will be updated again when we get into our 1975 program, but the concept is that this should be done every year.

From this process, the department will get into preparing what is called our annual state strategy, which is developing a one-year work plan as to exactly what program elements are to be given emphasis, which municipal projects are to be funded with planning and construction money, where permits are to be issued, etc.

The third element which flows from Section 106 of the Act is development of the annual program plan which establishes federal manpower and funding levels for each of our program elements. Our program grant for last year was something like $856,000. This supported some 29 positions in the water pollution control program of our agency.

Q. One of our previous speakers from EPA said they may be stopping this type of grant funds, what would you do then?

A. This was my next comment. The Office of Management and Budget has now advised EPA that FY 1975 may be the last year of program grants for the states. The cry by the states has gone out loud and clear already. The administrator, Russell Train, has taken the side of the states in this, saying that if you put all these requirements on the states with the idea that the money was going to be there and now pull back the funds just as the program is getting under way, it would have a drastic effect. Really what it boils down to is that we have about 73 people in our water quality program in the State of Washington. Of those, 29 are federally supported. To pull out the funds would have a real drastic effect upon the level of program maintained in the state. From a recent news release by the State of Oregon, it appears their situation is equally as bad, if not worse. However, should the federal program grant be discontinued, the decision would then shift to the state legislatures as to whether the states wish to absorb the additional financial burden of a federally dominated program. While these decisions are being made and in a manner which I am sure would not be uniform throughout the nation, a number of the milestone dates of the Federal Act would be missed and the overall goals become ellusive.

I would like to next turn to one element of the federal program now receiving considerable attention. This is the NPDES permit system established under Section 402 of the Federal Water Pollution Control Act. Actually, it's a permit system which gives very little recognition to any similar programs which may have been going on in the states prior to 1972.

Under Section 402, any discharge of pollutants to navigable waters requires a permit. Since navigable waters are defined as being "waters of the United States", this requirement becomes about as broad as you wish to make it. At this time, this definition is provoking considerable argument in our state as we proceed to apply this system to the discharge of irrigation return flows. Many artificial drainage channels which have existed for years take on the characteristics of natural streams and a rather large issue is now resulting as to where and how, if at all, does the Federal Act apply to these situations.

One of the provisions of Section 402 allows for the approval of qualified states to administer the NPDES permit system. We were one of the first states to request delegation of the program. Our request was first submitted in July of last year, and the resulting paper work was almost a full-time activity for a small staff from July through November 14, 1973, when approval was granted. Although a minimum of 90 days from the time application is filed is required to receive delegation approval, our delay resulted from two problem areas. First, we were concerned that the federal requirement to issue all permits by December 31, 1974 was unrealistic and not achievable. We did not wish to become the "fall guy" for a program element that had a difficult, if not impossible, completion schedule. This problem was resolved by our state commitment that it would be a "goal" of our program to issue all permits by the target date and we are seriously striving to meet this goal.

The second major problem pivoted around the provision in the federal regulations that provided for the waiver of EPA right to object to the issuance of permits under certain categories and classes of discharge. We argued at length that based upon our experience in permit activities dating to 1955, we were capable of administering the program with a large degree of freedom. EPA did not necessarily agree and after considerable negotiations we entered into an agreement whereby discharges from publicly owned treatment works having an average daily discharge of 0.5 MGD, or less, and from industrial or commercial sources with an average daily discharge of 0.1 MGD, or less, would be exempt from EPA review and veto. This waiver does not apply if the discharges (1) are to the territorial sea, contiguous zone or the ocean, (2) affect the waters of any other state, or (3) contain toxic substances in excess of standards promulgated by EPA.

Application processing requirements under the federal regulations are extremely complex from the applicant-state-federal relationship. The system initiated by our state is shown on the flow diagrams in Attachment III. The first two pages describe the process where EPA retains a veto power over the activity of the state. The first and third pages represent

the flow or process where the state actions are not subject to the veto of EPA. If you total the individual steps in those actions subject to EPA review, you will find in excess of 30 steps from the submittal of application to issuance of permit. This jungle of red tape has caused considerable outcry from both the states and applicants to the point where recent congressional hearings in Washington, D.C., were devoted to overview of the system.

Q. This raises a question. Let's not look at the example of Washington, but let's take the example of another state that did not have any permit system of their own in the state. Why would they want to get into the permit system? What is the background, except pride and other things? Why would the state want to issue permits?

A. Basically, I feel that a permit program is a necessary part of a total water pollution control program. It is the enforcement tool for scheduling the preliminary engineering, design and construction of treatment projects. Without the permit activity a state program could become one of planning without control of implementation and issuance of construction grants under priorities established by a completely federally dominated system. Granted, a municipal program can be run without a permit system --our state did so for many years. However, at that time there was no municipal permit requirement. Now that a permit system must exist, we feel it is best operated at the state level.

Q. In Washington though, wouldn't it have been duplication, because you have to issue permits anyway for the state?

A. No, there would not have been duplication. If we had not elected to go for the program, the EPA would have issued the only permit for direct discharges to navigable waters. If the state would have then continued in the permit business, it would have been for those discharges not covered by the federal system. The majority of our permits would then have been for discharges to non-overflow lagoons and to systems discharging to municipal treatment plants. In fact, we will continue to operate our state permit program for those categories of discharges not covered by the NPDES program. Now, the other northwest states (Oregon, Alaska, and Idaho) may differ at different levels as to how much of the program they should take. But in our state, we felt that if we were going to do the program at all, we would want permits--all or nothing. And so we went after the permit program just on the premise that we were going to stay in the water quality business and not hand it over to the government.

Q. What about Idaho?

A. It is my understanding that Idaho has elected not to go for the permit system at this time. That strategy might not be too bad. Experience may show that a better strategy would be to request program authority after December 31, 1974, and after the first rounds of permits have been issued. That way, Region X would go through the agonies of getting these first permits issued and Region X is running very hard on the program in Idaho right now. I think we'll see Idaho requesting program authority, in what year I'm not exactly sure.

Q. Idaho made two attempts to get the delegation of authority to issue permits and they flunked out both times. They stopped first with personnel, and the second time it was the money for fines. Our state legislature had limited fines to about $300 a day, and the EPA said that wasn't sufficient. We'd never fined anybody more than $25 anyway, so .....

A. Well, the thing you have to look at is how bad you want the program, and this is not exclusive to Idaho. We had to go to our legislature and completely overhaul our laws to put us in a position to qualify for the program. We had to adopt our continuous planning process very quickly because it was a prerequisite to receiving the delegation. We got hung up with EPA right at the end over criminal penalties. EPA was going to make a big issue of the failure of our state laws to provide for criminal penalties and we basically told them that if they flunked us on our application based on that issue, so be it, but we would make the fact well known. We finally resolved the criminal penalty problem by stipulating that we would go to the next regular session of our state legislature with a request amendment of our state statutes to incorporate criminal penalty provisions consistent with the Federal Act. I guess the point is, there is a lot of homework to be done in obtaining approval to administer the program.

One of the basic problems we face for implementation of the permit program is the failure of EPA to promptly issue regulations which define the effluent standards for some of the principal industry categories. The Act provided that regulations establishing standards of performance and effluent guidelines for some 27 industrial categories would be published by EPA within one year of enactment of the law. We're past one year and still awaiting many of the guidelines. Another major problem was failure of EPA to timely define secondary treatment. They have done so now, but with time the problem has shifted to that of a definition of best practicable treatment. We are into that phase of the Act where "best practicable" treatment is the design standard of the day and we have no idea what that is. And again, we now hear rumors that OMB is saying to EPA you will not define "best practicable" treatment because if

you do the cost of treatment works will be further escalated. The present national estimate to complete all needed facilities for secondary treatment is $60 billion, which is the figure which came from the needs survey conducted last year. That figure must be measured against the $9 billion that was allotted for municipal construction work during the first three years of the program. It is rapidly becoming apparent on a national level that the money is not there to do the job required by the Act. So where do you go from here? The compliance dates are fixed by federal law, requirements of all kinds are fixed by regulations, but many of the necessary implementation tools are not coming through.

One significant problem now facing our agency is implementation of the agricultural permit program. This element of the NPDES program has taken a lower priority than the municipal and industrial elements and, frankly, has not received much attention to date. Under the federal definition, the agricultural program includes irrigation return flow, feedlots and fish hatcheries. How the latter category got included in this element of the program is not clear. Feedlot guidelines have been published, but there has been nothing on irrigation return flow or fish hatcheries.

If you were to contact irrigation district managers, directors or other people involved in the distribution and use of water, I am sure you would find the majority of these people very nervous about what's coming down the road at them through this waste discharge permit program. This concern is prompting questions such as: What type of requirements are to be imposed for cleaning up irrigation return flows or feedlots? What are the available technologies and related costs? Who is responsible for policing the activities of individual farmers? To a large degree these questions have not been adequately answered at either the state or federal level and this uncertainty is probably the root of the present rejection of program by the agricultural community. In the interest of obtaining answers to some of these problems, we are proposing to undertake through a consultant a rather large research project on the Yakima River this summer which will look at the irrigation return flow problems of the river in relation to the total pollution load that presently exists.

Q. I have one question, you said you are going to do a research project at Yakima; I know about some work done by our Water Research Center, is that the one you're talking about?

A. No, but we are aware that both the University of Washington and Washington State University have done related work through the Water Research Center on the Yakima. Bryn Mar has developed a water quality model. However, we propose to extend that work by studying in-depth a pilot area.

For this purpose we have chosen a drainage in the Yakima system, Sulphur Creek, which has every conceivable problem. This water course is essentially a drain which receives wastes from the city of Sunnyside, feedlots, industrial operations, irrigation return flows and many non-point sources. It is essentially a hodgepodge of every conceivable type discharge to a drain.

Q. I think that's a great idea, but my question was, are you going to do this research within your department yourself, or are you going to ask for proposals? In other words, a lot of times a project is proposed, and we don't find out until too late

A. It will be through a consultant. For a variety of reasons we have elected to extend an existing contract with the firm presently completing certain phases of our sewage drainage basin plan for the Yakima Valley. This work will be a logical continuation of the present study and will allow for completion of the research project during the 1974 irrigation season.

Let me next turn for a few minutes to the problems being encountered in the area of construction grants. I remarked earlier about the lack of funding; $18 billion being authorized and only $9 billion coming through. This has been a real problem in attempting to maintain continuity in our construction program. Further aggravating the lack of funds is the number of new engineering design requirements that have been imposed on projects, some of which were very near the construction stage. Through this transitional stage, many projects have gone back to the drawing board and there has actually been a substantial decrease in the amount of municipal pollution control work undertaken over the past several years.

There are several features of the Federal Act related to the construction grants program which are obvious improvements. One such feature is the broadening of the eligibility for funding to collector systems and storm water separation. Unfortunately, until a substantial increase in funds becomes available, these type projects will remain a low priority and it is doubtful that much money will flow to these needs over the next few years. Another feature which has more immediate value is the contract authority concept. This concept provides for funding of projects from preliminary engineering through construction by extensions of a basic contract. Project funding is separated into three stages. Step 1 is the engineering report, Step 2 is the preparation of engineering plans and specifications, and Step 3 is the actual construction. Through funding of these three phases, we are hopeful that needed projects can be promoted and placed in operation at a more rapid rate

Another significant feature of the Act is the user fee requirement that places a burden on the municipality to collect sufficient fees to offset future operation and maintenance costs for the constructed works. Also, industries are required to pay to the city their pro rata share of the treatment plant costs as relate to the wastes the industries discharge.

Q. I have a pretty specific question about these Step 1, 2, 3 grants. At one time EPA was trying to say that you wouldn't be able to proceed past Step 1, maybe some cases not even into it, unless you could show that Step 3 would involve construction of an operable facility. Now at the time that all came about, I read the Act myself and tried to interpret what the Act intended to do, and I told a lot of clients, including one here in Washington that I didn't think would stand up, that it seemed to me that rebuilding a sewer system per se could demonstrate as much overall improvement in some cases as modification or expansion of treatment facilities.

A. Yes, that's right.

Q. I think just once in my life I'm right. I noticed just the other day a flier from EPA in which they said that that was no longer to be a stipulation, and I've got to tell you I feel a whole lot better about it now. I'm thinking primarily about a situation where you go in, you take a look at the situation and you can see your problem is just handling excess storm flows. There is precious little you can do, I think, to improve the system except keep out the excess water. So I stated to those people, my fingers crossed behind my back, that I didn't think that the original provision would hold up.

A. No, it didn't, and your question brings to mind a few other points which might be discussed.

As you are aware, the Act requires secondary treatment for all municipal discharges by mid-1977. Our construction grant funding is being directed to this goal; however, a grant cannot be issued until a NPDES permit is issued. Therefore, in order to move the grants program, emphasis might be placed upon permit issuance and we are thus involved in two high priority programs, each of which carried a large manpower commitment. Add to these tasks the problem of shortage of construction grant funds and you arrive at the conclusion that it is impossible to obtain secondary treatment on all municipal discharges by 1977. This realization is now setting-in at the federal level and the 1977 goal is now informally revised to require secondary treatment through issuance of NPDES permits for those projects which grant funds are projected

to be available over the next three years and issue operation and maintenance permits for the remainder. This approach now requires that we develop priority lists through 1976 without knowing the level of funding to be obtained in future years. In this regard the program now requires a very clear crystal ball.

Another complex problem has been brought into focus by Metro of Seattle. Based upon Metro data, secondary treatment on its discharges to Puget Sound may not result in any water quality improvement. It has been established that in many areas of the Sound, there is no dissolved oxygen problem and biological treatment is not necessary. However, nutrient problems appear to exist and best practicable treatment should be required. Metro has expressed a desire to bypass the secondary requirement and go directly to best practicable treatment, but the Act does not provide this flexibility. Metro is now promoting amendment of the Act to allow such a program and based upon recent statements made by the EPA Administrator when he visited Seattle, EPA may support the proposed amendment. However, in the meantime we are expected to issue NPDES permits where the ground rules have yet to be established.

Q. Could you try to, if you'd like to, address the question of whether funds will be available for shoring up the shaky sewer systems, if it can be demonstrated that that money will be well spent in controlling water pollution in that particular instance?

A. Generally speaking, replacement or repair of existing collector systems are eligible for funding. However, the federal regulations provide that the existing system must be badly in need of improvement and it must be shown that the integrity of the overall system is dependent upon this improvement. But frankly, such projects would still be very low in the list of priorities of types of projects to receive grants. Based upon the present level of federal funding, it is doubtful that any such projects will receive attention in the next few years.

This picture may change within the year should any of the so-called "impoundment suits" against the federal government be successful. The State of Washington has joined with the State of Pennsylvania in suing EPA for release of their share of impounded funds. A similar case previously filed by the State of New York has found its way up through the Court of Appeals and up to now the courts have ruled that the full $18 billion must be allotted. This case will undoubtedly be reviewed by the U.S. Supreme Court and that decision should then become the precedent

for the many other similar pending cases, including our own. If and when additional construction grant money may become available through these lawsuits or other means, it is possible that critical collector sewer problems may be considered.

Q. Is this 15% that Washington put up in 1972 and before all that was allowed? I thought they were supposed to permit up to 50%.

A. The Act provided for the federal grant to be up to 50% if a state put in 25%. We elected to go only 15% to make the money spread further, and based on that decision the federal share was reduced to 30%. It was a trade off as to whether we were going to give less money to a larger number of projects.

Q. Then I just got three fliers from EPA a couple of days ago, and it says the State of Washington will get some $6 million and Idaho will get $1 million. Is this a backlog of impounded funds for 1972?

A. No. I believe these are reimbursement funds for sewage projects built without the full federal grant. Since our state did not have a full matching program between 1966 and 1972, projects were not funded by EPA for the full 50% federal grant. Reimbursement is now taking place for a number of eligible projects.

Q. I'd like to get back to the agricultural return flow problem. We have in the State of Idaho, EPA trying to develop something, and I understand in the State of Washington the state is trying to do a similar thing, is that correct?

A. Yes, what happened is EPA assigned to its various regional offices certain large program elements for development. The agricultural program was assigned to the Denver region and the silviculture program to Region X. However, EPA realized quite early in its research work that the problems of the Colorado River were not necessarily the problems of the northwest states. For this reason Region X embarked upon what is called a prototype program for water quality problems related to animal feedlots and irrigation return flows. Staff of Region X developed a working document which described the nature of the problem in Idaho, Oregon and Washington, the state of the art in correcting such agriculturally related pollution problems, a rationale statement and actual draft permits for a typical feedlot and irrigation district discharging return flows. This working document was distributed widely in the three states for comment. It went to universities, state agencies, soil conservation services, extension agents and to

many irrigation district managers and feedlot operators. Since the draft permits carried requirements for the 1974 calendar year, the irrigation districts particularly became extremely concerned that they were being forced into a program for which they had little, if any, statutory authority. The draft permit for irrigation return flows basically required that the district monitor both the quantity and quality of its intake water and return flow and take corrective action for reducing turbidity and suspended solids to certain acceptable levels. The working paper inferred that the districts could use such measures for reducing sediment loads as closing the headgate to those farmers who had poor irrigation practices. The irrigation people in our state took strong exception to the EPA proposed project on the grounds that they had neither the legal authority or financial capability to enter into the required monitoring program and that they were obligated to deliver water to their users irregardless of any users irrigation practices.

Since the NPDES program has been delegated to the States of Oregon and Washington, EPA has now focused its attention in this program to Idaho. The program now being proposed for Idaho provides that the districts would identify their return flow problems during the first year of the program. In the second year the district is to monitor diversions to and point discharges from the district, both as to quantity and quality. In the third year the district will develop a corrective action plan which would then be submitted to EPA for its approval. I am advised by EPA representatives that this program may be favorably received by the irrigation district people in Idaho.

A number of jurisdictional questions have cropped up in this program. As an example, we have the projects that were constructed by the U. S. Bureau of Reclamation. The USBR contracts with the districts normally provided that the Bureau does not relinquish any rights to seepage, waste and irrigation return flows. In addition, the United States retains ownership of the major structures. Who then is responsible for managing return flows, the USBR, the irrigation district, the individual farmer? Incidentally, that brings up a point I missed In the delegation of the NPDES permit program to the states, authority is not granted over federal facilities. We have joined with California in a suit against EPA challenging its authority to refuse to grant authority to the states to issue permits for federal facilities, but it will be some time before the case is heard. In the interim, we will have a dual program where these discharges identified with federal projects will be operating under permits issued by EPA and the non-federal projects will be under state permit.

Q. But is EPA satisfied that the controversy they stirred up about whether the irrigation district in fact had the legal authority to enforce water quality standards? Do they feel now that it is not a problem?

A. I think they still recognize it but have gone around the problem for the time being, making no identification of who's going to be responsible for the corrective action, and providing three years to try and figure it out.

Q. Well, is the State of Washington using the same approach?

A. We haven't even begun our program. We have issued no draft permits; and, frankly, we haven't even developed our guidelines. The agricultural program has been relegated to a low priority based on the pressures we have to issue the industrial and municipal permits.

Q. A question I have goes back early in your talk where you said you worked with EPA in getting for the state apparent complete control over minor permits, with EPA having some sort of veto power over major permits. Is this a uniform policy throughout the five states that have the permit issuing authority?

A. Actually, it is not uniform. California was the first state to request and receive the permit program. Some precedence was also established by California in that it successfully negotiated a waiver of veto clause for inclusion in the Memorandum of Understanding that is executed between EPA and the state. Other states, such as Michigan, didn't want the waiver and every permit they issue is routed through EPA for its concurrence before it's issued. Oregon did not go for a waiver to the best of my recollection. Our initial approach was to go for a waiver condition that just about ruled out EPA. Of course, that didn't work.

I don't recall whether I indicated the significance of our waiver agreement but it effectively provides that about 60% of the permits written on industries and 80% on municipalities are not subject to review and veto by EPA. So really we're talking, as far as the small projects are concerned, about quite a bit of freedom to run the program based on our own judgment.

Q. I think it has generally been the feeling on their part (if I can infer from our previous speakers) that they thank God they didn't get all the money that the Act said, because they're having enough trouble administering just the portion that they did get. I was wondering how you feel as a state agency, and perhaps you know the conditions in other states, in terms of manpower situation for actually handling this Act. What will be the situation in the states? Are they staffed to handle the situation now? You indicated already that some of the federal money will not be coming to you after FY 75; how will that offset

the manpower situation at that time? What kind of training problems do you foresee?

A. If the money had come through in the amounts that were authorized, it would have been difficult to get it out on the street, not so much because of the manpower or staff capability problems, but more due to the failure of EPA to issue rules, regulations and guidelines that are necessary to implement the new program. Administrative problems throughout the program have been acute over the past year which have resulted in many delays in moving the program, including the issuance of grants.

Q. You don't see any trained manpower problems?

A. We are having difficulty recruiting technical staff, especially sanitary engineers. At this time a number of vacancies exist throughout the agency for engineers at both the entrance level and with a few years experience. Actually, when a candidate appears on the state personnel register, he may find that he has two or three offers of alternate jobs within our department. There is, of course, an initial impact of staffing to undertake a larger water quality program than we had in the past. However, the job market for trained people in this field has expanded in the federal, state and private sectors to the degree that I would expect a shortage of manpower to exist over the next few years. Colleges and universities have a difficult task in attracting, educating and graduating sufficient people to meet the present demands of the job market in the field of environmental engineering.

Q. On the question of non-point sources, what if there is no surface discharge but it does impact the groundwater? We haven't talked about that at all.

A. Two elements of our program relate to this question. First, we will continue to operate the state waste discharge permit program and require such permits for point discharges to non-navigable waters, including land disposal. Many potential groundwater pollution problems can be addressed in this manner. Second, under the Federal Act philosophy, the majority of the non-point source problems, which can also impact groundwater quality, are to be treated through the 303(e) planning process. These plans are under preparation by our department and are scheduled for completion by mid-1975.

Q. Is the state also thinking beyond 1975?

A. Yes, particularly through our 303(e) plan preparation process. Hopefully, planning will soon overtake our operational programs and provide guidance for future activities. Up to this point our program has been one of reacting to the early dates of the Federal Act in the areas of permits

and construction grants. On the horizon are the problems of non-point source pollution related to logging operations, agricultural practices, highway construction activities, lake eutrophication and many other such problems.

CONSTRUCTION GRANT FUNDS

WATER POLLUTION CONSTRUCTION FACILITIES

STATE OF WASHINGTON

Fiscal Year	% of National Allotment	Federal Allotment	Matching Ratio Federal/ State/Local	State Funds
1975	1.64%	$64,730,500	75/15/10	
1974	0.89	26,718,000	"	$225,000,000
1973	0.89	17,812,000	"	
1972	1.65	33,037,650	30/15/55	
1971	1.27	12,719,900	"	
1970	1.57	12,528,700	"	$ 25,000,000
1969	1.63	3,488,500	"	
1968	1.64	3,321,328	"	
1967	1.65	2,471,720	"	
1966	1.69	2,042,910	"	

3/25/74

Attachment I

WATER QUALITY MANAGEMENT SECTION

January 1, 1974

STATEWIDE SEGMENT LIST

The attached list of segments and their numbers represent the latest revisions and corrections to the State's segment list. The list will be used for such purposes as the development of Annual State program for FY 75, the collection of data by the Wastewater Inventory now in progress, and the segment identification for discharge permit applications.

Most changes from the list as submitted in the "State Continuing Planning Process" are intended either to correct errors or to clarify ambiquities which became apparent after using the system to development the discharger inventory.

Changes include the use of 99 in the last two digits to represent discharge locations not identified in the segment list and the separate surface class for Puget Sound waters was dropped. The list will be updated periodically with new data and the completion of individual basin plans.

Explanation of the Numbering System

The State is divided into Twenty-three (23) basin planning areas which consist of consolidation of sixty-two (62) sub-basins used in the State's 18 CFR Drainage Basin plans and the Storet systems by the EPA and DOE for data compilation

Each segment is identified by six digit number starting with the consolidated basin (see attached Map No. 2); the middle two digits indicating one of the sixty-two (62) sub-basins (see attached Water Resource Inventory Area Map No. I), and the last set of digits corresponding to the number of segments in that particular consolidated basin.

Also, see attached Table I for more information on the consolidated basin and sub-basin numbers.

Attachment II

Segment Number*	Segment Name	Class
Skagit Consolidated Basin Planning Area		
02-03-01	Samis Bay	EFF
02-03-02	Padilla Bay	WQ-PS-SWL
02-03-03	Fidalgo Bay	WQ-PS-SWL
02-03-04	Guemes Channel	WQ-PS-SWL
02-03-05	Skagit Bay	EFF
02-03-06	Skagit R. & tribs. from mouth to WRIA #4 boundary	WQ-NPS
02-04-07	Skagit R. tribs. from WRIA #4 boundary to Canadian Border	EFF
02-03-08	Marine Water, Undesignated	--
Snohomish - Island - Stillaguamish Consolidated Planning Area		
03-05-01	Port Susan	WQ-NPS
03-05-02	Stillaguamish R. and tribs. from mouth to confluence of the North and South Forks	WQ-NPS
03-05-03	Stillaguamish- NF mouth of Squire Cr. (A water)	WQ-NPS
03-05-04	Stillaguamish River NF Squire Cr. to headwaters (AA water)	WQ-NPS
03-05-05	Stillaguamish River SF to mouth of Canyon Cr. (A water)	WQ-NPS
03-05-06	Stillaguamish River SF Canyon Cr. to headwaters (AA water)	WQ-NPS
03-06-07	Saratoga Passage and adjacent harbors	WQ-NPS

List of Segments and Classifications

LEGEND:

EFF	Effluenct Limited
WQ-PS	Water Quality Point Source
WQ-PS-SWL	Water Quality Point Source (Sulfite Waste Liquor)
WQ-PS-Gas	Water Quality Point Source - Gas (Total Dissolved Gas)
WQ-NPS	Water Quality Non-Point Source

*Consolidated Basin Planning Area, Water Resource Inventory Area (WRIA), and Segment Number respectively.

A Segment Number 99 will be applied to all undesignated segments within each consolidated Planning Area.

Segment Number*	Segment Name	Class
Nooksack Consolidated Basin Planning Area		
01-01-01	Drayton Harbor	EFF
01-01-02	Bellingham Bay	WQ-NPS
01-01-03	Inner Bellingham Bay (B & C water) including Whatsom Waterway	WQ-PS
01-01-04	Nooksack R. and tribs. from mouth to confluence with Maple Creek (All "A" water)	WQ-NPS
01-01-05	Nooksack R. & tribs. above confluence with Maple Creek ("AA" water)	EFF
01-01-06	Sumas River and tribs. from Canadian Border to headwaters	WQ-NPS
01-01-07	Marine Waters (Non-designated)	WQ-No Data

Segment Number*	Segment Name	Class
04-09-05	Elliot Bay	WQ-PS
04-09-06	Green R. & tribs, from Black R. to Flaming Geyser Park	WQ-NPS
04-09-07	Green River from Flaming Geyser to headwaters	EFF
04-09-08	Marine waters, Undesignated	WQ-NPS
04-09-09	Duwamish Waterway R. to Black R.	WQ-PS
Puyallup Consolidated Planning Area		
05-10-01	Inner Commencement Bay to Puyallup R. Mile 1	EFF
05-10-02	Commencement Bay (Class A)	WQ-NPS
05-10-03	Puyallup R. from RM 1 to Kings Cr.	WQ-NPS
05-10-04	Puyallup R. from Kings Cr. to headwaters & tribs.	EFF
05-10-05	White R. from mouth to Mud Mt. Dam & tribs.	WQ-NPS
05-10-06	White R. from Mud Mt. Dam to headwaters & tribs.	EFF
05-12-07	Chambers Cr. - Clover Cr. & tribs.	WQ-NPS
05-10-08	Marine waters, Undesignated	--
05-12-09	Marine Waters, Undesignated	--

Segment Number*	Segment Name	Class
03-07-08	Possession Sound	WQ-NPS
03-07-09	Port Gardner Bay & Inner Everett Habor (B & C waters)	WQ-PS
03-07-10	Snohomish R. to confluence of Skykomish & Snoqualmie Rivers	WQ-NPS
03-07-11	Skykomish R. to mouth of May Cr. (Class A water)	WQ-NPS
03-07-12	Skykomish R. from May Cr. to headwaters	EFF
03-07-13	Snoqualmie R. & tribs. from mouth to Twin Falls State Park on S. Fork	WQ-NPS
03-07-14	Snoqualmie R., Middle Fork from mouth to River Mile 6.1	EFF
03-07-15	Snoqualmie R., North Fork	EFF
03-07-16	Snoqualmie, Middle F., RM 6.1 to headwaters	EFF
03-07-17	Snoqualmie South Fork from Twin Falls S.P. to headwaters (AA water)	EFF
03-06-18	Marine waters, Undesignated	--
Cedar - Green Consolidated Planning Area		
04-08-01	Ship Canal & Lake Union	WQ-PS
04-08-02	Lake Washington & Feeder Streams	WQ-NPS
04-08-03	Cedar River & tribs.	WQ-NPS
04-08-04	Marine waters Undesignated segments	WQ-NPS

Segment Number*	Segment Name	Class
09-17-02	Sequim Bay	WQ-NPS
09-17-03	Big Quilcene R. & tribs.	EFF
09-17-04	Chimicum Cr.	WQ-NPS
09-18-05	Dungeness R. & tribs.	EFF
09-18-06	Elwha R. & tribs.	WQ-NPS
09-18-07	Port Angeles Harbor	WQ-PS
09-18-08	Port Angeles Harbor tribs.	WQ-NPS
09-19-09	Hoko R. & tribs.	WQ-NPS
09-19-10	Pysht R. & tribs.	WQ-NPS
09-20-11	Hoh R. & tribs.	WQ-NPS
09-20-12	Quillayute R. & tribs.	WQ-NPS
09-20-13	Quillayute R. & tribs.	WQ-NPS
09-19-14	Straits of Juan De Fuca	WQ-NPS
09-18-15	Straits of Juan De Fuca	--
09-17-16	Straits of Juan De Fuca	--
09-20-17	Pacific Ocean, Undesignated	--
Chehalis - Grays Habor Consolidated Planning Area		
10-21-01	Queets R. & tribs.	WQ-NPS
10-21-02	Quinault R. & tribs.	WQ-NPS
10-22-03	Grays Harbor (A water)	WQ-NPS
10-22-04	Inner Grays Harbor east of long, 123°59' w. to Cosmopolis & including the tide waters of the Wishkah & Hoquiam River	WQ-PS

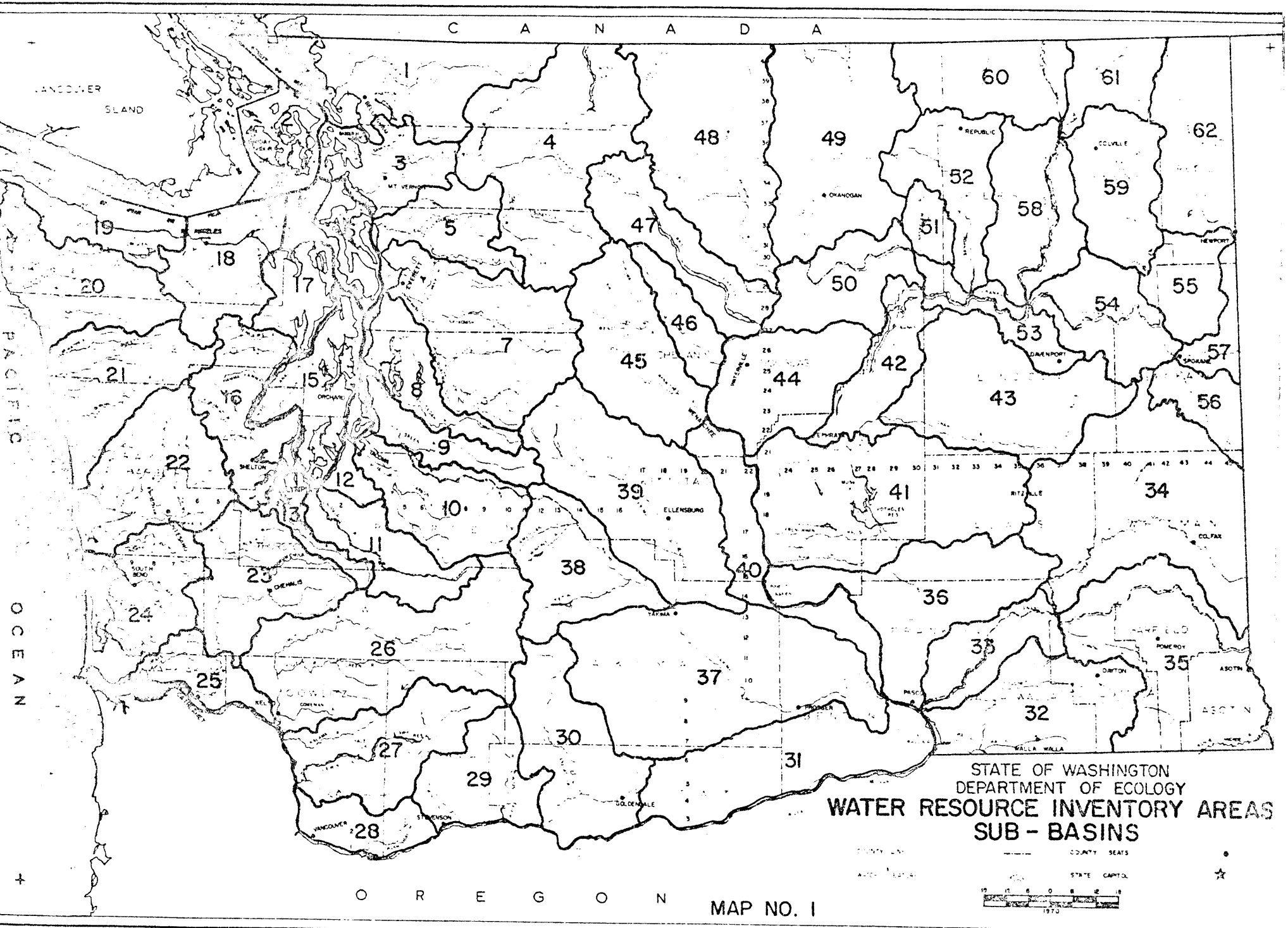
Segment Number*	Segment Name	Class
Nisqually - Deschutes Consolidated Planning Area		
06-11-01	Nisqually R. & tribs.	WQ-NPS
06-11-02	Nisqually R. estuary	EFF
06-13-03	Budd Inlet	WQ-NPS
06-13-04	Deschutes R. & tribs.	WQ-NPS
06-13-05	Marine waters, Undesignated	--
West Sound - Hood Canal Consolidated Planning Area		
07-14-01	Oakland Bay West of latitude 123°05' & tribs. to Oakland Bay	WQ-NPS
07-15-02	Small tribs. on Kitsap Peninsula	WQ-NPS
07-15-03	Kitsap Peninsula Inlets	WQ-NPS
07-16-04	Tribs. to Hood Canal	WQ-NPS
07-16-05	Hood Canal Surface water	--
07-14-06	Marine waters, Undesignated	--
07-15-07	Marine waters, Undesignated	--
07-14-08	Hood Canal Surface water	--
07-15-09	Hood Canal Surface water	--
San Juan Consolidated Planning Area		
08-02-01	Marine waters San Juan Island	--
North Olympic Consolidated Planning Area		
09-17-01	Port Townsent Harbor	WQ-NPS

Segment Number*	Segment Name	Class
Cowlitz- Columbia Estuary Consolidated Planning Area		
12-25-01	Grays Bay	WQ-NPS
12-25-02	Grays River	WQ-NPS
12-25-03	Elocohman	WQ-NPS
12-26-04	Cowlitz R. & tribs.	WQ-NPS
12-26-05	Coweeman R. & tribs.	WQ-NPS
Lewis Basins Consolidated Planning Area		
13-27-01	Lewis R. & tribs.	WQ-NPS
13-27-02	Kalama R. & tribs.	WQ-NPS
13-28-03	Salmon Cr. & tribs.	WQ-NPS
13-28-04	Burnt Bridge Cr. & tribs.	WQ-NPS
13-28-05	Washougal	WQ-NPS
Middle Columbia Consolidated Planning Area		
14-30-01	Klickitat R.	EFF
Walla Walla Consolidated Planning Area		
15-32-02	Walla Walla R. & tribs.	WQ-NPS
15-32-03	Touchet R. & tribs.	WQ-NPS
15-32-04	Mill Cr. & tribs.	WQ-NPS
Palouse Consolidated Planning Area		
16-34-01	Palouse R. & tribs.	WQ-NPS
16-34-02	S.F. Palouse R. & tribs.	WQ-NPS
Lower Snake Consolidated Planning Area		
17-33-01	Snake R. from Lower Granite Dam to Wash-Ore Border	WQ-PS-Gas

Segment Number*	Segment Name	Class
10-22-05	Humptulips R. & tribs.	WQ-NPS
10-22-06	Hoquiam R. & tribs.	WQ-NPS
10-22-07	Wishkah R. & tribs.	WQ-NPS
10-22-08	Wynooche R. & tribs.	EFF
10-22-09	Satsop R. & tribs.	EFF
10-22-10	Wildcat Cr. & tribs.	WQ-NPS
10-22-11	Colquallum Cr. & tribs.	WQ-NPS
10-22-12	Chehalis R. from Cosmopolis to Scammen Cr.	WQ-NPS
10-23-13	Chehalis R. from Scammen Cr. to the Newaukum R.	WQ-NPS
10-23-14	Newaukum R. & tribs.	WQ-NPS
10-23-15	Chehalis R. from Newaukum R. to headwaters & tribs.	WQ-NPS
10-22-16	Pacific Ocean	WQ-No Data
10-21-17	Pacific Ocean	--
Willapa Consolidated Planning Area		
11-24-01	Willapa Bay	WQ-NPS
11-24-02	Willapa R. from mouth to limit at tidal influence	WQ-NPS
11-24-03	Willapa R. from limit at tidal influence to headwaters	WQ-NPS
11-24-04	Willapa Bay tribs.	WQ-NPS
11-24-05	Pacific Ocean	WQ-No Data

Segment Number*	Segment Name	Class
Wenatchee - Chelan Consolidated Planning Area		
21-45-01	Wenatchee R. & tribs.	EFF
21-46-02	Entiat R. & tribs.	WQ-NPS
21-47-03	WRIA 47 Lake Chelan & tribs.	WQ-NPS
Okanogan - Methow Consolidated Planning Area		
22-48-01	Methow R. & tribs.	WQ-NPS
22-49-02	Okanogan R. mouth to Lake Osoyoos	WQ-NPS
22-51-03	WRIA 51	
Northeast Consolidated Planning Area		
23-58-01	WRIA 58	WQ-PS-Gas
23-59-02	Colville R. & tribs.	WQ-NPS
23-52-03	Sanpoil R. & tribs.	WQ-NPS
23-60-04	Kettle R. & tribs.	WQ-NPS
23-62-05	Pend Oreille R. & tribs.	WQ-NPS
23-61-06	WRIA 61	--
Spokane Consolidated Planning Area		
24-54-01	Spokane R. mouth to Idaho-Wash. Border	WQ-PS
24-55-02	Little Spokane & tribs.	WQ-NPS
24-56-03	Hangman Cr.	WQ-NPS
SPECIAL WATER SURFACE STUDY AREA		
26-WRIA-99	Columbia River & Undesignated tribs.	WQ-PS-Gas

Segment Number*	Segment Name	Class
17-35-02	Tucannan R. & tribs.	WQ-NPS
17-35-03	Grand Ronde	WQ-NPS
17-35-04	Snake R. & tribs. from mouth of Lower Granite Dam	WQ-PS-Gas
Yakima Consolidated Planning Area		
18-37-01	Yakima R. & tribs. from mouth to Sunnyside Dam Bridge	WQ-NPS
18-37-02	Yakima R. & tribs. from Sunnyside Dam Bridge to Wilson Cr.	WQ-NPS
18-37-03	Wide Hallow Cr. & tribs.	WQ-NPS
18-39-04	Yakima R. from Wilson Cr. to Thorp	EFF
18-39-05	Yakima R. & tribs. from Thorp to headwaters	WQ-NPS
18-39-06	Wilson Cr. & tribs.	WQ-NPS
18-38-07	Naches R. & tribs.	WQ-NPS
Big Bend Consolidated Planning Area		
19-41-01	Crab Cr. & tribs. in Basin 41	WQ-NPS
19-42-02	Crab Cr. & tribs. in Basin 42	WQ-NPS
19-43-03	Crab Cr. & tribs. in Basin 43	WQ-NPS
19-44-04	WRIA 44	WQ-NPS
19-36-05	WRIA 36	WQ-NPS
19-50-06	WRIA 50	WQ-PS-Gas



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

WATER RESOURCE INVENTORY AREAS
SUB - BASINS

COUNTY SEATS

STATE CAPITOL

1970

MAP NO. 1

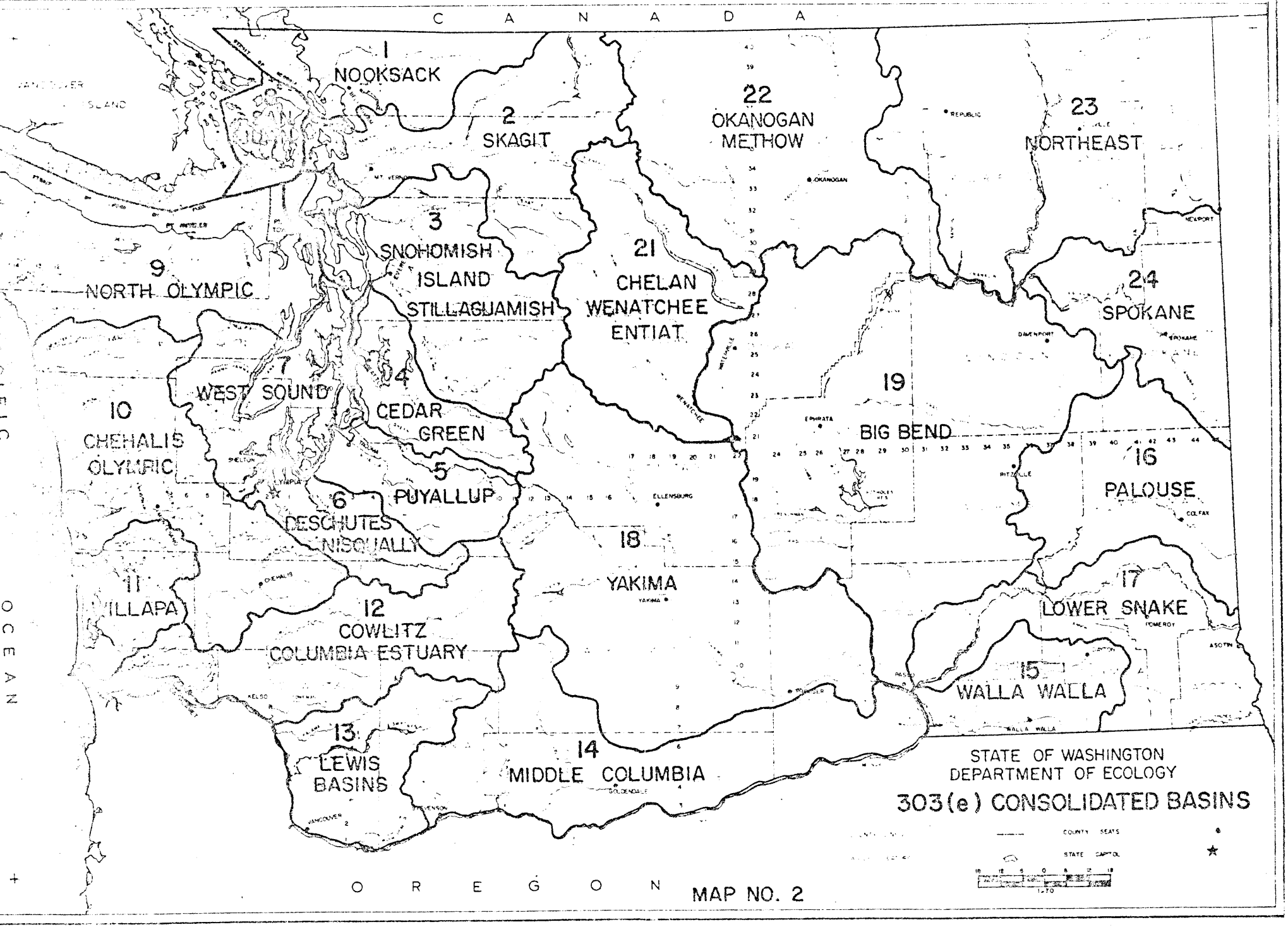

C A N A D A
1
NOOKSACK
2
SKAGIT
22
OKANOGAN
METHOW
23
NORTHEAST
3
SNOHOMISH
ISLAND
STILLAGUAMISH
21
CHELAN
WENATCHEE
ENTIAT
9
NORTH OLYMPIC
24
SPOKANE
7
WEST SOUND
4
CEDAR
GREEN
19
BIG BEND
10
CHEHALIS
OLYMPIC
5
PUYALLUP
16
PALOUSE
6
DESCHUTES
NISQUALLY
18
YAKIMA
11
ILLAPA
12
COWLITZ
COLUMBIA ESTUARY
17
LOWER SNAKE
15
WALLA WALLA
13
LEWIS
BASINS
14
MIDDLE COLUMBIA
O R E G O N
PACIFIC OCEAN
STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
303(e) CONSOLIDATED BASINS
COUNTY SEATS
STATE CAPITOL
MAP NO. 2

Table I

CONSOLIDATED BASIN PLANNING AREAS

Consolidated Basin Number	STORET BASINS Sub-Basins (WRIA)	Basin Name
01	(01) Nooksack	NOOKSACK
02	(03) Lower Skagit (04) Upper Skagit	SKAGIT
03	(05) Stillaguamish (06) Island (07) Snohomish	SNOHOMISH- ISLAND- STILLAGUAMISH
04	(08) Cedar (09) Green	CEDAR-GREEN
05	(10) Puyallup (12) Chambers-Clover	PUYALLUP
06	(11) Nisqually (03) Deschutes	NISQUALLY- DESCHUTES
07	(14) Kennedy-Goldsborough (15) Kitsap (16) Skokomish-Dosewallips	HOOD CANAL- WEST SOUND
08	(02) San Juan	SAN JUAN
09	(17) Quilcene-Snow (18) Elwha-Dungeness (19) Lyre-Hoko (20) Soleduck-Hoh	NORTH OLYMPIC
10	(21) Queets-Quinault (22) Lower Chehalis (23) Upper Chehalis	CHEHALIS- GRAYS HARBOR
11	(24) Willapa	WILLAPA
12	(25) Grays-Elochoman (26) Cowlitz	COWLITZ- COLUMBIA ESTUARY
13	(27) Lewis (28) Salmon-Washougal	LEWIS BASINS
14	(29) Wind-White Salmon (30) Klickitat (31) Rock Glade	MIDDLE COLUMBIA

Consolidated Basin Number	STORET BASINS Sub-Basins (WRIA)	Basin Name
15	(32) Walla Walla	WALLA WALLA
16	(34) Palouse	PALOUSE
17	(33) Lower Snake (35) Middle Snake	LOWER SNAKE
18	(37) Lower Yakima (38) Naches (39) Upper Yakima (40) Alkali-Squilchuck	YAKIMA
19	(36) Esqualtzel Coulee (41) Lower Crab (42) Grand Coulee (43) Upper Crab-Wilson (44) Moses Coulee (50) Foster (53) Lower Lake Roosevelt	BIG BEND
20	(reserved)	
21	(45) Wenatchee (46) Entiat (47) Chelan	WENATCHEE-ENTIAT-CHELAN
22	(48) Methow (49) Okanogan (51) Nespelem	OKANOGAN-METHOW
23	(52) Sanpoil (58) Middle Lake Roosevelt (59) Colville (60) Kettle (61) Upper Lake Roosevelt (62) Pend Oreille	NORTHEAST
24	(54) Lower Spokane (55) Little Spokane (56) Hangman (57) Middle Spokane	SPOKANE
26	SPECIAL WATER SURFACE STUDY AREA (All WRIA's bordering COLUMBIA RIVER on River)	

Eff	Effluent Limited
WQ--PS	Water Quality--Point Source
WQ--PS--SWL	Water Quality--Point Source--Sulfite Waste Liquor
WQ--PS--Gas	Water Quality--Point Source--Total Dissolved Gas
WQ--NPS	Water Quality--Non-Point Source
WQ--No Data	Segments so noted are those where data is insufficient to subclassify and where water quality violations are not caused by point source dischargers

Segments have been classified according to the following segment definitions:

Effluent Limited - Present water quality is above the water quality standards or can be expected to exceed the standards with the application of BPT and/or secondary treatment for all point source discharge.

-Permits based on best practicable treatment and/or secondary treatment can be issued to all dischargers in the segment. (BPT - Best Practical Treatment)

Water Quality--Point Source - Present water quality is below the standards and specified criteria are not expected to be achieved with the application of BPT and/or secondary treatment for all point source discharge.

-A water quality study will be conducted to assist in completing appropriate waste load allocations and establishing permit conditions for individual dischargers where such a study is required.

-Permits can not be issued to dischargers (point source and non-point source) until after data is collected and evaluated where such data is now lacking.

Water Quality--Point Source (Total Dissolved Gas) - Present water quality is below the standards due to point source and dam structures and in some cases naturally occuring total dissolved gas levels. All problems relating to point sources can be corrected with the application of BPT and/or secondary treatment. The problem of undesirable total dissolved gas generation from dam structure will require special control measures.

-A water quality study may be conducted to assist in establishing control measures for entities responsible for the generation of undesirable levels of total dissolved gas.

-Permits based on BPT and/or secondary treatment can be issued immediately to all dischargers in the segment, with the exception of those entities responsible for the generation of undesirable levels of total dissolved gas.

Water Quality--Non-Point Sources - Present water quality is below the standards due to non-point sources.

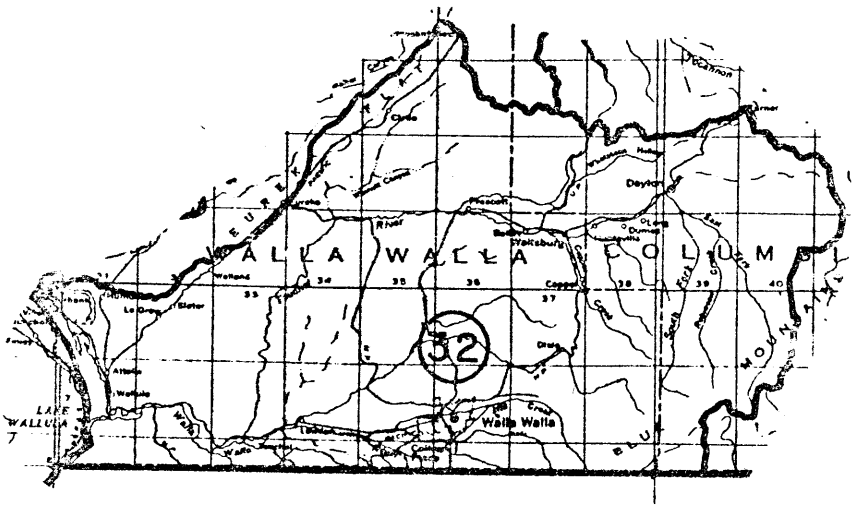
-A water quality study will be conducted prior to completion of section 303(e) basin plans.

-Permits based on BPT and/or secondary treatment can be immediately issued to all dischargers in the segment.

Water Quality--Point Source (Sulfite Waste Liquor) - Present water quality is below the standards due to point sources and in some cases apparent SWL conditions. All problems relating to point sources can be corrected with the exception of SWL discharge.

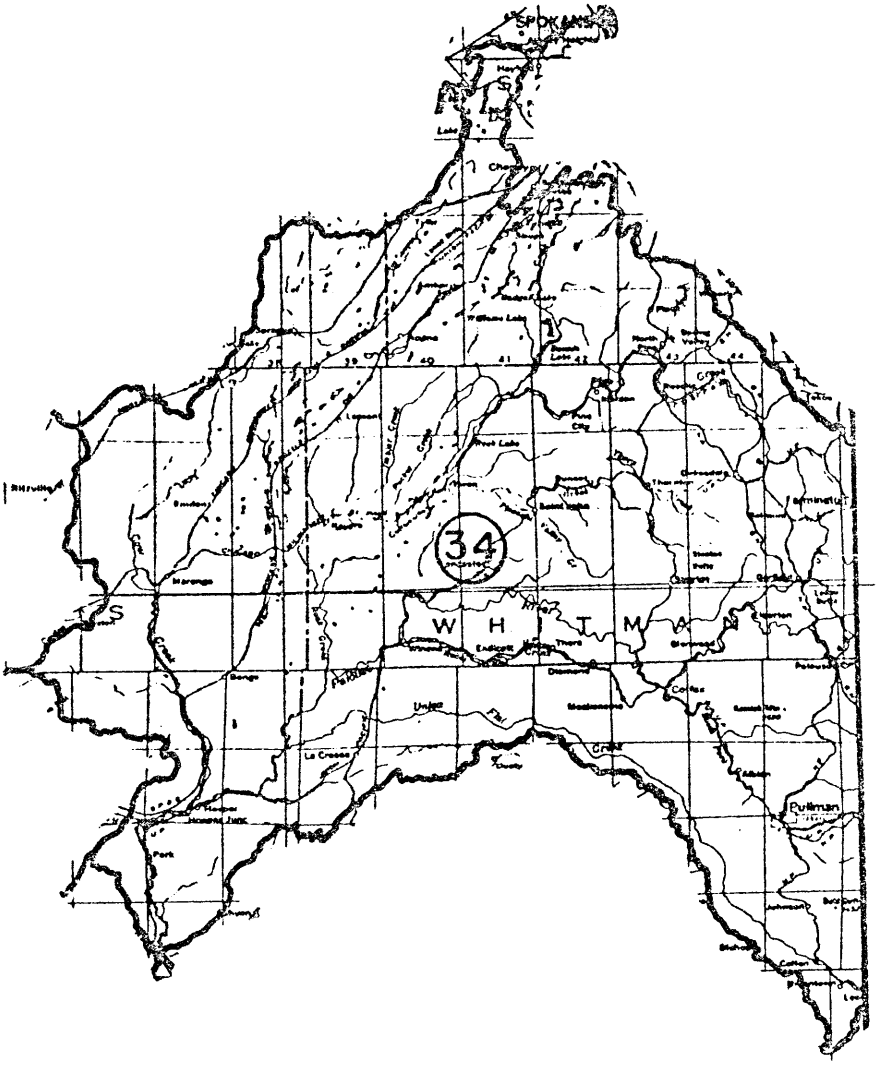
-A SWL receiving water quality criterion objective will be established to serve as a basis for conducting waste load allocations.

WALLA WALLA 303(e) Consolidated Planning Area
NUMBER 13-08-15
Includes River Basins: (32) Walla Walla



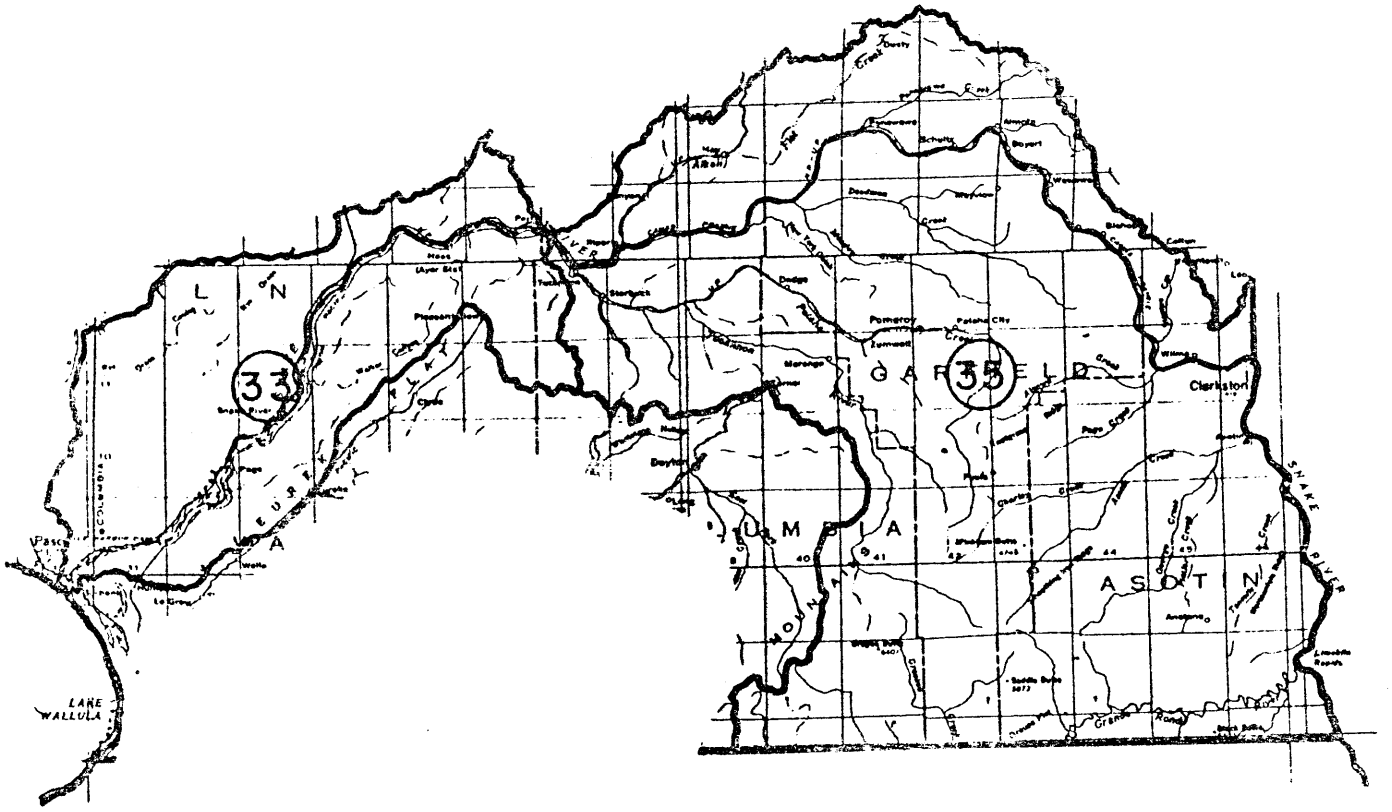
Segment Number	Segment Name	Class	Violations
15-32-02	Walla Walla R & tribs	WQ-NPS	Coli, Temp, DO
15-32-03	Touchet R & tribs	WQ-NPS	Coli, Temp, DO
15-32-04	Mill Cr & tribs	WQ-PS	DO, Temp

PALOUSE 303(e) Consolidated Planning Area
NUMBER 13-08-16
Includes River Basins: (34) Palouse



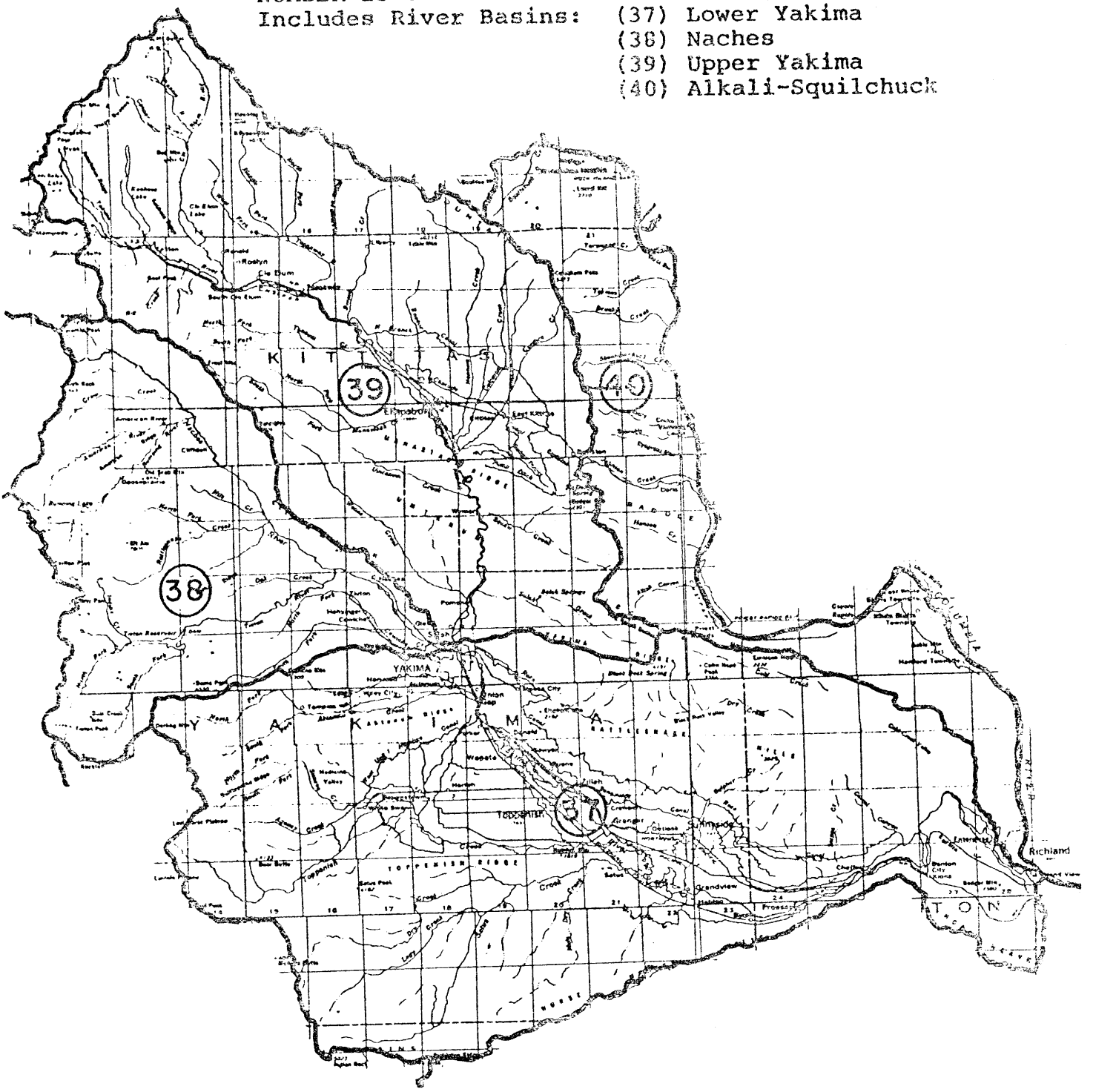
Segment Number*	Segment Name	Class	Violations
16-34-01	Palouse R & trib	WQ-NPS	Coli, Temp, DO
16-34-02	S.F. Palouse R & trib	WQ-NPS	Coli, Temp, DO

LOWER SNAKE 303(e) Consolidated Planning Area
NUMBER 13-08-17
Includes River Basins: (33) Lower Snake
(34) Middle Snake



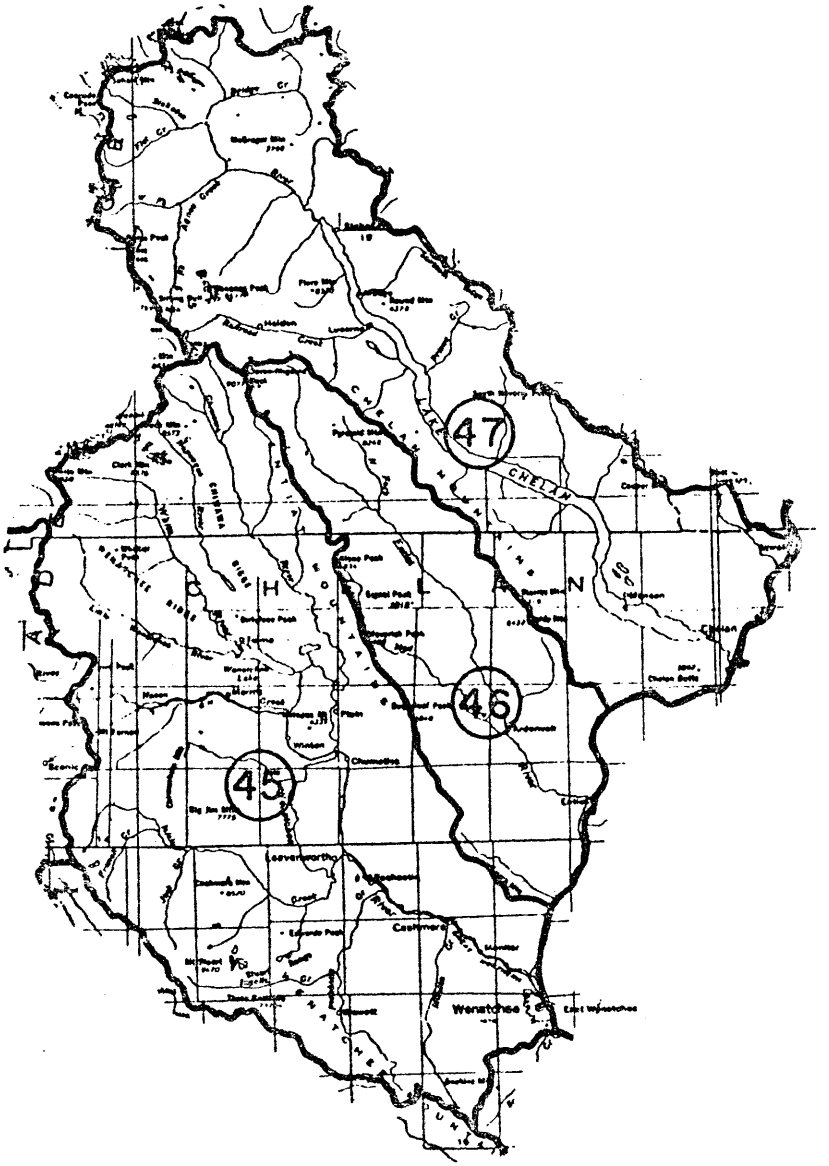
Segment Number	Segment Name	Class	Violations
17-33-01	Snake R from Lower Granite Dam to Wash-Ore Border	WQ-PS-Gas	Coli, Temp, DO, T. & D Gas
17-35-02	Tucannan R & tribs	WQ-NPS	No Data
17-35-03	Grand Ronde	WQ-NPS	No Data
17-35-04	Snake R & tribs from mouth to Lower Granite Dam	WQ-PS-Gas	Coli, Temp, DO, Gas

YAKIMA 303(e) Consolidated Planning Area
NUMBER 13-04-18
Includes River Basins: (37) Lower Yakima
(38) Naches
(39) Upper Yakima
(40) Alkali-Squilchuck



Segment Number	Segment Name	Class	Violations
18-36-01	Yakima R & tribs from mouth to Sunnyside Dam Bridge	WQ-NPS	Coli, Temp, pH
18-36-02	Yakima R & tribs from Sunnyside Dam Bridge to Wilson CR	WQ-NPS	Coli, Temp
18-36-03	Wide Hollow Cr & tribs	WQ-NPS	Coli, DO, Temp
18-39-03	Yakima R from Wilson Cr to Thorp	FFF	Coli, DO, Temp
18-39-05	Yakima R & tribs from Thorp to headwaters	WQ-NPS	Temp
18-39-06	Wilson Cr & tribs	WQ-NPS	Coli, DO, Temp

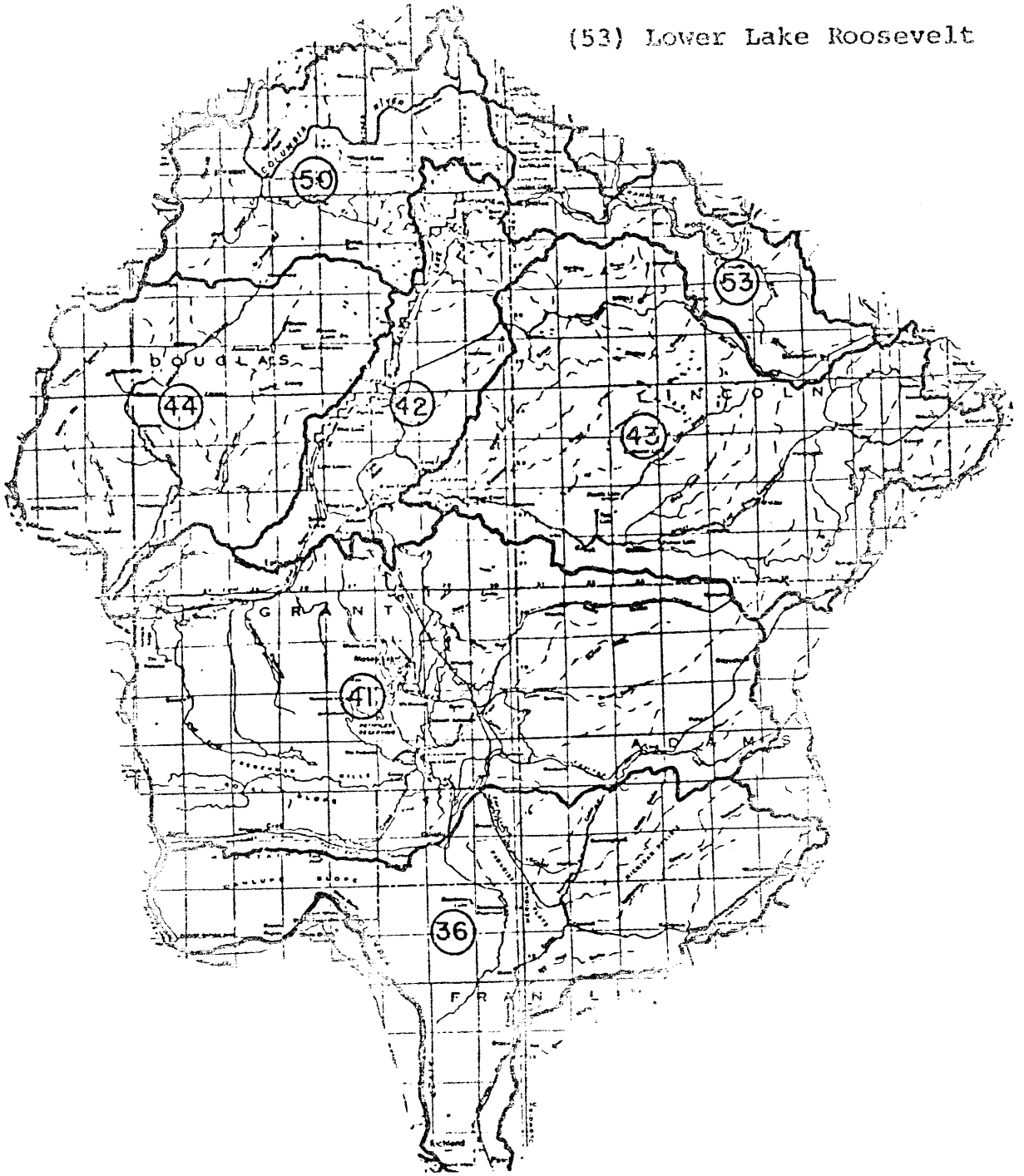
WENATCHEE-CHELAN 303(e) Consolidated Planning Area
NUMBER 13-05-21
Includes River Basins: (45) Wenatchee
(46) Entiat
(47) Chelan



Segment Number	Segment Name	Class	Violations
21-45-01	Wenatchee R & tribs	EFF	Coli
21-46-02	Entiat R & tribs	WQ-NPS	Coli
21-47-03	WRIA 47 Lake Chelan & tribs	WQ-NPS	Temp

BIG BEND 303(e) Consolidated Planning Area
NUMBER 13-05-19
Includes River Basin: (36) Esquatzel Coulee
(41) Lower Crab
(42) Grand Coulee
(43) Upper Crab-Wilson
(44) Moses Coulee
(50) Foster

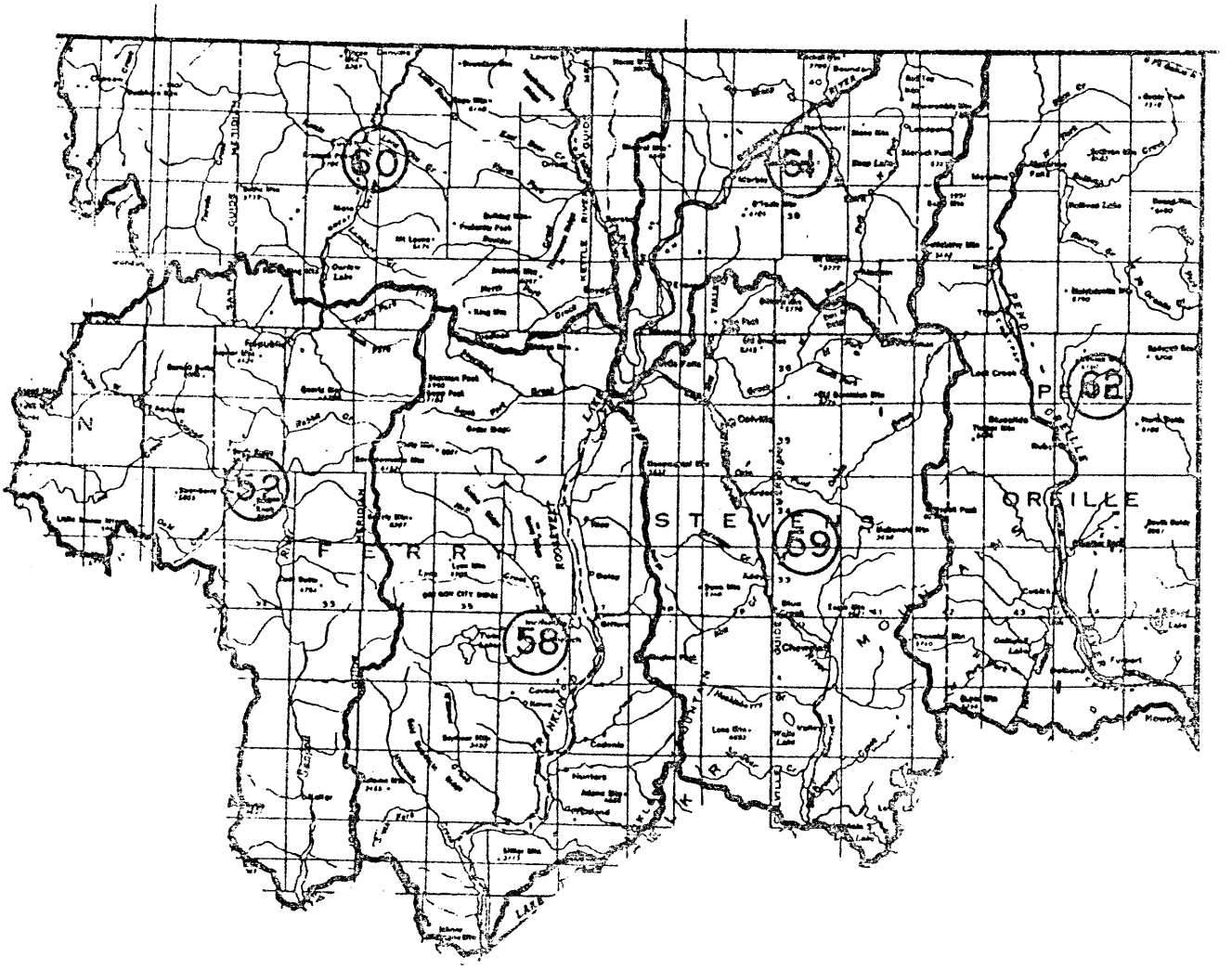
(53) Lower Lake Roosevelt



Segment Number	Segment Name	Class	Violations
19-41-01	Crab Cr & tribs in Basin 41	WQ-NPS	Coli, Temp
19-42-02	Crab Cr & tribs in Basin 42	WQ-NPS	No Data
19-43-03	Crab Cr & tribs in Basin 43	WQ-NPS	No Data
19-44-04	WRIA 44	WQ-NPS	No Data
19-51-05	WRIA 51	WQ-NPS	No Data
19-50-06	WRIA 50 Columbia R		

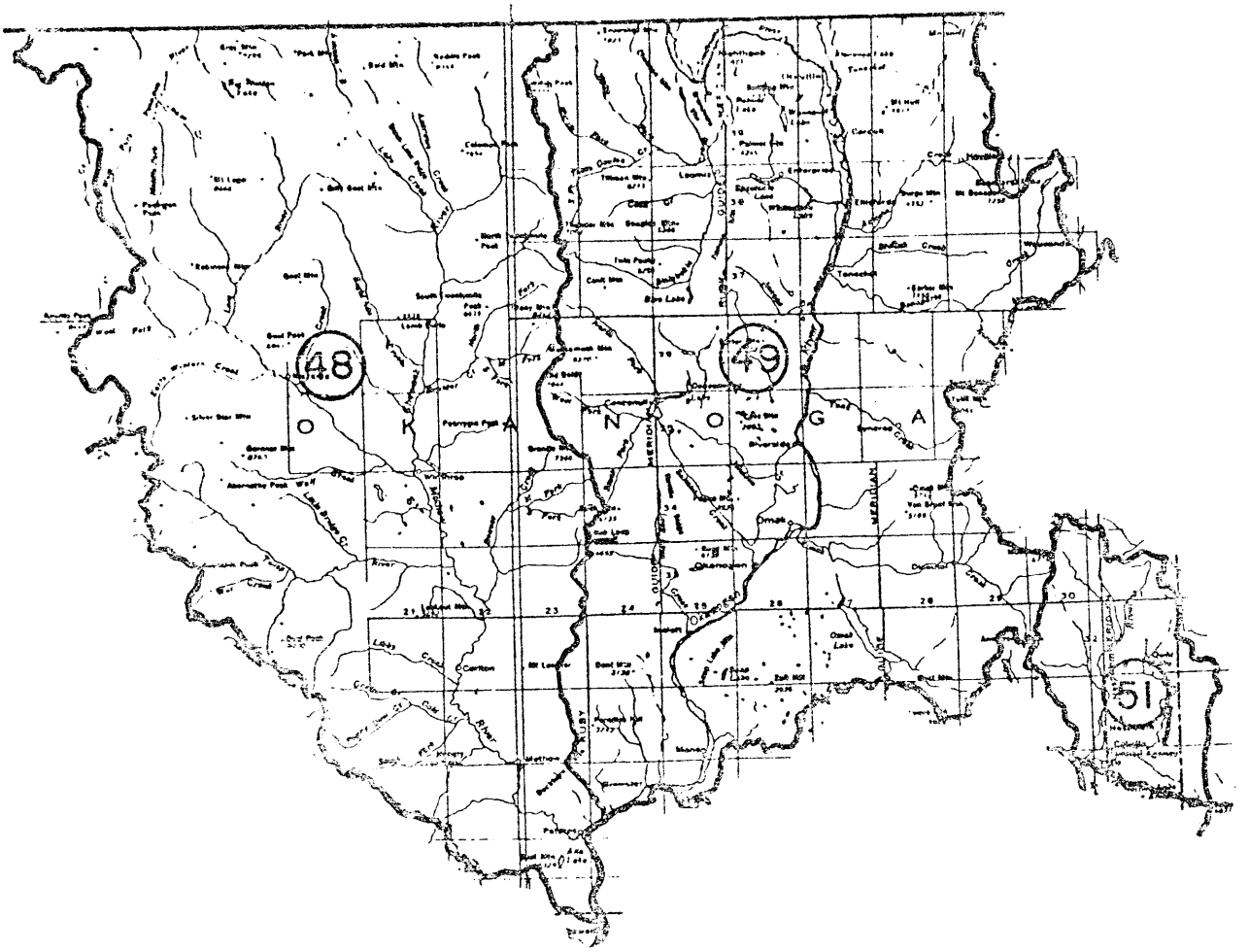
NORTHEAST 303(e) Consolidated planning Area
NUMBER 13-03-23
Includes River Basins:

(52) Sanpoil
(58) Middle Lake Roosevelt
(59) Colville
(60) Kettle
(61) Upper Lake Roosevelt
(62) Pend Oreille



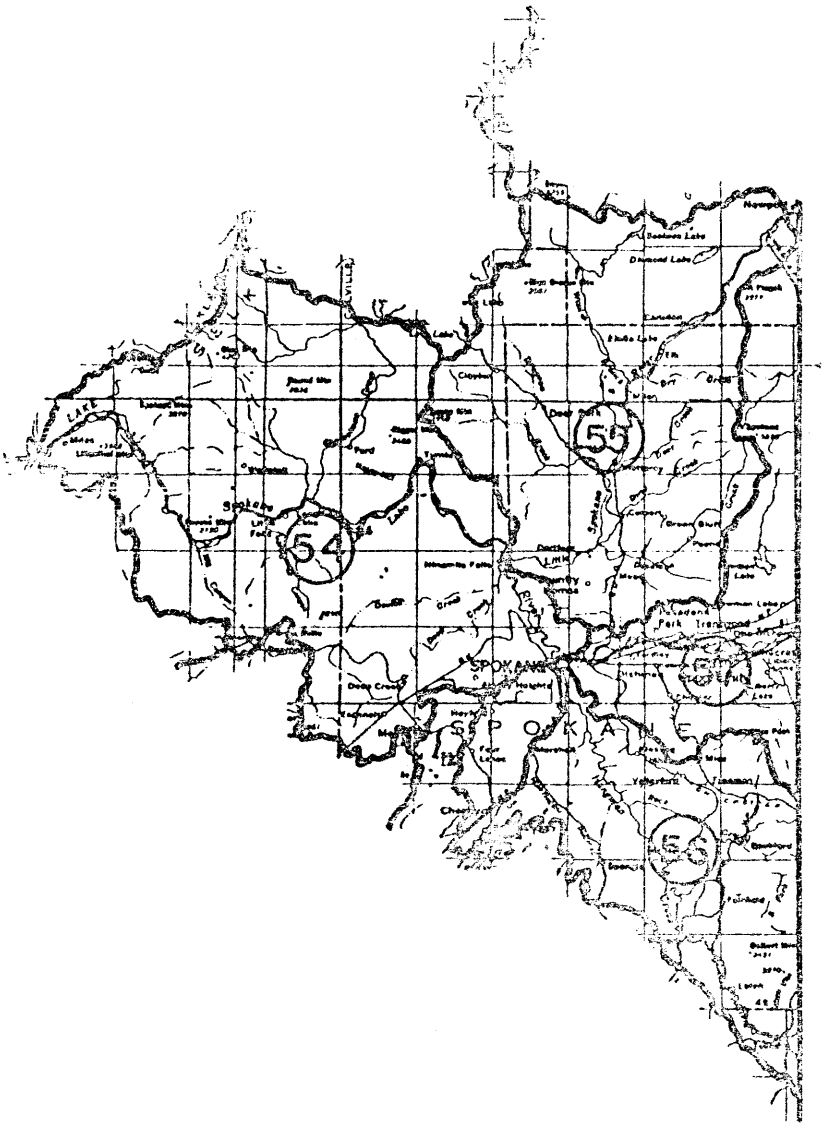
Segment Number	Segment Name	Class	Violations
23-58-01	WRIA 58, Columbia River	WQ-PS-Gas	TDGAS
23-59-02	Colville R & tribs	WQ-NPS	Coli, Temp, pH
23-52-03	Sanpoil R & tribs	WQ-NPS	Coli, DO &pH
23-60-04	Kettle R & tribs	WQ-NPS	Temp
23-62-05	Pend d' Oreille R & tribs	WQ-NPS	No Data

OKANOGAN-METHOW 303(e) Consolidated Planning Area
NUMBER 13-05-22
Includes River Basins: (48) Methow
(49) Okanogan
(51) Nespelem



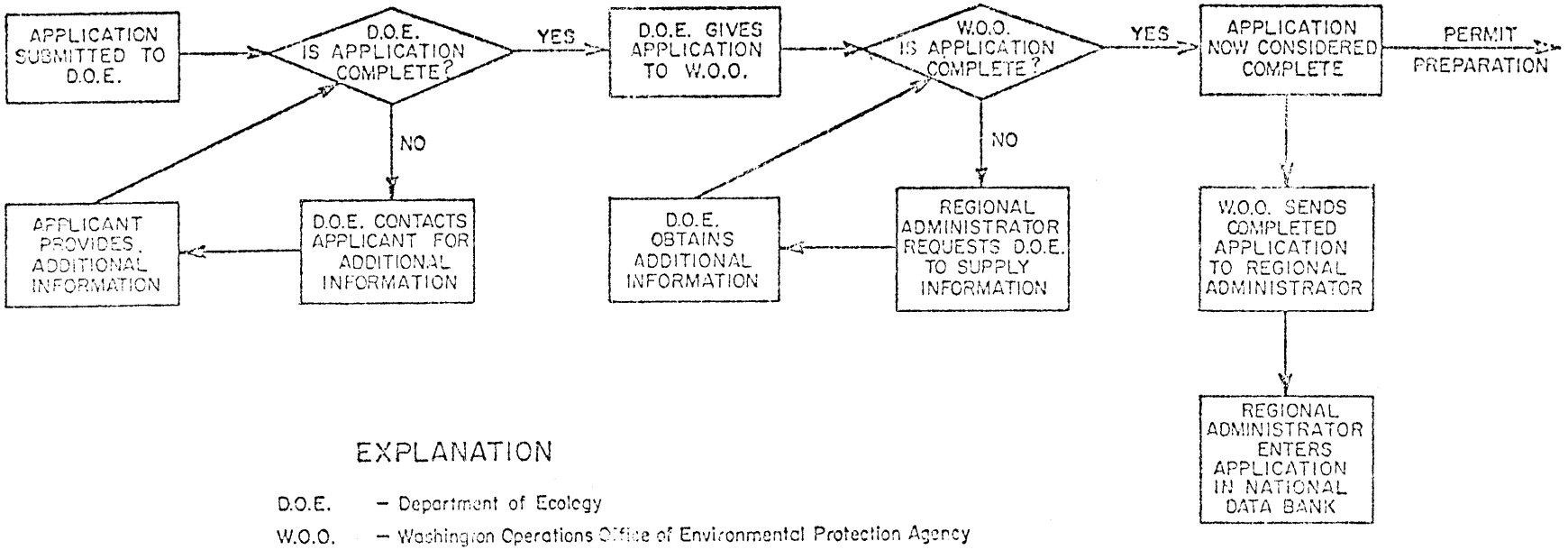
Segment Number	Segment Name	Class	Violations
22-48-01	Methow R & tribs	WQ-NPS	Coli
22-49-02	Okanogan R south to Lake Osoyoos	WQ-NPS	Coli, Temp

SPOKANE 303(c) Consolidated Planning Area
NUMBER 13-03-24
Includes River Basins: (54) Lower Spokane
(55) Little Spokane
(56) Hangman
(57) Middle Spokane



Segment Number	Segment Name	Class	Violations
24-54-01	Spokane R mouth to Idaho-Wash. Border	WQ-PS	Coli, DO, Temp, T & D Aesthetics
24-55-02	Little Spokane & tribs	WQ-NPS	Coli
24-56-03	Hangman Cr	WQ-NPS	No Data
25-a.	Puget Sound	WQ-No Data	No Data
b.	Puget Sound		
26-a.	Columbia River	WQ-PS-Gas,	Temp, T & D Gas
b.	Columbia River		

APPLICATION PROCESSING



EXPLANATION

D.O.E. – Department of Ecology

W.O.O. – Washington Operations Office of Environmental Protection Agency

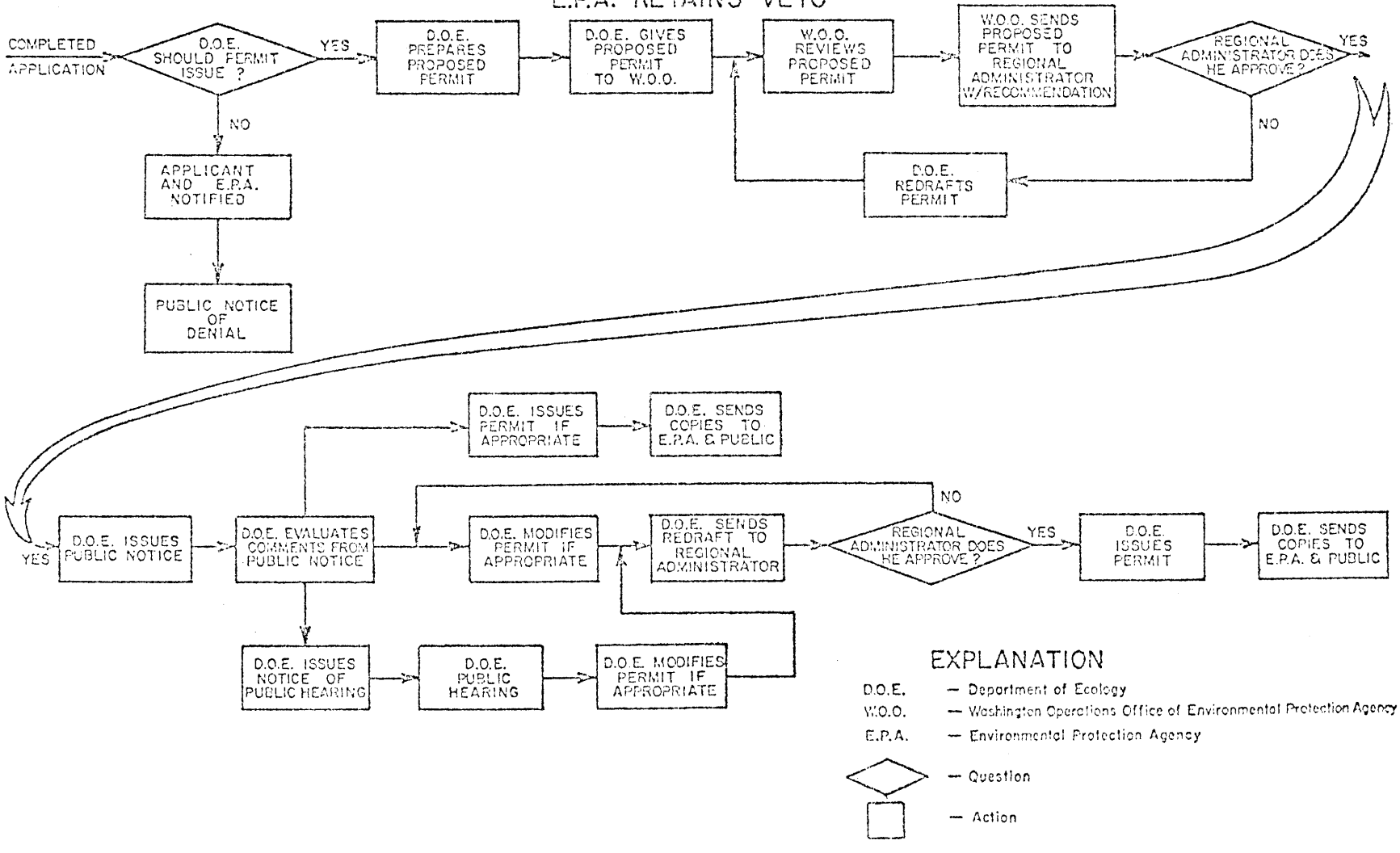
 – Question

 – Action

Attachment III

PERMIT PREPARATION
PUBLIC PARTICIPATION
PERMIT ISSUANCE

E.P.A. RETAINS VETO



EXPLANATION

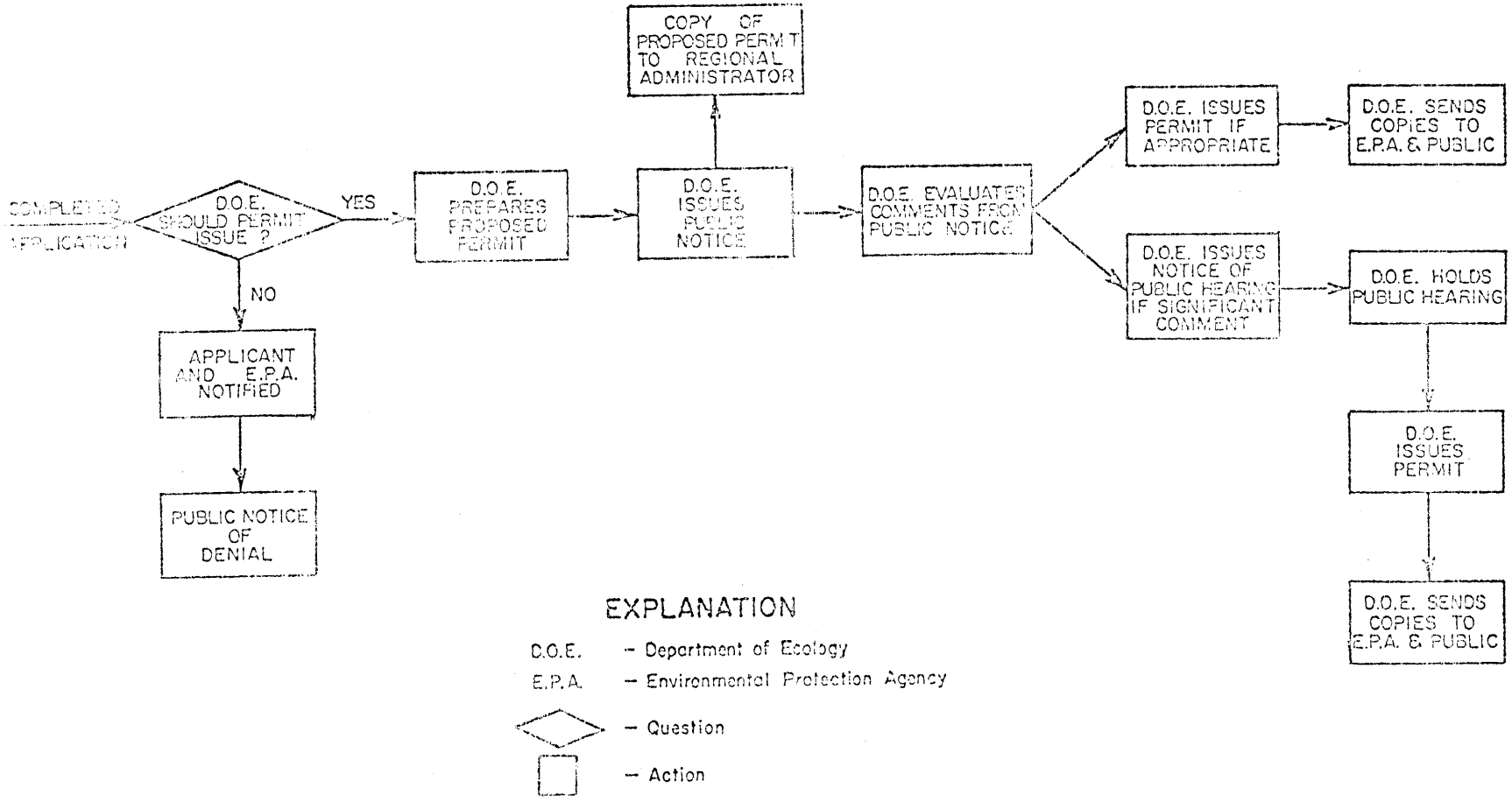
D.O.E. — Department of Ecology
W.O.O. — Washington Operations Office of Environmental Protection Agency
E.P.A. — Environmental Protection Agency

— Question

— Action

PERMIT PREPARATION
PUBLIC PARTICIPATION
PERMIT ISSUANCE

E.P.A. WAIVES VETO (MINOR PERMITS)



EXPLANATION

D.O.E. – Department of Ecology

E.P.A. – Environmental Protection Agency

– Question

– Action

A REVIEW OF FEDERAL FUNDING FOR TREATMENT PLANTS UNDER PUBLIC LAW 92-500

by

Gary Mansell

The need for a solution to the continuing degradation of United State's waterways was evident in 1972. Federal studies declared that 29% [4] of all waterways in the nation were polluted. The situation was clearly becoming even more serious, since yearly dumping involved 10 trillion gallons of industrial effluent. Also, of critical concern was the 4.4 trillion [4] gallons included in the industrial effluent that received no purification at all.

In an attempt to meet this need President Nixon, on January 20, 1972, called for a five-year, $10 billion clean water program.[3] Congress responded to the call by passing the most comprehensive and expensive environmental legislation in the nation's history. The Federal Water Pollution Control Act Amendments of 1972 were made Public Law 92-500 on October 19, 1972.

Basically, Public Law 92-500 authorized federal funding of $24.7 billion including more than $18 billion in contract grants for waste treatment construction. The amount in the law was determined from the U.S. Environmental Protection Agencies (E.P.A.) 1971 Needs Survey. The congressional intention of providing the federal funds to meet the nation's needs was aimed at eliminating all discharge of pollutants into waterways by 1985. Ironically, one obstacle in meeting the goals of P.L. 92-500 has been the President.

President Nixon had attempted to veto the amendments two days prior to their enactment. The amendments, he argued were a "budget wrecking expenditure". After congressional enactment of the bill, the President announced that allotments for waste treatment construction would be reduced as follows:

> Fiscal Year 1973 (Nov. 18, 1972 - June 30, 1973)
> to $2 billion from the $5 billion authorized.
> Fiscal Year 1974 (July 1, 1973 - June 30, 1974)[16]
> to $3 billion from the $6 billion authorized.

In a letter to the Environmental Protection Agency, Director William D. Ruckelshaus, President Nixon explained his impoundment of funds. The letter read, "This course of action ... deals generously with the environmental problems and at the same time recognizes as the national priority the need to protect (the public) ... against tax increases and renewed inflation."[14] The author could not find any other statements against the P. L. 92-500 by President Nixon.

Candidate for B.S. in Civil Engineering, Washington State University, Spring, 1974.

If inflation and tax increases compared to pollution are less desirable, then some considerations deserve mentioning. Both inflation and tax increases effect the public by decreasing purchasing power of the individuals.

Inflation is especially felt by families depending on a fixed income, such as social security. Their quality of life decreases towards minimum subsistence as prices rise. However, this effect of inflation exists independent of the particular type or cause of inflation. When the P.L. 92-500 was enacted, the particular inflation was due to shortages. Recently, the economy has been subjected to a inflation stemming from excessive buying. This is probably the type of inflation the administration predicted that would happen due to granting the full allotment. The full allotment has not been spent; only $2 billion of the approximately $11 billion allowed has been obligated. In addition, the existing inflation peculiarly does not coincide with full employment. During 1973, enough contractors were available to participate in competitive biding. For example, Clarence Metcalf, Director of Municipal Services, New Hampshire Water Supply and Pollution Control Commission in testifying before the House of Representative Hearing said, "We anticipate no shortage of qualified construction services. On a recent small project -- only about three quarters of a million dollars in size -- 16 contractors picked up bid documents." He continued, "We have never had a job in the past two years where we have had less than five to six contractors that picked up documents to bid."

Injecting federal funds into the economy has the potential of boosting America closer to full employment as well as inflation. The money granted for construction represents an income to these contractors and their employees, and creates important jobs of maintaining the plants after construction.

Obviously, increasing taxes means decreasing incomes for most of the public. If taxes are not increased, then the public maintains the ability to purchase various goods to improve their standard of living. However, these goods have an opportunity cost in addition to the price. The money not utilized for the construction of waste treatment plants represents that much more pollution the public will be expected to tolerate. A degraded waterway limits or discourages consumption, aquatic food production, recreation, and aesthetic appearance.

The taxpayer's bill for waste treatment construction has been climbing steadily, and probably will continue to climb. The Environmental Protection Agency reported an average twenty[1] percent increase in construction cost between 1971 and 1973. Some localities have experienced yearly increases of 16 percent. In 1962 the Conference of State Sanitary Engineers had estimated construction requirements for new public treatment facilities would cost $2.0 billion, but the E.P.A. revised this figure to $18.1 billion nine years later. Now, the E.P.A. has determined in their 1973 Needs Survey the cost will be near $35.9 billion.[1] The author used current allowable funding levels of roughly $3 billion, 10 percent increasing costs, and a capital recovery factor to determine that the current funding level does not even cover the increasing costs of construction. Of course, this calculation is simplified, and engineering economics texts suggest rising costs are balanced off by advanced technology. However, federal support of research to reduce the costs of treating municipal sewage has been drastically reduced over the past five years.[14]

President Nixon's impoundment effectively reduced allotments in fiscal year 1973 and appears to have restricted funds for the current fiscal year. If the 1975 impoundment is enforced, then only $4 billion [19] of the $7 billion allotted will be available. This impoundment may not be legally enforced in the future according to recent court rulings. Historically, the impoundment of funds is a precedent started by Thomas Jefferson. Current opponents of impoundment have successfully challenged the action by citing two clauses from the Constitution. The most recent court ruling by the U.S. Appeals Court, District of Columbia has stated the impoundment by the President is illegal. The President's response, according to Budget Director, Roy L. Ash, is to continue the impoundment of funds appropriated under P.L. 92-500, but he will abstain from impounding funds in other programs.

Senator Muskee has succeeded in passing legislation to eradicate some of the uncertainty and confusion of the law. His bill S 2812 authorizes a formula for the allocation of funds for fiscal year 1975 for sewage treatment construction. The bill was approved January 2, 1974 and became Public Law 93-243. The allotments are shown on Figure 1.

The impoundments of funds effectively withheld a lot of money, but money was kept from distribution to the states through other means, too. During a House of Respresentatives hearing some restrictive practices by E.P.A. were revealed.

The management technique strategy used by the Environmental Protection Agency for implementing P.L. 92-500 determines the rate of cash outflow to the construction projects. The amount of cash flow needed for any period is dependent upon estimates by E.P.A. for covering contractual obligations made according to priority and eligibility lists. After this estimate is made, and the request for appropriations is submitted to the Appropriation Committee; the E.P.A. apparently feels approval of additional drawings beyond current appropriation requests would be illegal. The Environmental Protection Agency rigidly adheres to the following excerpt from the constitution:

> Article 1; Section 9, Clause 7 "No money shall be drawn from the treasury, but in consequence of appropriations made by law." [3]

Therefore, until another appropriation has been requested some plans and drawings are not obligated by E.P.A., even though the Presidential limit for the current fiscal year has not been reached. The result is needless delay in the approval of plans and specifications.

Some areas have experienced specific problems associated with the delay in approval. New Hampshire was notified that due to a large percentage of obligations made on a particular appropriation, the New England Region would not receive any further water pollution grants between May 21, 1973 and December 31, 1973. The crux of the situation was a breakdown of communication between E.P.A. headquarters and the regional offices. The regional office had interpreted the requested appropriation as a ceiling for obligations. Now, the E.P.A. contends that the appropriations are not intended as ceilings, and appropriations will be requested throughout the fiscal year as necessary. But, delays are still possible when the prediction of needed cash flow exceeds appropriations.

FIGURE 1

FUNDS STATES WOULD GET IN FISCAL 1975 UNDER **
FULL AUTHORIZATION OR REDUCED ALLOTMENTS

(in millions)

State	$3-billion allotment	$4-billion allotment	$7-billion allotment
Alabama	$ 33.8*	$ 33.8*	$ 55.9
Alaska	10.9	15.0	26.5
Arizona	17.7*	17.7*	28.6
Arkansas	19.4*	24.0	42.6
California	333.5	457.3	813.8
Colorado	22.5	31.1	55.2
Connecticut	50.7	69.7	123.6
Delaware	15.8	21.7	39.1
District of Columbia	27.9	38.2	67.8
Florida	120.0	164.4	292.7
Georgia	55.6	76.0	135.5
Hawaii	30.0	41.2	73.4
Idaho	7.8*	7.9	14.0
Illinois	183.9	252.4	449.2
Indiana	50.0*	63.7	113.2
Iowa	28.7	39.3	69.9
Kansas	29.2	40.1	71.3
Kentucky	47.6	65.2	116.0
Louisiana	35.6*	35.6*	51.0
Maine	19.1	26.2	46.8
Maryland	39.6	54.3	96.4
Massachusetts	65.7	90.3	160.7
Michigan	137.6	188.8	336.0
Minnesota	46.8	64.4	114.6
Mississippi	22.3*	22.3*	37.7
Missouri	54.3	74.5	132.7
Montana	7.5*	7.5*	9.8
Nebraska	15.3	21.0	37.0
Nevada	13.7	18.7	33.5
New Hampshire	25.6	35.2	62.2
New Jersey	185.8	254.7	453.4
New Mexico	10.7*	10.7*	13.3
New York	357.5	490.6	873.2
North Carolina	51.5	70.4	125.7
North Dakota	6.9*	6.9*	6.9*
Ohio	141.0	193.2	344.4
Oklahoma	34.1	46.8	83.8
Oregon	24.8	34.1	60.8
Pennsylvania	162.5	222.5	396.1
Rhode Island	15.3	21.0	37.0

FIGURE 1 Cont.

State	$3-billion allotment	$4-billion allotment	$7-billion allotment
South Carolina	40.4	55.8	99.9
South Dakota	7.3*	7.3*	7.3*
Tennessee	38.2	48.3	85.9
Texas	106.9*	106.9*	116.0
Utah	12.2	16.5	29.3
Vermont	8.5	12.0	21.0
Virginia	71.9	98.5	175.3
Washington	47.1	64.8	115.3
West Virginia	27.4	37.8	67.1
Wisconsin	42.6	52.4	92.9
Wyoming	4.0*	4.0*	5.6
Guam	2.2*	2.2*	3.5
Puerto Rico	29.8	40.8	72.7
Virgin Islands	2.3	3.0	5.6
American Samoa	.5	.7	.7
Pacific Island Territories	.3	.7	.7

*Based on 1972 allocation.

SOURCE: Prepared by the Environmental Protection Agency at the request of the House Public Works Committee.

** Congressional Quarterly; Weekly Report, V. XXXII, No. 1 (January 5, 1974), Page 22 (ref. #13)

The detrimental effects of the Environmental Protection Agency's policies have been felt most severely on state treatment planning organizations. State directors of public works have suffered in their attempts to meet the requirements of P.L. 92-500. They encourage local communities to develop plans and specifications for treatment plants to take advantage of federal funds allocated to the state. After the communities complete their plans, the state director must return to the communities to relay the message that E.P.A.'s current appropriations are insufficient to approve the plans. Another situation has appeared: state directors determine needed funds from their priority lists, but the list may be pre-empted by E.P.A. for an immediate project. The credibility of the state directors is being deteriorated by these unpredictable aspects of federal funding under P.L. 92-500.

The enthusiasm of local communities to start and finish the job has dampened because of the resulting confusion in funding. Some communities have complained when the law appears to have been enforced unfairly. The community that builds an expensive sewage treatment plant does not understand how a similar community downstream can delay constructing its plant, especially when the delay appears to continue until some indefinite time in the future

The uncertainty of appropriations has caused other problems in specific states. For example, seventeen state legislators meet biennially and the state's share of the first 25% of construction costs must be appropriated from the state's budget. State public works directors do not know the size of their funds to request, unless the federal funding level can be predetermined and a project's approval expected. If the state makes their funding available to communities allowing construction before E.P.A. has approved, then the federal share of 75% will not be granted for the project. The alternative is also unattractive, a director may find himself asking for appropriations twice for the same project. When the state's appropriations for a given budget period are not used, the project must be reappropriated. This backtracking affects the director's credibility with legislators. Perhaps, a pre-financing arrangement similar to previous federal funding programs could alleviate some of these planning problems

Proper sewage treatment of all effluents is an eventual necessity. Increasing population and water usage without a proportional increase in sewage treatment plants will result in possibly greater public exposure to pathogenic micro-organisms and toxic chemicals. Also, edible fish foods will become scarcer as the content of dissolved oxygen decreases in lakes. Building the required new sewage plants will cost the public, and this cost will increase each year. Presently, the per capita cost for improvement of treatment plants to achieve stringent treatment levels is $172.45

The administration, including President Nixon and the Environmental Protection Agency, have protected the American public from a current increase in taxes and perhaps from an elusive inflation. However, the cost of this protection has been the physical perpetuation of filthy waterways, and wasted labor of government employees

BIBLIOGRAPHY

1. U.S. Environmental Protection Agency. The Economics of Clean Water -- 1973. Washington, D.C., December, 1973.

2. U.S. Environmental Protection Agency. Clean Water Report to Congress-- 1973. Washington, D.C., May, 1973.

3. Committee on Public Works, House of Representatives. Implementation of the Federal Water Pollution Control Act. Washington, D.C., June 14, 1973.

4. "From Congress, Tough New Rules for Clean Water." U.S. News, 73 (October 30, 1972), 38.

5. Semling, H. "Nixon Likely to Veto Water Pollution Control, But Congress will Override", American City, 87 (November, 1972), 14+.

6. "Stormy Debate Over Zero Discharge", Business Week, (February 5, 1972), 70-71.

7. Semling, H. "Four Sections of Water Pollution Control Act Require More Specific Guidelines", American City, 88, (June 1973), 35.

8. Semling, H. "Will 75% Federal Funding Last? Meeting Goals of The Water Pollution Control Act of 1973", American City, 89, (May 1973), 156.

9. "Release More Funds of Federal Treatment Timetable Can't be Met. W.P.C.F. Warns Congress", American City, 88, (June 1973), 14.

10. "Polluted Credibility; Delay in Implementing Canadian-American Pact." Nation, 217, (September 17, 1973), 229.

11. Solman, Lewis C., Economics. New York, 1972.

12. Time (October 16, 1972), 58.

13. "Water Pollution: New Funding Formula Cleared", Congressional Quarterly, XXXIII, No. 1 (January 5, 1974), 9-10.

14. "Water Pollution Control Hampered by Lack of Funds". Congressional Quarterly , XXXII, No. 3 (January 19, 1974), 121-122.

15. "Water Pollution". Congressional Quarterly, XXXII, No. 16, (February 9, 1974), 310.

16. "Water Pollution Grants", Congressional Quarterly, XXX, No. 48, (November 25, 1972), 3083.

17. "Fund Allocation Ordered", New York Times, January 12, 1974, Vol. CXXIII, Page 12.

18. "G.A.O. Says Insufficient Funds Peril Deadlines For Safe Water Pollution Control", The New York Times, February 27, 1974, Volume CXXIII, Page 77.

19. "Nixon Impounds Pollution Funds", New York Times, January 11, 1974, Volume CXXIII, Page 1.

SOME IMPLICATIONS OF PUBLIC LAW 92-500 ON SMALL TOWNS AND COMMUNITIES WITH A POPULATION OF 1,000 OR LESS

By

Paul W. Rea

INTRODUCTION

On October 18, 1972, the most comprehensive program ever enacted to clean up the Nation's waters became law. Public Law 92-500, known as the Federal Water Pollution Control Act Amendments of 1972, mandates a sweeping nationwide campaign to prevent, reduce and eliminate water pollution.

Two general goals for the United States are proclaimed by the law:

(1) To achieve wherever possible by July 1, 1983, water that is clean enough for swimming and other recreational uses, and clean enough for the protection and propagation of fish, shellfish and wildlife.

(2) To have no discharges of pollutants into the Nation's waters by 1985.

The total impact of PL 92-500 is just beginning to be felt at the local government level of the thousands of small towns and communities scattered throughout this Nation. Suddenly the things the people have seen and/or heard about through the news media concerning water pollution are being discussed at town council meetings, county commissioner's meetings, school board meetings, and even local social gatherings. Questions such as: What will be required and when? How much will it cost and where can the necessary funds be obtained? Who will pay for whatever has to be done? Where can the technical assistance needed be acquired? What benefits can be expected?

These questions will be discussed, but not necessarily answered in this paper. The variables are too numerous and the problems too complex to attempt all encompassing answers to the questions in a paper of this scope.

THE NEED

The total estimated population of the United States in 1973 was 210 million people. According to EPA data published in 1973, 47 million people in the U.S. are not served by a public sewage treatment system of any type and 4 million people are considered to have no sewage treatment whatsoever. Approximately 46 million of the people who are served by public sewage treatment systems are served by systems using primary treatment only. Many millions of these people live in the small town and communities scattered across the Nation. These millions of people must not be overlooked by the Federal and State planners in their zeal to meet the 1977 and 1983 goals of PL 92-500. "The problem, if ignored, will not go away!"

Presently a candidate for MS in Environmental Engineering, at Washington State University, College of Engineering. Received a BS in 1959 from Mississippi State University in Forestry.

THE SMALL TOWN OR COMMUNITY

For purposes of this paper a small town is defined as an incorporated municipality with a population of 1,000 or less, and a small community is defined as a unincorporated group of dwellings located in such a manner that all or a major portion of the dwellings could be served by an economically feasible central waste water collection system.

PRESENT WASTE TREATMENT FACILITIES

The waste treatment systems presently in use by small towns or communities range from excellent secondary treatment to individual outdoor privies. Primary treatment only and individual septic tanks probably make up the largest percentage of the treatment systems in use. Oxidation ponds are often used in sections of the Nation where climatic conditions are favorable for their use. Generally, the waste treatment systems presently used by small towns and communities will not meet the waste water treatment requirements of PL 92-500.

WASTE WATER TREATMENT REQUIREMENTS UNDER PL 92-500

Research of available literature causes one to wonder if possibly the U.S. Environmental Protection Agency and the various State Water Quality organizations have forgotten the small towns and small communities of our vast country. Questions put to various personnel of these agencies seem to reveal a concern on their part for the problem but its priority appears to be a considerable distance down on their lists. This is probably caused by a high degree of concern for elimination of larger and/or more toxic pollution sources rather than an attempt to "let the problem slide and maybe it will go away."

If a small town or community has or plans to have a waste water treatment system which will have an effluent, the following effluent standards, as stated in PL 92-500, must be met by the date specified:

(1) All sewage treatment plants in operation on July 1, 1977, whether or not built with the aid of a Federal grant, and no matter when built, must provide a minimum of secondary treatment. (Exception: A plant being built with the help of a Federal grant that was approved before June 30, 1974, must comply with the secondary treatment requirement within four years, but no later than June 30, 1978).

(2) By July 1, 1977, all sewage treatment plants must apply whatever additional, more stringent, effluent limitations that may be established by EPA or a State to meet water quality standards, treatment standards or compliance schedules.

(3) All publicly owned waste treatment plants, whether or not built with the aid of a Federal grant, and no matter when built will have to use "best practicable" treatment by July 1, 1983.

(4) A point source discharger must obtain a permit for discharge of any pollutant in the navigable waters of the United States.

(5) Any industry that discharges its wastes into a municipal treatment plant must pre-treat its effluent so that the industrial pollutants do not interfere with the operation of the plant or pass through the plant without

adequate treatment. This requirement takes effect no later than May, 1974, for new industrial sources of pollution, and no later than July, 1976, for existing industrial facilities.

The basic effluent guidelines that small towns and communities will probably be concerned about are: biochemical oxygen demand (BOD), suspended solids (SS), fecal coliform bacteria (FC), and acidity-alkalinity (pH). For BOD the requirements are a maximum 30-day average of 30 milligrams per liter or water and for SS, a maximum 7-day average of 45 milligrams per liter. A monthly maximum average of 200 per 100 milliliters of water and a weekly average of 400 per 100 milliliters are required for fecal coliform bacteria. The effluent pH must be within the range of 6 to 9.

If the waste influent contains pollutants other than those listed above the effluent limitation guidelines published by EPA and/or the appropriate State agency must be consulted.

It is probably that a high percentage of small towns and communities will elect to use waste stabilization ponds (lagoons) for waste treatment. When properly designed and constructed, it is possible to completely eliminate any effluent from these ponds, thereby eliminating the requirement to meet the effluent standards. (The revised 1971 edition of Recommended Standards for Sewage Works, which is a report by the Committee of the Great Lakes - Upper Mississippi River Board of State Sanitary Engineers, is an excellent reference for local government officials contemplating sewage projects.)

ECONOMIC IMPACT ON LOCAL GOVERNMENTS

The total cost of providing sewage treatment facilities can deal a resounding blow to the fiscal resources of a small town or community. This is particularly true if the local governmental personnel do not know and/or fail to obtain the legal, technical, and financial assistance available to them from various Federal and State sources.

The financial assistance available to the small town or community is usually in the form of grants from both Federal and State agencies. PL 92-500 authorizes the EPA to award grants in the amount of 75 percent of the allowable project costs for the construction of publicly owned and operated waste water treatment works. Projects generally eligible for Federal assistance include those to construct new treatment plants, to expand or improve existing plants, to construct interceptor and outfall sewer lines or to provide pumping, power, and other equipment necessary to operate a sewage treatment system. Under certain conditions, sewage collection systems and projects to control pollution from combined sewers may also receive Federal assistance. Allowable project costs are considered to be allocable project costs that are reasonable and necessary for the construction of a treatment system. These may include, but are not limited to:

(1) Planning directly related to the feasibility of the treatment system;

(2) Engineering, architectural, legal, fiscal or economic investigations or studies;

(3) Surveys, designs, plans, construction drawings and specifications for project related construction;

(4) Cost of land used directly as a part of the treatment process or for disposal of residues.

Costs which are generally not considered allowable are:

(1) Basin or area wide planning not directly related to the project;

(2) Costs outside the scope of the Federally approved project;

(3) Ordinary operating expenses of local government, such as salaries and expenses of a mayor, city council members or city attorney;

(4) Site acquisition (for example, sewer right-of-ways, sewage treatment plant sites, sanitary landfills, etc.);

(5) Interest on bonds or any other forms of indebtedness required to finance the grantee's share of project costs.

State agencies may also authorize grants for waste water (sewage) treatment facilities. The requirements and amounts available vary from State to State. The State of Washington, for example, provides an additional 15 percent of the cost for those items on which EPA contributes.

These grants also have certain other requirements not previously mentioned. The new EPA regulations require all users of a public waste treatment facility to pay a specific "user fee", the amount being determined by the expense of the service rendered. EPA regulations also require that grantees set up a system to recover from industrial users that portion of the grant amount allocated to the treatment of wastes from such users (recovery of capital costs). Industrial users are not charged interest on this de facto "loan" of Federal funds and the "user charges" are such that the repayment period will extend for 30 years. Fifty percent of the funds recovered from industry must be returned to the Federal Treasury. The other half can be retained and of this half, a minimum of 80 percent must be used solely for long-range water pollution control projects approved by the Regional Administrator of EPA. The remaining 20 percent can be used for any purpose. Another important point a town or community must consider when allowing an industry to dump its treated or partially treated effluent into their system is that the additional costs involved in having to provide adequate additional treatment and handling may be completely out of proportion to the cost of the system without the industrial load.

A state may also have specific requirements which must be met by a grantee receiving State funds. For example, the State of Washington requires that before any grant funds are advanced the town or community must have a trained sewage plant operator who has been certified as having attended one of the training courses for operators. The training courses are sponsored by the State Department of Ecology.

Even with the Federal and State grant programs to assist them financially, many small towns and communities may find they have a problem raising their share of the total project cost. The EPA states in the 1973 Economics of Clean Water that: "Local governments will probably finance their portion of the capital expenditures through a variety of sources, including current general revenues and the issuance of municipal bonds." This may not be true in the small town or community. They often have trouble simply financing the few local programs they have, and in many instances local officials work for a very small salary or no salary at all. Any attempt to raise local taxes to increase general revenues quite often meets with strong opposition from residents.

The issue and sale of municipal bonds also presents a problem for the small town or community. If for some reason they have a bad credit rating or cannot sell the bonds once issued, what recourse do they have? If the population is

less than 10,000, which is the case being discussed in this paper, then it may be possible for the town or community to obtain a loan from the Farmer's Home Administration.

Loan assistance from the Farmer's Home Administration is extended to those towns and communities (under 10,000 population) who cannot market their bonds on the commercial market at a reasonable rate. These loans bear an interest rate of five percent and the loan term period is related to the needs of the community and their statutory borrowing limitations. However, under no circumstances will the term be greater than 40 years. At present, priority is being given to Indian tribes and towns and communities of less than 5,500 population with deteriorating systems or systems which need to be expanded and/or improved. Normally, the funds are made available when project expenditures approach the amount of the loan. Prior to entering into the construction contracts, the town or community must demonstrate that they can meet all FHA requirements for closing the loan. Repayments may be made by a combination of user assessments and general revenue, GO bonds and revenues or any one of the three methods stated. Systems financed in any portion by the FHA must be designed and constructed to meet EPA and, where required, State standards.

How much will treatment facilities cost the individual user? The EPA in its 1973 Needs Survey puts the average per capita costs for the entire Nation at $286 (based on 1972 population). In the 1973 EPA edition of The Economics of Clean Water, no figures are given for per capita costs for communities with a population under 2,500. Data obtained from the Farmer's Home Administration (State of Washington) on recently completed projects showed the following costs:

TOWN OR COMMUNITY POPULATION	TOTAL PROJECT COST	PER CAPITA COSTS	*PER CAPITA IF 90% GRANT RECEIVED
390	$ 663,800	$1,700	$170
380	$ 618,600	$1,626	$163
566	$1,307,900	$2,311	$231

*The data received from the FHA did not state if any grants were included in the total figures. The figures in this column are assumptions only and are made by the author.

During the fiscal year 1973, the Farmer's Home Administration (State of Washington) also had requests for assistance as shown below:

Initial Loans:	Domestic Water	14	$1,768,500
	Sewer	14	$2,014,000
	Combination	1	$ 250,000
			$4,032,500
Subsequent Loans:	Domestic Water	9	$ 588,500
	Sewer	2	$ 50,000
	Combination	1	$ 354,000
			$ 992,500
Initial Grants:	Domestic Water	5	$2,719,900
	Sewer	8	$1,168,200
			$3,888,100

Subsequent Grants:	Domestic Water	3	$ 386,600
		TOTAL	$9,299,700

Not all of these projects were funded, primarily because the allocation of grant funds was withdrawn. However, grant funds are expected to become available in FY 75 which begins July 1, 1974. As more grant funds become available, an increase is expected in the number of requests for assistance. At that time, the problem may arise of the FHA not having adequate numbers of personnel to process the loans and/or grants and inspect the projects.

There are probably other methods and means of reducing the economic impact of providing waste treatment facilities to small towns and communities; however, the scope of this paper is such that only the major sources have been pointed out.

TECHNICAL AND LEGAL ASSISTANCE

Technical and legal assistance is available from the various Federal, State, and County agencies with which a town or community would have contact during planning and construction of waste treatment facilities.

BENEFITS

Unless an individual or group is convinced that an expenditure of funds on their part will bring about some type of reasonable benefit, they are reluctant to provide the funds necessary for any public project. This is probably true to an even greater extent in the small town or community where the per capita cost of any public project can be much higher than in the more densely populated towns and cities. Even if this is not the attitude, people now are not willing to accept the old adage of: "We have to do it because the Federal (or State) government says it must be done."

There are many benefits to be derived from better waste treatment; however, it is doubtful that any small town or community can expect to benefit to the same extent as the larger cities. Benefits to the people of a small town or community may be things such as not having to have septic tanks pumped, the local children being able to swim in a stream nearby again, not having to worry about the objectionable smell from drain fields or inadequate present public facilities, or worrying about what type of detergent to use in the family washing machine. More tangible benefits could be that with the new or improved sewage treatment and possibly new collection systems, new businesses may locate in the community or long awaited new homes could be constructed. Local industries, which had not been able to expand due to inadequate treatment facilities may now be able to do so; thereby creating more jobs in the area. These are only a few of the benefits. There are many other benefits, some of which may be unique to a specific town or community. Regardless of why new or improved waste treatment facilities are constructed, in the long run everyone will benefit and will undoubtedly pay a share of the cost.

CONCLUSION

The small towns and communities of this Nation will undoubtedly do their share in achieving the goals set by PL 92-500. They will need technical, legal, and most of all financial assistance. One point must be remembered by our Federal and State environmental quality agencies: "The waste problems of the small towns and communities cannot be ignored and it most certainly will not go away unless meaningful assistance is provided."

REFERENCES

U.S. Environmental Protection Agency, "User Charges and Cost Recovery in Water Pollution Control," Environmental Facts (Sept. 1973)

U.S. Environmental Protection Agency, "Federal Grants for the Construction of Municipal Waste Water Treatment Facilities," Environmental Facts (July, 1973)

U.S. Environmental Protection Agency, "Secondary Treatment," Environmental Facts (Sept., 1973)

92nd U.S. Congress, Public Law 92-500 (Oct. 18, 1972)

U.S. Environmental Protection Agency, "Highlights of the Federal Water Pollution Control Act Amendments of 1972," An Environmental Law (Jan, 1973)

Fink, John S., "Community Facility Programs," Data From the Farmer's Home Administration, U.S. Department of Agriculture

U.S. Environmental Protection Agency, Clean Water - A Report to Congress - 1973 (May, 1973)

U.S. Environmental Protection Agency, Costs of Construction of Publicly Owned Waste Water Treatment Works - 1973 "Needs" Survey (Nov. 1973)

U.S. Environmental Protection Agency, The Economics of Clean Water - 1973 (Dec. 1973)

U.S. Environmental Protection Agency, The National Water Permit Program (June, 1973)

State of Washington, Department of Ecology, Water Quality Standards (1973)

U.S. Environmental Protection Agency, Upgrading Existing Waste Water Treatment Facilities (1972)

Great Lakes-Upper Mississippi River Board of State Sanitary Engineers, "Policies for the Review and Approval of Plans and Specifications for Sewage Collection and Treatment," Recommended Standards for Sewage Works - 1971 Revised Edition (1971)

FEEDLOTS AND PUBLIC LAW 92-500

By

Robert E. Smith

In this seminar I will try to deal with the effect of PL 92-500 on the feedlot industry in general and more specifically on the beef cattle feedlot.

Animals are grown and fed under a wide variety of management systems and environments. For this reason it is necessary to define what is meant by the term "feedlot." For the purposes of this report and the EPA'a effluent limitation guidelines for feedlots, a feedlot shall mean "a concentrated, confined animal or poultry growing operation for meat, milk, or egg production, or stabling, in pens or houses wherein the animals or poultry are fed at the place of confinement and crop or forage growth or production is not sustained in the area of confinement."[6]

Some of the operations may meet only part of the requirement and so would not come under the effluent limitation guidelines. An example would be a pasture or range situation where supplemental feeding may be required under severe conditions. These animals will be living under such low densities that the growth of plants and grasses will not be hindered and the wastes will be easily assimilated by the plants in a natural cycle.

The feedlot industry has several animal categories including beef cattle, dairy cattle, swine, chickens, turkeys, sheep and ducks. Each category has received special attention in the development document for feedlot point sources.

In the beef feeding industry there are basically two groups of feeders. The smallest, the "farmer feeder," is classified as an operation that handles less than 1,000 head. The second group that handles greater than 1,000 head is termed a "commercial feeder."

In the last 15 years there has been a growth trend toward more commercial feeders. In 1962 farmer feeders comprised 99.4 percent of the 230,000 beef feedlots and marketed 64 percent of the fed cattle. By 1972 the number of feedlots had decreased to less than 155,000. Farmer feeders had decreased in number by 35 percent while the commercial feeders increased by more than 46 percent. Also the number of cattle marketed by the two groups changed. By 1972 the commercial feeders only comprised 1.4 percent of the number of feedlots but fed and marketed over 60 percent of the fed cattle in the U.S. The largest increase has been in lots with greater than 32,000 head which increased by 20 times in the last ten years.[3] Even though the fed cattle marketed per year has doubled since WW II the number of feedlots has decreased considerably, with essentially all of the loss taking place in operations of less than 1,000 head.

Presently a candidate for MS in Environmental Engineering, at Washington State University, College of Engineering. Received a BS from Washington State University in Environmental Science.

The farmer feeder operation is many times a family operation and is run as a supplemental operation to their other farming and ranching enterprises. Due to the specialization and higher efficiency of the much larger commercial feeder the farmer feeder has been using his time and capital in other ventures and leaving the cattle feeding to the larger feeders.

This trend toward the large commercial feeder has resulted in the concentration of large amounts of animal wastes on very small areas creating a higher pollution potential than under the smaller scale and less confined operations before the 60's.

Animal feedlots are the largest source of solid wastes in the U.S., producing more than 2 B tons annually.[1,7,8] It is important to note that these wastes are potential pollutants and become pollutants when carried off the confined area by snowmelt or rainfall runoff and enter a stream or through seepage enter the groundwater. The disposal of wastes from a large beef feedlot is a major problem. A lot feeding 10,000 head will produce ½ million lbs. of manure daily.[5,8]

Many times people try to equate animal wastes with domestic wastes. Estimates generally say that one animal unit equals from 6-18 people depending on the situation, therefore the waste from a 10,000 head feedlot would equal a city of population from 60,000-180,000 people. However, this is a misleading statement because a high percentage of animal wastes are collected and spread on the land where in contrast a high percentage of human waste is carried to surface waters after various forms of treatment. In actuality only 5-10 percent of the animal wastes ever enter surface and ground waters. This 5-10 percent would put more lbs. of BOD in the nation's waters than domestic sewage if not contained.[8]

The pollutant concentrations in feedlot runoff range from 5-100 times those found in domestic sewage.[1,2,5,8] Some of the variables are pen cleanup schedule, duration of the preceeding dry period, intensity and duration of the rainfall, slope of the lot, dirt or concrete surface, percent roughage in the feed, temperature, breed and age of the animal, and the type of housing.

These runoff wastes are not readily treatable by traditional municipal waste treatment methods. Feedlot runoff has a higher solids concentration and a much higher pollutant strength than domestic sewage. Most cattle wastes also have a high lignin content which is only slowly degradable.[5] Also rainfall runoff results in shock loadings which put a strain on the conventional systems. These systems also require more sophisticated equipment and facilities, as well as trained operators. Animal wastes have been treated by conventional methods but the effluent still usually contains higher amounts of pollutants than domestic sewage.[5,8] After secondary treatment up to 80 percent of the phosphorous and 50 percent of the nitrogen still reamins.[7] The only real solution is to return the wastes to the land.

There are two major concepts in applying solid and liquid wastes to the land. One is application of the wastes for crop fertilization and irrigation. The other is a fairly new concept of applying wastes to the land for disposal purposes.

In the crop fertilization and irrigation approach no more waste is applied than is necessary to provide optimum crop growth. The seepage and runoff of pollutants from this type of application is not considered to exceed the amounts that runoff from inorganic fertilization.[3]

Disposal rates of application are very high rates of application. Rates up to 630 tons (dry) per acre have been tried.[3] There is not very much experience with these high rates of applying wastes to the land. Some of the problems are the tolerance level of crops to ammonia and salts, lack of commercial equipment that can haul these large amounts, odor, and possible runoff. The runoff potential from disposal rates of application is undetermined because of lack of experience with this method, but the runoff of pollutants is expected to be in excess of that found with normal fertilization rates.[3]

Before Public Law 92-500 most of the leading cattle producing states already had regulations requiring a feedlot to be registered or licensed if it was above a certain size. This included Arizona, Kansas, Iowa, Nebraska, South Dakota, and Oklahoma.[2,8] (Under Public Law 92-500 all feedlots are required to get a discharge permit if their operation is over 1,000 head.) These states and several others had also attempted before PL 92-500 to prevent water contamination from feedlot runoff sources. They usually suggested building ditches around a feedlot and diverting the runoff to a lagoon or pond. Usually the detention volume was calculated from either a 5 yr., 48 hr. storm, a 10 yr., 24 hr. storm, or a 25 yr., 24 hr. storm. Most of these states required that the pond be pumped out within 10-15 days.[2,8] The effluent limitations put out by the EPA are similar to these state effluent limitations.

The effluent limitations that must be achieved by feedlots by July 1, 1977 were based upon the average performance of the best existing systems in the several categories and subcategories within the industry. The technology applied by these exemplary feedlots has been termed "Best Practicable Control Technology Currently Available." (BPCTCA) In developing the BPCTCA the total costs in relation to effluent reductions were considered, as well as age and size of the facility, and the process employed. The BPCTCA also had to be considered to be reliable.

For the purposes of feedlots the wastewater is considered to be rainfall runoff and flush or wash down water for cleaning pens, stalls and houses.

The effluent limitation for feedlots by July 1, 1977 is "no discharge" of pollutants to navigable water bodies for runoff from any and all precipitation events up to but excluding anything in excess of the 10 yr., 24 hr. rainfall as established by the U.S. Weather Bureau for the area the feedlot is located in.[3] These limitations are applicable to the animal types including beef cattle, dairy cattle, hogs, chickens, turkeys, sheep, and horses. The only animal type excluded were ducks which have effluent limitations of 3.66 lb. BOD_5 per 1000 ducks for any one day, and coliform counts not to exceed 400 FC/100 ml. for the summer months or 2,000 FC/100 ml. during the winter months. Feedlots that already meet the no discharge limitation are already in existence which shows that the technology to provide no effluent discharge is available and economically achievable.

In the proposed guidelines no exceptions were made regarding the size of the operation. When the proposed guidelines were put out for public comment a majority of the comments received by the EPA centered on the fact that small feedlots should be excluded from the requirements. The EPA has now decided to review some more data that was submitted during the public comment period.[6] The present regulations affect only the operations as large or larger than a specified size for each category; i.e., 1000 beef cattle, 2500 hogs, 700 dairy cattle and others as defined by EPA.[6] It was felt from the available economic information that the large commercial

feeders could meet the requirements without undue economic hardship.[3] After the EPA's review of more economic data effluent limitations applicable to smaller feedlots will be proposed and put out for public comment.

For commercial feeders to meet the requirements a system that will contain all of the feedlots' contaminated runoff must be utilized. These collected wastes should be applied to productive crop land at rates such that crops may utilize the nutrients and moisture. Some of the possibilities are, 1) diversion ditches to keep water not falling on the lot from coming in contact with the wastes, which reduces the size of the holding facilities, 2) collection ditches for water coming off the lot, 3) holding ponds, 4) lagoons, or 5) terraces. Also an application system for applying the collected wastes to the land.

The size of the containment and storage systems will vary for each operation depending on the climate, topography, crop growing season, and length of time the ground may be frozen or saturated. Therefore an operation in a northern humid area where the ground is saturated part of the year will require a much larger containment and storage system than a feedlot located in a southern dry climate.

The Best Available Technology Economically Achievable (BATEA) has been determined from the very best performance by a specific feedlot within its category or subcategory. The effluent limitation which must be achieved by July 1, 1983 for all feedlot animal types including ducks is no discharge of pollutants to any navigable water from any precipitation event up to but excluding the 25 yr., 24 hr. rainfall event as established by the U.S. Weather Bureau for the region the point source is located in.[3]

The technologies used for the BPCTCA apply to the technologies available for BATEA as well as new technologies which at the present aren't generally available because of economics or reliability. These technologies are being demonstrated at field operations or universities where the situation is representative of a commercial operation. These technologies are available to give more flexibility in meeting the effluent limitations. These systems look very promising and warrant investment by the feedlot industry for application. Included are 1) wasteland, 2) dehydration with refeed, 3) oxidation ditch with refeed, 4) activated sludge (thermophilic conditions), and 5) water recycle processes.

The BATEA amounts to approximately a 10 percent increase in capacity over BPCTCA.[3] This slightly larger investment reduces the chances of a "slug flow" discharge of pollutants into a stream from a series of rainfall events. It is unnecessary to design beyond a 25 yr., 24 hr. rainfall because anything beyond that amount would probably be termed a natural disaster and effluent controls would not be technologically or economically feasible.[1]

For new sources the BATEA is required.

At the present time a complete and reliable estimate of the control costs is unavailable because of a lack of information. However, the best estimates from the available information place the figure at between $0.5 B. and $1.0 B. for the remaining total investment (this estimate includes the less than 1,000 head lots).

The EPA estimates that 60-70 percent of all lots with more than 1,000 head beef cattle can now meet the effluent guidelines of zero pollutant discharge.[3] However, only 20-30 percent of the lots with less than a 1,000 head of beef cattle can meet the zero discharge limitation.[3] Five segments of the feedlot are considered to essentially already meet the zero discharge limitation. This includes broiler production, egg production, turkeys, and sheep. The remaining industries, beef cattle, hogs, and dairy cattle will have to make some initial investment in pollution control facilities.

The estimates of the investment costs to meet the zero effluent limitation were made using two assumptions. First, it was assumed that livestock producers already have the land and equipment for the removal and disposal of solid manure or another system; and second, that lagoons, ditches, and equipment for effluent control and dispersion would be the only investment required for meeting the effluent guidelines.[4] These costs were estimated for all sizes of feedlots feeding beef, dairy cattle, or hogs. Costs decrease per head as the size of the lot increases.

The investment in effluent control systems as a percent of original investment varied from 34 percent for feeders marketing 100 head to 6.6 percent for feeders marketing 40,000 head.[2] The amount decreased for all segments as the size of the lot increased. These costs were estimated from model production units of each class of feedlot.[4]

The price effects will depend a lot on the time period in which the standards are applied. If applied immediately, there would be a temporary decrease in production and prices would rise. However, it is assumed that the standards will be applied gradually over the next several years.

The estimated price increases range from 0.9 cents per hundred weight of milk to $1.35 per hundred weight for hogs. Beef price increases were estimated at $0.30 for small lots marketing 100 head/yr. to $0.03 for lots marketing 42,000 head per year.[4] These price increases are those required to maintain the existing profit level. However, these estimates were made before the decision was made to not apply the zero discharge limitation at the present to the smaller lots. A new economic impact will be required after the controls for the small lots are proposed.

In general, in the long run, even though the price increases are quite insignificant in most cases, they will not be absorbed by the feedlot owners and will most likely be passed on to the other processors and finally to the consumer.

The application of effluent controls to the feedlots with greater than 2,000 head capacity is expected to have a minimal effect. This is because this size of operation needs a fairly large investment in facilities and equipment, and an additional increase in the original investment of under 8 percent will be accepted as "another necessary expense."[4] Also the number of feedlots needing to make pollution control investments will be less than 30 percent.[4] In some unique topographical situation that may be found on a few of these large lots the high control costs may force a closure. However, the number should be insignificant.

REFERENCES

1) Characteristics of Rainfall Runoff from a Beef Cattle Feedlot, Environmental Technology Research Series, EPA-R2-72-061, Sept. 1971.

2) Characteristics of Wastes from Southwestern Cattle Feedlots, Water Pollution Control Research Series, 13040 DEM 01/71.

3) Development Document for Proposed Effluent Limitations Guidelines and New Source Performance Standards for the Feedlots Point Source Category, EPA 440/1-73/004, August 1973.

4) Economic Analysis of Proposed Effluent Guidelines, Feedlots Industry, EPA-230/1-73-008, August 1973.

5) Evaluation of Beef Cattle Feedlot Waste Management Alternatives, Water Pollution Control Research Series, Report No. 13040 FXG 11/71, November 1971.

6) "Feedlots Point Source Category, Effluent Guidelines and Standards," Federal Register, V39, No. 32, Part II, Feb. 14, 1974.

7) Livestock Waste Management and Pollution Abatement, The Proceedings of the International Sumposium on Livestock Wastes, Ohio State University, Columbus, Ohio, ASAE Publication No. PROC-271, 1971.

8) Waste Management Research, Proceedings of the 1972 Cornell Agricultural Waste Management Conference, Syracuse, New York.

THE EFFECTS OF PUBLIC LAW 92-500 ON THE FRUIT AND VEGETABLE PROCESSING INDUSTRY

By

H. Richard Esvelt

According to the "Census of Manufactures", there are 1,450 fruit and vegetable canning and freezing plants in the United States. Fruit and vegetable canning, freezing and dehydrating firms vary greatly in size, organizational structure and products produced by each plant. Over a third of the plants would be considered small canners with an annual pack of less than 250,000 cases. At the other end 28 percent packed over 1,000,000 cases and would be classed as large plants. Ten percent of the canners packed over 5 million cases annually and would be classes very large. About the same proportions hold for freezing and dehydrating plants.

Because of the unique structure and competitiveness of the fruit and vegetable processing industry, pollution abatement standards when imposed on the industry, will have a serious impact on the industry itself. The magnitude of this impact will depend on the level of investment required to meet the specific standards. The smaller third and to some extent the middle third of the plants are expected to be seriously impacted. The specific plant impacts will depend on many factors such as plant size, profitability of the plant, location and availability of low cost treatment strategies, and existing waste water treatment facilities already operated by the plant. Land area available to the plant for treatment facilities and possible land application of the waste has a large effect on the total cost of treatment.

Many different treatment systems are being applied successfully in the treatment of fruit and vegetable processing wastes. Table 1 lists some of these treatment systems utilized and the expected waste load reductions from the different systems.

To meet the effluent limitations as proposed, the fruit and vegetable processing industry will have to combine some of these various systems. A number of alternative combinations are presented in Table 2. The apple processing segment of the industry is used as an example. The combinations were proposed by the Ben Holt Co. a consultant for the E.P.A. Alternatives B and E are processes to meet Best Practicable Treatment guidelines. Alternatives C, F, and G can meet Best Available Treatment. D, spray irrigation, is indicated to provide treatment to meet both the BPT and BAT guidelines. As I mentioned earlier, if land area is available in close enough proximity to the plant, this can be an economical treatment alternative, plus the possible monetary return from crop production.

Presently a candidate for M.S. in Environmental Engineering, at Washington State University, College of Engineering. Received a B.S. in February, 1969 from Washington State University in Civil Engineering.

Alternative B can be upgrade to alternative C by addition of the indicated processes, and likewise alternative E can be improved to F or G. So system combinations B and E will meet BPT and then later will meet BAT guidelines after addition of the other processes.

Initial treatment plant investments and annual cost data for each of the alternatives presented for large and small plants, are listed in Table 3, in thousands of dollars.

One consideration not mentioned by any of the papers I found on treatment costs was the monetary return from the sale of waste by-products from this industry. Initial waste screening solids are sold as cattle feed along with dewatered sludge. The sludge, if not used for cattlefeed, can be applied on crop land for fertilizer. Other plants such as potato processing reclaims and sells grease. The percentage of plants utilizing by-product recovery and sale and the amount of money realized from these sales, was lacking from any articles I could find.

Approximately two-thirds of the plants in the citrus and apple processing portion of the industry have tie-ins with municipal systems or have land-irrigation waste disposal systems. Except for pre-treatment prior tc discharge into municipal sewers, these plants should not need further treatment for BAT. The remaining one-third will all need further treatment to meet the 1983, BAT guidelines.

Table 4 shows the various treatment strategies that will be utilized by these, one-third of the citrus and apple processing plants to meet BPT and BAT guidelines. The data is derived from schedules provided by E.P.A.

The estimated distribution of treatment practices for 1977 (BPT) and 1983 (BAT) and the distribution of present treatment practices are presented in Table 5, for the segment of the industry that processes citrus and apple products.

In order to cover treatment costs, the EPA estimates that a price increase for products will be in the range of one percent for BPT guidelines and an additional one percent for upgrading from BPT to BAT treatment. Because of the competative nature of the industry, the small plants will not be able to raise prices enough to cover waste treatment costs. So many plants, especially single-product plants, are expected to close down.

Small plants comprise a relatively small portion of total industry production. Consequently, production loss from small plant closures can be made up by the larger plants. Economic impacts, in the local areas around these small plants can be severe, however.

In conclusion, the overall impact of public law 92-500 on the fruit and vegetable processing industry is expected to be moderate on an industry wide basis but some small plant closures can be expected.

There should be no production loss but employment is expected to decline by approximately 1.5 percent throughout the industry.

REFERENCES

1. "Economic Analysis of Proposed Effluent Guidelines", U.S. EPA, (Oct. 1973).

2. "Development Document for Proposed Effluent Limitations Guidelines and New Source Performance Standards for the Citrus, Apple and Potato Segment of the Canned and Preserved Fruits and Vegetables Processing", U.S. EPA, Nov. 1973).

3. Public Law 92-500, 92nd Congress, S. 2770, (Oct. 18, 1972).

4. "The Economics of Clean Water", U.S. EPA, (Dec. 1973).

5. "Canned and Preserved Fruits and Vegetables Processing Point Source Category", Federal Register, Part III, Vol. 39, No. 56, U.S. EPA, (March 21, 1974).

6. Selected articles from Proc. 1st National Symposium on Food Processing Wastes, Portland, Oregon (April 1970).

TABLE 1

Effectiveness and Application of Waste Treatment Systems

Treatment System	Application	Waste Load Reduction	
Flotation	preliminary	BOD - 30%	55 to 80%
Sedimentation	primary	BOD	50 to 80%
Aerated Lagoons	biological	BOD	50 to 99%
Aerobic Lagoons	biological	BOD	50 to 99%
Trickling Filter	biological	BOD	70 to 90%
Anaerobic & Aerobic Lagoons	biological	BOD	95%
Anaerobic, Aerated & Aerobic Lagoons	biological	BOD	99%
Anaerobic contact	biological	BOD	90 to 95%
Activated sludge	biological	BOD	90 to 95%
Extended aeration	biological	BOD	90 to 95%
Microscreen	Advanced	BOD to 10 - 20 mg/1 SS to 10 - 15 mg/1	
Electrodialysis	Advanced	TDS	90%
Carbon Adsorption	Advanced	BOD	98%
Chemical Precip.	Advanced	Phosphorus	85 to 95%
Reverse Osmosis	Advanced	Salt to 5 mg/1 TDS to 20 mg/1	
Spray Irrigation	Ultimate	Complete	
Flood Irrigation	Ultimate	Complete	
Ponding & Evaporation	Ultimate	Complete	

Source: "Developmental Document for Proposed Effluent Limitations Guidelines" EPA.

TABLE 2

Alternative Strategies of Effluent Reduction

Treatment Component	Alternative For Apple Products						Alternative For Citrus Products					
	B	C	D	E	F	G	B	C	D	E	F	G
Screening	X	X	X	X	X	X	X	X	X	X	X	X
Cooling Tower							X	X		X	X	X
Shallow Lagoon (30 day)		X	X					X	X			
Aerated Lagoon (settling)		X					X	X				
Aerated Lagoon (no settling)	X	X				X	X	X				X
Anaerobic - Aerobic Lagoon								X				
Activated Sludge				X	X	X				X	X	X
Sand Filtration					X	X					X	X
Spray Irrigation			X						X			

B & E - BPT; C, F, & G - BAT; D - Both

Source: EPA and Ben Holt Co., Inc.

TABLE 3

Investment (I) and Annual Cost (AC) For
Selected Apple Products Plants

Treatment Practice	Type Cost	Small plant 100 ton/day (thousands of dollars)	Large Plant 1,000 ton/day
Treatment B (BPT)	I	32.0	135.2
	AC	11.8	34.4
Treatment C (BAT)	I	74.0	278.2
	AC	42.2	60.7
Treatment D (BPT & BAT)	I	49.0	199.2
	AC	11.0	45.3
Treatment E (BPT)	I	242.0	600.2
	AC	9.5	33.3
Treatment F (BAT)	I	280.0	692.7
	AC	17.4	48.8
Treatment G (BAT)	I	295.0	757.7
	AC	22.8	79.2

Source: EPA

TABLE 4

Treatment Strategies to be used to meet BPT & BAT

Description	BPT Strategy	Treatment (percent)	BAT Strategy	Treatment (percent)
Citrus:				
Municipal	--	12	--	12
Secondary	B	16	C	16
	E	16	F	10
			G	6
Land	D	56	D	56
		100		100
Apple Products:				
Municipal	--	26	--	26
Secondary	B	10	C	10
	E	10	F	6
			G	4
Land	D	54	D	54
		100		100

Source: EPA

TABLE 5

Present and Estimated Distribution of Treatment Practices for Citrus and Apple

Type of Prod. & time period	Type of Treatment				
	Municipal %	Land Disposal %	Biological %	None %	Total %
Citrus:					
1973 (current)	26	46	20	8	100
1977 (BPT)	29	62	B: 4 E: 5	--	100
1983 (BAT)	19	62	C: 4 F: 3 G: 2	--	100
Apples:					
1973	30	36	15	19	100
1977	39	54	B: 4 E: 3	--	100
1983	39	54	C: 4 F: 2 G: 1	--	100

Source: EPA

RELATIVE ECONOMICS OF APPROACHING ZERO DISCHARGE OF POLLUTANTS FROM POTATO PROCESSING WASTES IN IDAHO

By

F. LEON BALLARD

In order to assess the cost of approaching the concept of "zero discharge of pollutants" for the potato process, treatment of a typical effluent has been hypothesized at various levels of pollutant removal to show how rapid costs rise with added treatment. The quantity of flow chosen for these calculations was 1 mgd; the values of the typical waste characteristics were taken from a report by CH_2M Hill Engineers and are shown in Table 1. Costs and design are given in Tables II-VIII.

PRELIMINARY TREATMENT

The first processing to be considered is preliminary treatment. This includes grit chambers, screen chambers, overflow and bypass chambers and Parshall flume. Robert Smith gives the equipment cost by the following equation:

Equip. Cost = \$14.7 x (mgd) 0.625 per 1000 gal.

1965 Cost = \$14,700

Engineering News-Record shows an index for July, 1965, as 977 and January, 1973, as 1838.

$$1973\ \text{Cost} = \frac{1838}{977} \cdot (\$14{,}700) = \$27{,}640$$

PRIMARY TREATMENT

The second process is primary treatment which includes primary settling tanks, pipes, scum removal, valves, fittings, sludge waste pump and sludge collector. Estimates of the equipment costs are by Russell and Axon (January, 1960 ENR Index= 812).

Cost = dollars/ft^2 = \$13.4 = \$5.2 (1000/ft^2)

Appendix 1 shows a surface area of 1116 ft^2

$$\text{Cost} = \$13.4 = 5.2 \cdot \frac{1000}{1116} \cdot .9 = \frac{\$18.11}{ft^2}$$

Mr. Ballard is presently a candidate for an M.S. in Civil Engineering at the University of Idaho in the College of Engineering. He received a B.S. in Civil Engineering from the University of Idaho in 1973.

Total Equipment Cost $= (1{,}116\ ft^2)\ \left(\frac{\$18.11}{ft^2}\right) = \$20{,}200$

1973 cost $= \$20{,}200\ \left(\frac{1838}{812}\right) = \$45{,}725$

At this point the following water quality parameters exist:

Waste influent

Suspended Solids	1370 mg/l
BOD	1040 mg/l

Primary effluent

Suspended Solids	195 mg/l
BOD	550 mg/l

Removals across primary clarifier are as follows:

SS = 86% BOD = 47%

SLUDGE AS CATTLE FEED

In most of the potato processing industries the sludge from the primary underflow are recovered and sold as cattle feed. Therefore it is necessary to use vacuum filters to dewater the sludge. This also means that digestion is not necessary. (The construction costs following include the cost of constructing a digester. However, for the purpose of this paper the annual cost of construction is assumed to be equal to the annual cost of land filling excess sludges.) Russell and Axon (Jan., 1960) give the cost of vacuum filters as:

Cost = \$12,800 + \$37,200 (ft2/1000)

Appendix 1 shows the area of the filter needed as 184 ft^2.

Therefore Cost = \$12,800 + \$37,200 (1.84) = \$81,248

1973 cost = $\frac{1838}{812}$ (\$81,248) = \$183,900

The cattle feed sold for \$30.70 per ton in 1970. In 1973 the cattle feed sold for \$43.10 per ton. Therefore, the total return per year is \$46,250.

SECONDARY TREATMENT

As a third step in treatment activated sludge is used as secondary treatment. The current standards define secondary treatment as that which releases a monthly average of 30 mg/l or less BOD as effluent. Therefore, the system must be designed to accomplish this. Design criteria and calculation are shown in Appendix 1. A summary of the costs are given on Table II.

Smith (July, 1965) gives the total cost for a blower installation which includes blowers, air headers, piping and blower house as:

Cost = \$10,570 + \$5, 875 (cfm/1000)

Calculations show a blower which has a capacity of 3,810 cfm of air is required

Therefore Cost = \$10,570 + \$5,857 (3.810) = \$32,900

1973 Cost = $\frac{1838}{977}$ (\$32,900) = \$61,900

Cost of aerators and pipe gallery are given by Smith as:

Cost = $\frac{\text{dollars}}{\text{mg(vol)}}$ = \$175,000 + \$36,500 $(\frac{1.0}{\text{mg(vol)}})$ .818

Appendix 1 shows the volume required for aeration as 108,330 gallons.

Therefore Cost = (.108333) (\$175,000 = \$36,500 $(\frac{1.0}{.108333})$ .818

Cost = \$43,315

1973 Cost = $\frac{1838}{812}$ (\$43,315) = \$98,045

The requirement for activated sludge treatment is the secondary clarifier. Estimates by Russell and Axon (1960) include pipes, fittings, valves, sludge waste pump and sludge collector.

$\frac{\text{Cost}}{\text{ft2}}$ = \$12.60 + \$5.35 $(\frac{1000}{\text{ft}^2})$ 1.126

Appendix 1 gives the required surface area as 1,448 ft^2.

Cost = 1448 (\$12.60 + \$5.35 (100/1448 ft^2) $^{1.126}$) = \$23,350

1973 Cost = $\frac{1838}{812}$ (\$23,350) = \$52,856

Cost of activated sludge return pumps by Smith:

Cost = 3650 + 1125x(mgd) (plant size)

Cost = \$4,775

1973 Cost - $\frac{1838}{812}$ (\$4755) = \$10,800

Assuming 85% removals for suspended solids and a removal of 520 mg/l of BOD

Suspended solids removal = .85 (195) = 165 mg/l

BOD removed = 550 - 30 = 520 mg/l

SS in effluent = 195 - 165 = 30 mg/l

BOD in effluent = 550 - 520 = 30 mg/l

Up to this point the values given have been only for equipment costs. Added to these for total cost are construction, operation and maintenance. Smith gives the following costs for construction and O & M costs.

	Construction	O & M
Primary treatment (1973)	464,660	27,530
Secondary treatment (1973)	447,340	27,530

PHOSPHATE REMOVAL

In order to achieve greater removals tertiary or advanced waste treatment is required. The potato industry may be required to provide phosphate removal. The raw waste contains an average of 11.8 mg/l phosphate. After primary treatment 10.9 mg/l are assumed left. Data from a post-design study of the J.R. Simplot plant at Burley (A.T. Wallace for CH_2M-Hill) show for every 100 lbs. of BOD utilized 1 lb. of phosphate is utilized by the microorganisms for cellular growth. Therefore, the phosphate removed in the activated sludge process is 520 mg/l BOD $\left(\frac{\text{lb. } PO_4}{100 \text{ lb. BOD}}\right)$ = 5.2 mg/l PO_4. The remaining phosphate to be removed by lime coagulation is 10.9 - 5.2 = 5.7 mg/l. The reaction of lime ($Ca(OH)_2$) with phosphate is given by the following equation:

$$5Ca^{+2} + 7OH^{-} + 3H_2PO_4 \rightarrow Ca_5OH(PO_4) + 6H_2O$$

Cost data shown in Appendix 2.

Capital costs for a lime system:

Lime storage and feeding	=	35,000
Rapid Mix	=	2,000
Clarifiers	=	37,000
Flocculation	=	38,000
Flow and pH Controls	=	5,000
Total	=	$117,000

Amortization & Interest	$9,900
A & I ($/mg)	27
O & M ($/mg)	
Clarification	27
Chemical Costs	16
Total Treatment	$70 per mg (annual)

Total Annual Cost = 365(70) = $25,550

Data show 80% removal of phosphate and removal of 65% BOD and 80% of the suspended solids.

PO_4 removed = .8 (5.7) = 4.56 mg/l

PO_4 in effluent = 1.14 mg/l

BOD removed = .65 (30 mg/l) = 19.5 mg/l

BOD in effluent = 10.5 mg/l

SS removed = .8 (30) = 24 mg/l

SS in effluent = 6 mg/l

The total nitrogen in the raw waste is assumed to be 61 mg/l. After primary clarification 9 mg/l is removed. Data from the post design of the J.R. Simplot plant at Burley show for every 10 lbs. of BOD used up in the activated sludge process, 1 lb. of nitrogen is utilized.

$$\text{Nitrogen utilized} = (520 \text{ mg BOD utilized}) \left(\frac{\text{lb nitrogen}}{10 \text{ lb BOD}}\right)$$

$$= 52 \text{ mg/l nitrogen utilized}$$

Using this value, practically all the nitrogen will be utilized by the microorganisms in the activated sludge process. Therefore, it is not necessary to provide any further treatment for nitrogen removal.

To further reduce the suspended solids and BOD, microscreening might be used. Diaper suggests the following guide for anticipated removals from secondary effluents:

*Fabric aperture	Anticipated removals	
	ss	BOD
22 micron	70-80	60-70
35 micron	50-60	40-50

*Taken from Culp & Culp (Advanced Waste Treatment)

The following costs are based on design criteria given by reference (2).

Capital costs	$60,000	
Amortization and Interest		$4,230
A & I ($/mg)		$14
O & M ($/mg)		57
Total Treatment Cost		$71 mg (annual basis)
Total Annual Cost		$25,915

Removals after microscreening

BOD = .65(10.5) = 6.8 mg/l

BOD in effluent = 3.7 mg/l

SS = .75 (6) = 4.5 mg/l

SS in effluent = 1.5 mg/l

CARBON ABSORPTION

For continued removal of BOD and suspended solids carbon absorption may be used. Design criteria for granular activated carbon absorption and regeneration operations on highly treated influent are shown in reference (2).

Costs

Capital cost in dollars

Carbon inventory	$ 30,000
Carbon contracting	$240,000
Pipes, pumps & tankage	$ 40,000
Regeneration	$ 40,000
Total capital costs	$350,000

Unit costs

Amortization and interest	$ 29,600	
A & I ($/mg)	81	
O & M ($/mg)	69.3	
Electricity	0.3	
Fuel	0.8	
Make up carbon	5.6	
Operating labor	46.7	
Maintenance labor	9.1	
Maintenance materials	2.7	
Instrument maintenance	4.1	
Total	147.6 ($/mg) annual basis	

Annual Cost = 365($147.6) = $53,874

Data from references 1, 2, and 3 show the removals of BOD to be approximately 60% and of SS to be 50%.

BOD removed = .6(3.7) = 2.22 mg/l

BOD in effluent = 3.7 - 2.22 = 1048 mg/l

SS removed = .5 (1.5) = .75 mg/l

SS in effluent = 1.5 = .75 - .75 mg/l

ELECTRODIALYSIS

If there is a need to remove inorganics from the waste water, electrodialysis should possibly be considered. The following costs are based on the design criteria shown in Table VIII.

Capital Cost	$390,000 (for 1 mgd)
Amortization & Interest	$ 33,000
A & I ($/mg)	$ 90
O & M ($/mg)	$ 289
Total treatment cost	$ 379 (per mg) annual basis
Annual costs =	$ 379 (365) = $138,335

CHLORINATION

The final step in treatment is chlorination. This will reduce the coliform count to levels which are permitted by law.

For a 1 mgd plant Smith found the cost of chlorine contact tank and chlorinator equivalent to the following equation:

Cost = $9000 (mgd) $^{.467}$ = $9000

Cost of control house including excavation, building, laboratory and shop.

From Smith

Cost = $4000

Total Cost = $4000 + $9000 = $13,000

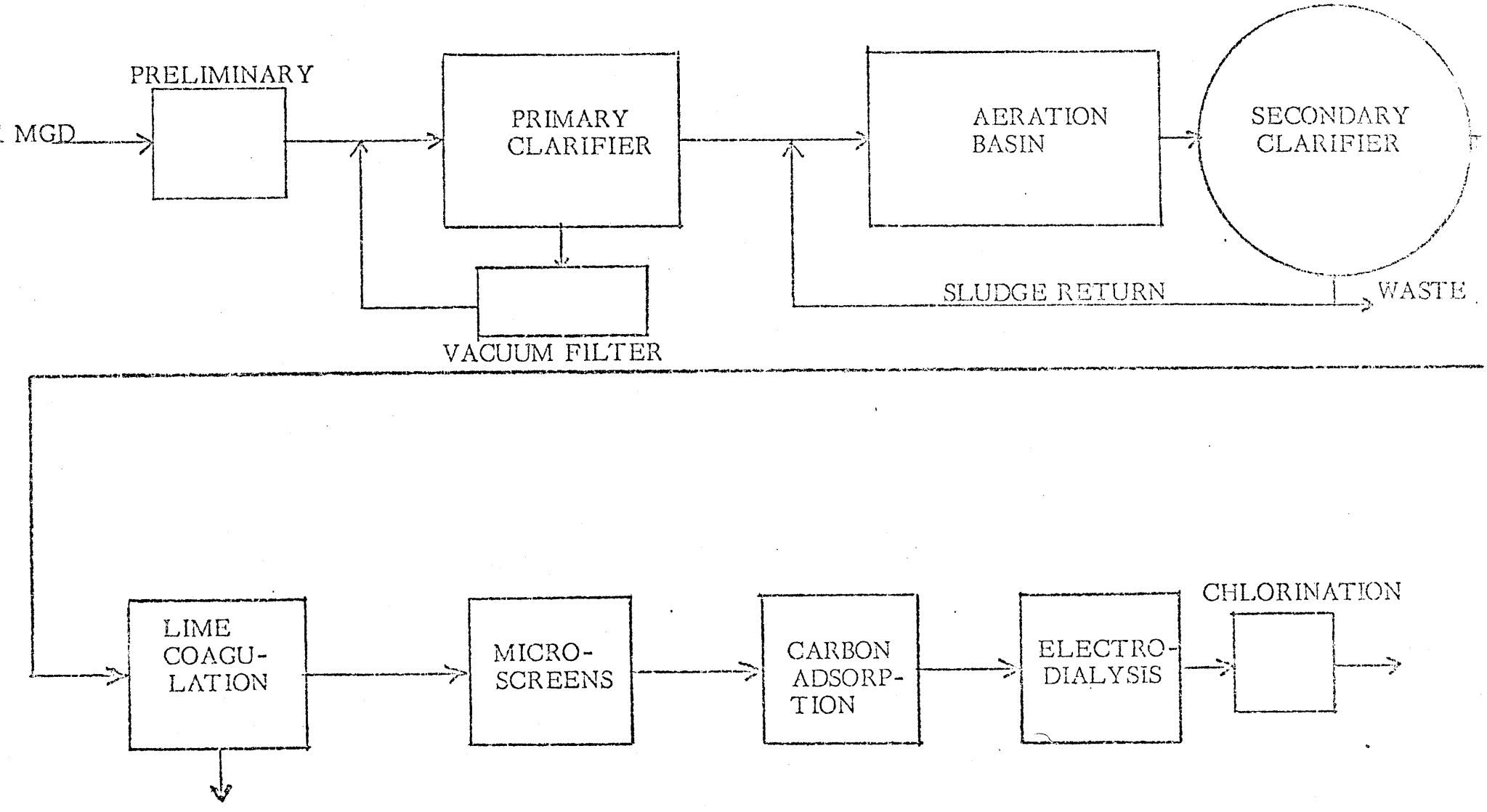
1973 Cost = $\frac{1838}{977}$ ($13,000) = 24,450

Annual Cost = .084 (24,450) = 2,050

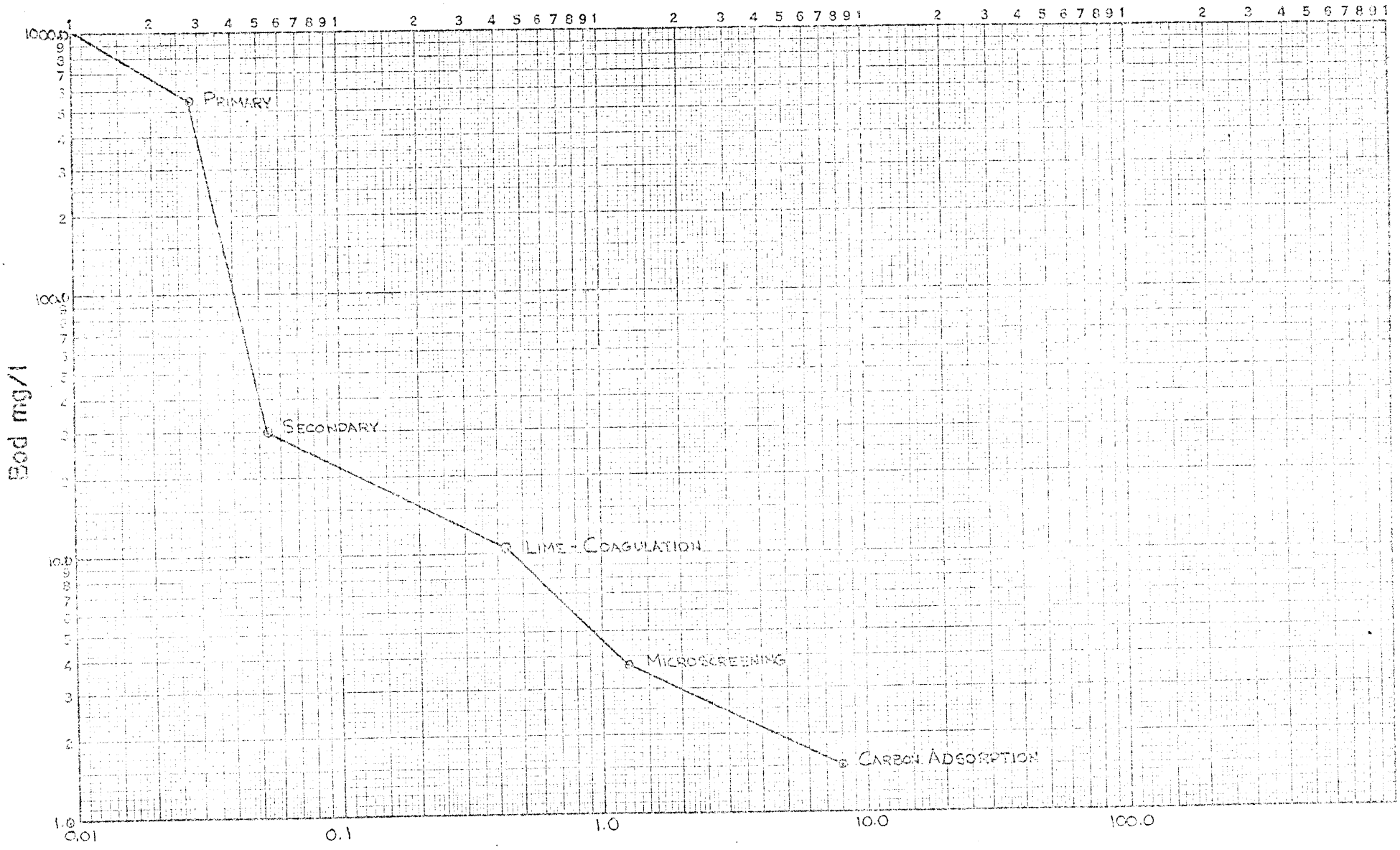
Assume construction and operation and maintenance costs are accounted for in the primary and secondary treatment calculations earlier.

Table IV lists the various removals for each step in treatment and the cost for removing BOD and suspended solids.

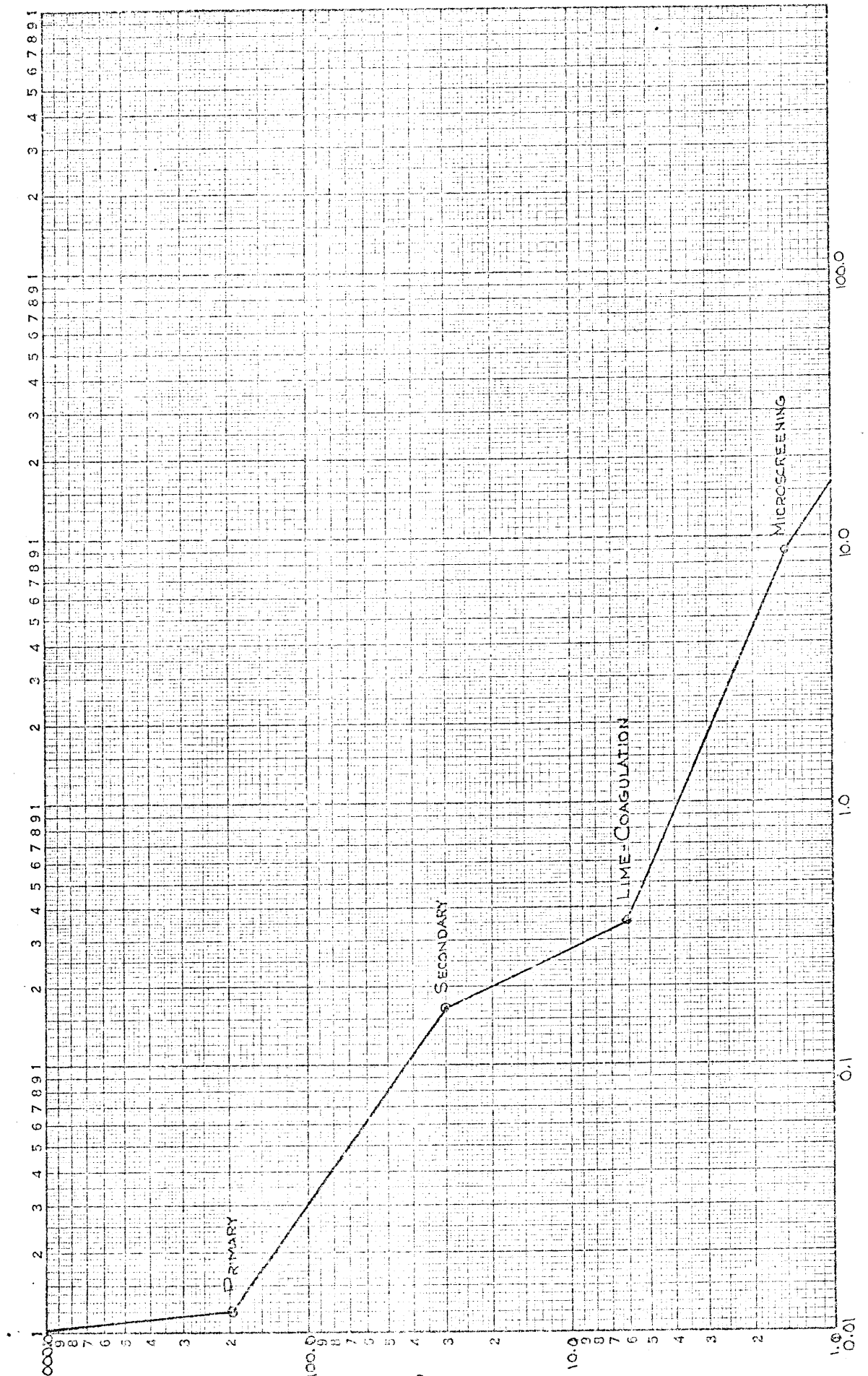
The cost of removing organics after secondary treatment becomes very expensive. The data was plotted on 3 x 5 cycle log paper to show how these costs rise with added treatment. These are shown as Figures 2 and 3. Before laws are passed to require "zero discharge of pollutants" the economics of removing the last one or two per cent should be carefully looked at.


MGD
PRELIMINARY
PRIMARY CLARIFIER
AERATION BASIN
SECONDARY CLARIFIER
SLUDGE RETURN
WASTE
VACUUM FILTER
LIME COAGU-LATION
MICRO-SCREENS
CARBON ADSORP-TION
ELECTRO-DIALYSIS
CHLORINATION

FLOW SCHEME



Dollars Per Lb. of Bod Removed



(16)

APPENDIX I

DESIGN CRITERIA AND CALCULATIONS

I. PRIMARY CLARIFIER

Assuming a two hour detention time for the clarifier, the volume is given by the following equation:

Volume = (Flow rate) (Detention time)
Volume = (1 MGD) (2 Hours) = 11160 $ft.^3$

Assuming a 10 ft. depth, the surface area will be 1116 $ft.^2$

II. VACUUM FILTER

Assuming:

1) 25% solids concentration
2) filter loading of 2 lb. per $ft.^2$ - hr.
3) filter is 60% efficient

Total solids available = 1370-195 = 1175 mg/l

Lb. solids per day = (1175 mg/l) (1 MGD) (8.34) = 9800 Lb. per day

For 60% efficiency solids = 0.6(9800) =5880 Lbs. per day

For an operation of 16 hours per day the solids = 368 Lbs.per hour

Area of filer required = $\frac{368 \text{ Lbs. per hr.}}{2 \text{ Lbs. per } ft.^2 \text{ - hr.}} = 184\ ft.^2$

III. AERATION AND ACTIVATED SLUDGE

A. Blowers

Assuming a detention time of two hours in the aeration basin and a recycle of 0.3 MGD.

Oxygen Requirement

Lb. O_2 per day = a' (Lb. BOD removed per day)

For various industrial wastes a' varies from 0.9 to 1.4. So assume a' equals 1.2 and the amount of BOD removed from the activated sludge process is 520 mg/l.

Lb. of BOD removed = 4337 Lbs. per day

Lb. of O2 needed per day = 1.2 (4337 Lb. per day) = 5204 $\frac{\text{Lb.}}{\text{day}}$

Assume the dissolved oxygen level in the aeration basin is 1.5 mg/l and an oxygen transfer of seven per cent. Temperature at 20 degrees centigrade and the constant alpha equal 0.95. The depth of the aeration tank is 14 ft. and the saturation concentration is 9.02 mg/l.

C_{sm} = Saturation concentration at the middepth

$C_{sm} = C_s(P_b/29.4 + O_t/42)$ $\quad C_s = 9.02\ (.95) = 8.563$

$C_{sm} = 19.9 \quad O_t = 19.53$

$C_{sm} = 8.569\ (19.9/29.4 + 19.53/42) = 9.785$ mg/l

For diffused aeration the following equation can be used to find the Lbs. of oxygen per hour transferred per unit (ECKENFELDER).

$$N = 0.0026\ (G)^{0.85}(H)^{0.7}(C_{sm} - C_o)\ (alpha)\ (1.2)^{T_t - T_{20}}$$

Assume a gas flow rate of 8CFM

N = 0.6824 Lb. per O_2 per hour unit

318 Units are needed

Amount of air required = 318 Units (8CFM per unit)
2544 CFM

A.S.C.E. specifications show the compressor capacity to be 1.5 (calculated requirement) = 1.5 (2544) = 3816 CFM

B. Aerators

For a detention time of two hours and a recycle of 0.3 mgd the required volume is:

Volume = (1.3 MGD) (2 Hours) = 0.10833 MG

C. Secondary clarifier

Assume a hydraulic detention time of two hours and a depth of ten feet. Flow into clarifier is inflow plus recycle which is 1.3 MGD.

Volume = (1.3 MGD) (2 Hours) = 14483 $ft.^3$

Surface area = 1448 $ft.^2$

TABLE I

ESTIMATED POTATO PROCESS WATER CHARACTERISTICS

SAMPLE CHARACTERISTICS	ESTIMATED ROGERS BROTHERS, RICHLAND PROCESS WATER	ESTIMATED ROGERS BROTHERS, CLARIFIED PROCESS WATER
PH	7.5	7.5
ALKALINITY	320	315
TOTAL SOLIDS (MG/L)	2600	1265
VOLATILE SOLIDS (MG/L)	1870	560
TOTAL SUSPENDED SOLIDS (MG/L)	1370	195
VOLATILE SUSPENDED SOLIDS (MG/L)	1270	170
TOTAL PHOSPHATE (MG/L)	11.8	10.9
COD (MG/L)	2800	1030
FILTERED COD (MG/L)	915	825
BOD (MG/L)	1040	550
FILTERED BOD (MG/L)	405	390
NITROGEN (MG/L)		
TOTAL KJELDAHL	55	46
AMMONIA	13	12
ORGANIC	42	34
NITRITES	0.1	0.1
NITRATES	6.0	6.0
BORON (MG/L)	0.08	0.08
SULFATE (MG/L)	22.8	24.8
CONDUCTIVITY (MHOS/CM)	1.2	1.21
Ca (MEQ/L)	3.45	3.45
Mg (MEQ/L)	1.71	1.71
K (MEQ/L)	3.18	3.18
Na (MEQ/L)	3.49	3.2
CO_3 + HCO_3 (MEQ/L)	7.4	7.6
CHLORIDES (MEQ/L)	0.77	0.77
SODIUM ABSORPTION RATIO	2.2	2.0
SOLUBLE SODIUM PERCENTAGE	29.5	27.8
RESIDUAL SODIUM CARBONATE (MEQ/L)	2.24	2.44

TABLE II

COSTS OF PRIMARY AND SECONDARY TREATMENT FOR

A 1 MGD POTATO PROCESSING PLANT

TOTAL COST FOR PRIMARY TREATMENT

EQUIPMENT	COST	ANNUAL COST
PRELIMINARY	$ 27,640	$ 2,320
PRIMARY	$ 45,750	$ 3,843
VACUUM FILTER	$183,900	$15,447
CONSTRUCTION	$464,660	$39,030
OPERATION AND MAINTENANCE		$27,530
TOTAL	$727,950	$88,170
REVENUE FROM SLUDGE		$46,250
TOTAL ANNUAL COST		$41,920

TOTAL COST FOR SECONDARY TREATMENT

EQUIPMENT	COST	ANNUAL COST
BLOWERS, AIR HEADERS PIPING AND HOUSING	$ 61,930	
AERATORS AND PIPE GALLERY	$ 98,045	
SECONDARY CLARIFIER	$ 52,855	
RETURN PUMPS	$ 10,800	
TOTAL EQUIPMENT	$223,630	$18,785
CONSTRUCTION	$447,340	$37,580
OPERATION AND MAINTENANCE		$27,530
TOTAL COST	$670,970	$83,895

TABLE III

COST OF TERTIARY TREATMENT

FOR A 1 MGD POTATO PROCESSING PLANT

TREATMENT	CAPITAL COST* DOLLARS	ANNUAL COST** DOLLARS
LIME COAGULATION	$117,000	$ 25,550
MICROSCREENING	$ 60,000	$ 25,915
CARBON ABSORPTION	$350,000	$ 53,874
ELECTRODIALYSIS	$390,000	$138,335
CHLORINATION	$ 24,450	$ 2,050
TOTAL	$941,450	$243,880
ADD COST OF PRIMARY AND SECONDARY TREATMENT		
PRIMARY		$ 41,920
SECONDARY		$ 83,895
TOTAL		$125,815
TOTAL ANNUAL COST FOR COMPLETE TREATMENT		$369,690

*Capital Cost--These Figures Do Not Include Operation & Maintenance Costs

**Annual Cost--Based On 5-5/8% Interest And A Life of 20 Years

TABLE IV

COST OF BOD AND SUSPENDED SOLIDS REMOVAL

FOR A 1 MGD POTATO PROCESSING PLANT

TREATMENT	ANNUAL COST* (DOLLARS)	BOD IN (MG/L)	BOD OUT (MG/L)	BOD REMOVED (MG/L)	COST PER LB. BOD REMOVED
PRIMARY	$ 41,920	1040	550	490	2.8¢
SECONDARY	$ 83,895	550	30	520	5.3¢
COAGULATION WITH LIME	$ 25,550	30	10.5	19.5	43.0¢
MICROSCREENING	$ 25,915	10.5	3.7	6.8	$1.25
CARBON ABSORPTION	$ 53,874	3.7	1.5	2.2	$7.97
TOTAL OVERALL TREATMENT	$231,154	1040	1.5	1038.5	7.3¢

TREATMENT	ANNUAL COST*	SS IN (MG/L)	SS OUT (MG/L)	SS REMOVED (MG/L)	COST PER LB. SS REMOVED
PRIMARY	$ 41,920	1370	195	1175	1.2¢
SECONDARY	$ 83,895	195	30	165	16.7¢
COAGULATION WITH LIME	$ 25,550	30	6	24	35.0¢
MICROSCREENING	$ 25,915	6	1.5	4.5	$1.89
CARBON ABSORPTION	$ 53,874	1.5	0.75	0.75	$23.60
TOTAL OVERALL TREATMENT	$231,154	1370	0.75	1369.25	5.6¢

Annual Cost*--Based On 5-5/8% Interest And a 20 Year Life

TABLE V

DESIGN CRITERIA: SINGLE-STAGE LIME CLARIFICATION

DOWNSTREAM FROM AN ACTIVATED SLUDGE PROCESS

PROCESS COMPONENTS	DESIGN CRITERIA
1. Equipment Type	Conventional upflow solids contact clarifier with flocculation and rapid mix
2. Overflow Rate	1,000 gpd/ft.^{2}
3. Detention Times	Settling---2-2.5 hours Rapid mix--1 minute
4. Lime Type	Purchased dry, fed slaked
5. Dosage	150 mg/l total with 45 mg/l makeup lime required; the balance is recovered Through recalcination.
6. Influent Phosphorous Concentration	10 mg/l
7. Effluent Phosphorous Concentration	1-2 mg/l (total)
8. Sludge Production	1.75 tons/day/mg
9. Rapid Mix Facilities	Concrete basins, with stainless steel mixers, shafts and impellers
10. Flocculation facilities	Flocculation chambers inside circular settling basins with necessary baffle walls and mixers

TABLE VI

DESIGN CRITERIA: MICROSCREENING[1]

PROCESS ELEMENTS	DESIGN CRITERIA
1. HYDRAULIC LOADING[2] (23 micron fabric)	600 gal/ft^2/hr
2. BACKWASH WATER REQUIRED	3-6 per cent of average flow
3. BACKWASH PRESSURE	20-80 psi
4. DRUM SPEED	0.7-4.3 rpm
5. ALLOWABLE HEADLOSS	12-18 inches water
6. OPTIMUM HYDRAULIC LOSS THROUGH SCREEN	6 inches
7. OPTIMUM SOLIDS LOADING	0.88 lbs/day/ft^2 at 6.6 gpm/ft^2

[1]Does not include housing

[2]Based on submerged screen area

TABLE VII

DESIGN CRITERIA: GRANULAR ACTIVATED CARBON
ABSORPTION AND REGENERATION OPERATING
ON HIGHLY TREATED INFLUENT

PROCESS ELEMENTS		DESIGN CRITERIA
ABSORPTION		
1.	CARBON COLUMNS	Upflow countercurrent type @ 1MGD - 2 in service; 1 in reserve for maintenance @ 10MGD - 6 in service; 2 in reserve for maintenance @ 100MGD - 60 in service; 15 in reserve for maintenance @1000MGD - 600 in service; 120 in reserve for maintenance
2.	CARBON SIZE	8 x 30 mesh
3.	CARBON VOLUME	1,800 cu. ft/column
4.	CARBON DEPTH, effective	15 ft/column
5.	CARBON CAPACITY @$600/ton	25 tons/column
6.	CARBON DOSAGE*	250 lb/MG 0.33 lb COD/lb carbon
7.	CONTACT TIME	15 minutes
8.	HYDRAULIC LOADING	6.5 gpm/ft^2; variable at 1 MGD
9.	BACKWASH RATE	10 gpm/ft^2 using process effluent
10.	TYPICAL INFLUENT CONTAMINANT CONCENTRATIONS*	3 - 5 mg/l BOD 20 -25 mg/l COD 10 -15 mg/l TOC
11.	TYPICAL EFFLUENT CONTAMINANT CONCENTRATIONS	<1 mg/l BOD 10 -15 mg/l COD 3 - 5 mg/l TOC

TABLE VII

DESIGN CRITERIA: GRANULAR ACTIVATED CARBON ABSORPTION AND REGENERATION OPERATING ON HIGHLY TREATED INFLUENT

(Reference No. 107, 153, 316, and 370; also, 368)

PROCESS ELEMENTS		DESIGN CRITERIA
REGENERATION		
1.	CARBON REGENERATION FURNACE	Multiple-hearth, gas-fired
2.	REGENERATION CAPACITY REQUIRED	@ 1MGD - 250 lbs/day; add 50% for downtime @ 10MGD - 2,500 lbs/day; add 33% for downtime @ 100MGD - 25,000 lbs/day; add 25% for downtime @1000MGD - 250,000 lbs/day; add 20% for downtime Note: Small capacity furnaces (1-10MGD) may be available only on special order
3.	REGENERATION LOSS ASSUMED	7.5%
4.	MAKEUP CARBON REQUIRED @ $ .30/lb.	@ 1MGD - 18.8 lbs/day @ 10MGD - 188 lbs/day @ 100MGD - 1,880 lbs/day @1000MGD - 18,800 lbs/day

*Assumes high level of prior treatment (chemical precipitation and filtration)

TABLE VIII

DESIGN CRITERIA: ELECTRODIALYSIS TREATMENT
DOWNSTREAM FROM AN ACTIVATED CARBON OR FILTRATION PROCESS
(References No. 57, 222, 461; also 368)

ANION-SELECTIVE MEMBRANES	Ionac Im-12*
AVERAGE EQUIVALENT WEIGHT OF DISSOLVED SALTS	67.5
CATION-SELECTIVE MEMBRANES	Ionac MC-3470*
FEED-WATER TEMPERATURE	$25^{o}C$
FEED-WATER TURBIDITY	1 to 10 JTU
MEMBRANE COST	$\$3/ft^2$
MEMBRANE LIFE	5 years
PRODUCT: WASTE RATIO	10:1
SOLUTION VELOCITY	10cm/sec.
STAGING	Multiple-staging**
TOTAL DISSOLVED SOLIDS CONCENTRATION IN FEED WATER	850 mg/l
TOTAL DISSOLVED SOLIDS CONCENTRATION IN PRODUCT WATER	500 mg/l

*Example only, membrane material to be used dependent on specific application.

** Precise number dependent on local conditions.

REFERENCES

1. Smith, Robert
   1965. A Compilation of Cost Information for Conventional and Advanced Waste Water Treatment Plants and Processes, U.S. Department of the Interior: Federal Water Pollution Control Administration.

2. 1974. Technical and Economic Review of Advanced Waste Treatment Processes. Office of the Chief of Engineers: U.S. Army Corps of Engineers.

3. Culp & Culp
   1971. Advanced Waste Treatment. Van Nostrand Reinhold Environmental Engineering SEries.

4. Metcalf and Eddy, Inc.
   1972. Water Resources and Environmental Engineering. McGraw-Hill Series.

5. Eckenfelder.
   1966. Industrial Water Pollution Control. McGraw-Hill.

6. Grant and Ireson.
   1970. Engineering Economics. Ronald Press Company.

7. 1973. Post Design Study of the J.R. Simplot Company at Burley. CH_2M-Hill Consulting Engineers

THE PROSPECTS OF RECYCLING OF ANIMAL WASTES AS AN ALTERNATIVE TO DISCHARGING INTO NAVIGABLE WATERS

by

Alden J. Foote

The trend in animal production in recent years has been toward confinement of animals in large numbers in smaller areas. The paramount problem of animal production in this manner is the disposal of waste. "The quantity of waste produced by swine alone equals the total waste production of humans in the United States." (Loehr, 1968)

The best available practice today for animal waste disposal is land recycling and this method will most likely be popular for the next few years. Its main drawback lies in its cost. Cost of the land, collection, transport, storage, spreading, and getting the wastes into the soil all must be taken into account. Where large animal production enterprises are concerned the main problems are lack of sufficient available land for disposal of wastes and public dislike of possible odors. Another problem lies in the fact that the soil can degrade just so much of the wastes, and the crops grown can also only utilize a limited amount. The excess can cause toxic conditions in the soil. In the Province of Ontario, Canada, there is a regulation whereby when there are 40 or less cows, land required for waste distribution is calculated at one acre per cow. With larger numbers of cattle, one-half acre is acceptable. Thus, a feedlot with 100,000 cattle would need 50,000 acres of land for disposal of wastes. In more ideal climates and with the best crops less land would be needed. Research may hit upon ways to improve use of a land for disposal of wastes, but even so, large areas of land will still be needed. It is obvious that other methods of waste disposal are needed.

Animal waste is viewed by many as filth and an environmental contaminant. Should these excretory products now be thought of as active biomasses, many possible recycling techniques utilizing refeeding could be used.

"The gross fecal and urine wastes from meat animals, dairy cattle and poultry on farms and ranches in the United States have a crude protein equivalence of about 40 million tons per year." (Yeck and Schleusener, 1971) Unfortunately, all wastes are not able to be collected and losses of nitrogen compounds do occur. Let us assume just one-third of the nitrogen from these wastes is able to be processed into feed. This amount alone has a crude protein content of 12 million tons. The yearly soybean production is comparable to this amount of crude protein. It has a value of 2.5 billion dollars, however, while most people consider wastes as having no value at all. Protein is not the only valuable resource in animal waste, it also contains vitamins, calcium, phosphorous,

---

Presently a candidate for M.S. in Environmental Engineering, at Washington State University, College of Engineering. Received a B.S. in 1973 from Washington State University in Zoology.

starch, and polysaccarides. In the undesirable category are pathogenic organisms and feed additives, with antibiotics, arsencals, and hormones being of the greatest concern.

Dr. L. W. Smith, research animal scientist at the U. S. Department of Agriculture, has compiled experiments on feed reuse of animal manures. He states that, "biological processes can double the concentration of protein, (but) this is at the expense of other digestible ingredients."

The remainder of this paper deals with the possible processes and promises of incorporating animal waste recycling in an animal production system.

The drying of animal wastes provides for easier handling. Two categories of drying are those utilizing additional heat and those using heat generated only by the decomposition process itself. Three successful methods of drying where no extra heat is used are mixing dry materials with the wastes, air drying using forced air and natural drying like one would dry hay. These techniques also increase the palatability. When extra heat is used, drying is speeded up, and when high enough temperatures are used for ample amounts of time, many pathological micro-organisms are destroyed.

What about the cost of drying manure? In 1972 Bergdoll presented the following results which were obtained using a Colman rotary manure dryer and chicken wastes. This unit has a capacity to serve 120,000 birds when run on a continuous basis. The capacity here is based on 75% manure being dried down to between 10% and 15% moisture. At the 10% moisture level there is no smell, while drying down to 12% or 15%, gives a slight smell. Labor, depreciation, taxes, insurance, upkeep, etc. all play a part in the total cost of drying wastes. Costs can range from $15 per ton up to $35 per ton, the largest variable is the cost of getting the raw material from underneath the cages to the dryer.

Manure is a very sensitive product subject to rapid change in chemical composition, due to both microbial and physical environments. Nutrient analyses change rapidly with time after excretion as does the concentration of other compounds. Therefore, for the highest protein content the manure should be dried as soon as possible.

It has been found that livestock such as chickens, cattle, sheep and swine can be fed dried poultry wastes without a loss in performance. At Pennsylvania State University, Long, Bratzler, and Frear conducted a study on the value of hydrolyzed and dried poultry waste as a feed for ruminant animals. The hydrolyzed poultry waste was steamed under pressure of 30 pounds and maintained for not less than 30 minutes. A cooked product was also steamed but not under pressure. The machine used to do the drying was a commercial type forced air dryer. The front end of the dryer (where the fire pot is located) had a temperature of approximately 648.8^{o} C. Wethers were used to test this dried poultry waste. They were fed partially purified rations where hydrolyzed poultry waste, cooked poultry waste or soybean oil meal supplied the nitrogen. The digestion coefficients for crude protein were significantly different between all rations. The amount of nitrogen excreted in the feces of the wethers which were fed the soybean oil ration was significantly lower than that amount found in the feces of the one fed the poultry waste ration. These were the only important differences found.

In fattening trials where beef steers were fed rations in which soybean oil meal, hydrolyzed poultry waste or dried poultry waste supplied the supplemental nitrogen the rate gain, feed efficiency and carcass grade showed no significant difference.

Improving the digestibility through the use of chemical treatment processes has been done. Smith, Goering and Gordon of the U.S.D.A. have determined the influence of chemical treatments upon the digestibility of rumen feces. Large decreases in undigested cell walls, cellulose, hemicellulose and lignin contents were obtained with sodium hydroxide and sodium peroxide. Improved digestibility was seen with NaOH, Na_2O_2, $NaClO_2$ and Na_2SO_3. The improved digestibility came about either by chemical digestion or making it more easily fermented by bacterial digestion. These products were well consumed by sheep as a 25% corn silage-treated feces ration.

"Wastelage is the combining of fresh manure with ground grass hay in the ratio of 57:43 with storage in a silo until fed." (Anthony, 1969) Feed concentrate and wastelege have been combined and fed to fattening cattle. Ewes and beef cows have been given wastelage alone as feed.

The composting of animal wastes could be used as a component in refeeding processes. Composting reduces the moisture of the waste while at the same time reducing the volume of the waste.

The use of an oxidation ditch system seems to hold much promise in the recycling of wastes. An oxidation ditch is an aerobic fermentation vat for the biological enhancement of swine waste. This process is virtually odorless. Products from the oxidation ditch can be fed to swine and seem to completely eliminate the loss of effluent to the surrounding environment. This system would provide a source of nutrients while almost eliminating any potential pollution.

The growing of plants in nutrient solutions with or without an inert medium to provide support is known as hydroponics. This method of cropping without soil could be used to remove the nutrients from the liquid effluents from an oxidation ditch or a lagoon. The plants grown then could be harvested and be recycled back as feed.

The use of insect cultures to degrade animal wastes is another method which has much promise. The waste is seeded with fly eggs, the eggs hatch and the larvae digest the waste. The pupae that result can be harvested and used as a feed. The residue waste is dry and odor free. The pupae is an excellent source of protein and has been successfully replaced as protein in the rations of poultry.

The use of fish cultures for food is now gaining in popularity. A refeeding process using catfish feed on diets of 50% feedlot manure shows much promise. A major problem is the high volume of input required by the process. The annual harvest, as predicted by current technology, will be approximately 1,500 pounds of fish per acre. A major constraint is the large amount of acreage that would be needed to economically operate a fish meal plant.

The harvesting of algae grown on sewage shows much potential for a recycling method. The use of alfalfa-algae pellets have resulted in higher weight gains when fed to lambs on a dry summer range. Although algae grown on sewage are not a high-energy feed because of a high ash content and low digestibility of the non-protein, nonfat organic matter, it appears to have potential as a livestock feed because of the high content of protein. Significant amounts of carotene, phosphorus, calcium and trace minerals present in algae are also desirable.

The recycling of animal wastes as feed is still very exploratory. What does the F.D.A. have to say on the issue? At the 50th annual convention for the Pacific Egg and Poultry Association, Dr. William D. Goatcher, animal nutritionist, Bureau of Veterinary Medicine, Food and Drug Administration, Washington, made this basic statement: "Research evidence shows that, with proper precautions, animal waste may be used as animal feed without jeopardizing either human or animal safety. Such use could have enormous value to the consumer by reducing the cost of meat, milk and eggs, and increasing available food supplies and alleviating part of an environmental pollution problem."

The F.D.A. states that animal waste may be used safely as a nutrient source in animal production providing it adheres to the following: (1) it should be fairly free of pathogenic organisms such as Clostridia and Salmonella, (2) it must be amply free of microbial toxins, (3) the absence of heavy metals, above the levels established by the F.D.A. in the edible products obtained from animals consuming waste products, (4) the edible products must not contain drug or pesticide residues outside the established tolerances, (5) the safeness of the wastes edibility for animals and there after its edible products for human consumption is the responsibility of those introducing the products for commercial distribution, (6) the labeling of the waste product if it is offered for sale must clearly state the nutritional content and must also have proper directions in case it is used as an animal feed.

REFERENCES

Anthony, W. B., 1969. Cattle Manure: Reuse through Wastelage Feeding. Proceedings of the Conference on Animal Waste Management, Cornell University, Ithaca, N.Y., p. 105.

Bergdoll, John F., 1972. Drying Poultry Manure and Refeeding the End Product. Waste Management Research. Proceedings of the Cornell Agricultural Waste Management Conference, p. 289.

Calvert, Morgan, and Eby., 1971. Bio-degraded Hen Manure and Adult House Flies: Their Nutritional Value to the Growing Chick. International Symposium of Livestock Wastes, p. 94.

Harmon, B.G., 1974. Potential for Recycling Swine Waste. Feedstuffs, Vol. 9, No. 9, p. 40.

Hintz, Heitman, Weir, Torell, and Meyer, 1966. Nutritive Value of Algae Grown on Sewage. Journal of Animal Science 25:675.

Loehr, R.C., 1969. Pollution Implications of Animal Wastes. U.S. Department of Interior Report of Federal Water Pollution Control, Administration, p. 175.

Long, Bratzler, and Frear, 1969. The Value of Hydrolyzed and Dried Poultry Waste as a Feed for Ruminant Animals. Cornell University Conference Agricultural Waste Management, Syracuse, N.Y., p. 98.

Small, M.C., 1974. Prospects for Recycling Waste, Increasing Energy Sources Examined at PEPA Meeting. Feedstuffs 46:10, p. 11.

Smith, Goering, and Gordon, 1969. Influence of Chemical T Treatments upon Digestibility of Ruminant Feces. Cornell University Conference Agricultural Waste Management, Syracuse, New York, p. 88.

Yeck, R.G. and P. E. Schleusener, 1971. Recycling of Animal Wastes. Proceedings of National Symposium on Animal Waste Management, p. 121.

FERTILIZER NITROGEN AND WATER QUALITY

AS ENACTED IN P.L. 92-500

by

Talib Hussain Chaudhary

Public concern about the deterioration of surface water quality in many areas or presence of nitrate in ground water in others have focused attention on the runoff and deep percolation of commercial fertilizers as possible contributors. This concern is resulting in the introduction of legislation in some states to regulate farm use of fertilizers and the suggestion by some ecologists that chemical nitrogen fertilizer be totally banned (Miller, 1970).

The conclusion that fertilizers contribute significantly to water pollution and should be regulated apparently stems from two sets of facts: (1) the importance of nitrogen to eutrophication and of nitrate to health, and (2) the phenomenal increase in nitrogen use in fertilizers. Although it cannot be denied that there are instances where improper use can be blamed, wholesale indictment of fertilizers cannot be justified.

COMPLEXITY OF NITROGEN PROBLEM

Among the agriculture operations, fertilizers are blamed as a serious offender in the contamination process. If these allegations are true, agriculture must tighten its management practices and re-evaluate its recommendations. But if agriculture's contribution of plant nutrients to the environment has been overstated, then agriculture has the responsibility to set the record straight with facts and objectivity (Miller, 1970).

Much of the problem in gaining a perspective on the whole pollution question is to wade through the emotionalism associated with the subject and the maze of conflicting data. At this point anyone can draft his favorite hypothesis and select the data to support it.

At present, there is great controversy about the magnitude of the problem. Some specialists feel that it is an over exageration by the press, and it is "political" and "hysterical" pollution rather than "actual" pollution. Others feel that as yet little is known about the effects of fertilizer use on water quality, and nature and extent of the problem have not been defined. This must be done through well planned research, otherwise restrictive legislation based on faulty and inconclusive evidence is bound to be passed.

Presently a candidate for Ph.D. in Soils at Washington State University, College of Agriculture. Received a B.S. from West Pakistan Agricultural University in Soils.

An example of difficulty of getting direct evidence of underground pollution from fertilizer nitrate or other sources is presented in the following table.

Core holes were drilled in South Platte Valley of Colorado under different kind of land use. The cores and the water that percolated into core holes were sampled.

Although the average amount of nitrate in 20-foot holes varied greatly, there was little difference in the nitrate of water. The virgin grassland and dryland fields had never received nitrogen fertilizer. The irrigated crop land not in alfalfa received almost 100 pounds of nitrogen per acre per year. The cattle feedlots got as much as 10 tons of organic and urea nitrogen. The lands had been in the same kind of use for more than 40 years, yet there was no correlation between the amount of nitrate in the soil and in the percolated water.

AVERAGE NITRATE IN 20-FOOT PROFILES AND WATER SURFACE OF WATER TABLE (Stewart, et. al., 1967)

	Profiles		Water Table		
	No.	NO_3^- -N (lbs/ac)	No.	NO_3^- -N Mean (ppm)	NO_3^- -N Range (ppm)
Virgin Grassland	17	90	8	11.5	0.1-.19
Dryland (wheat fallow)	21	261	4	7.4	5-9.5
Irrigated Land (except alfalfa)	28	506	19	11.1	0-36
Irrigated Land (alfalfa)	13	79	11	9.5	1-44
Cattle Feedlots	47	1436	33	13.4	0-41

U. S. Department of Agriculture is the first and most eminent agency which has tried to assess the losses of nitrogen from fertilizer applied to agricultural soils. The data of several studies conducted at various locations have been reported by USDA (1971). A study conducted at the University of Missouri showed that nitrate found in ground water did not come from fertilizer applied to agricultural soils. Some of the nitrates in ground water came from natural nitrate deposits and soil organic matter. Other nitrates came from livestock feedlots. Another study conducted at the California Agricultural Experiment Station reported that the nitrogen content of drainage water varied from 2 to 62 ppm. In one California area, 23,500 pounds of nitrogen were applied. Of this, 14,800 pounds were lost in drainage water. These tests show that improvements need to be made in the efficiency of nitrogen used under irrigation, or in heavy rainfall areas.

Some of these latter studies undoubtedly show heavy loss of nitrogen to water. But these results don't sound as alarming if we look at the concentrations of nitrogen in surface waters measured by U.S. Geological Survey and reported by National Academy of Sciences (1972). The nitrate contents of three representative major rivers from 1950 to 1970 indicate:

- a downward trend in Missouri
- an upward trend in Deleware
- and no distinct pattern of change in Colorado.

In general, available records show that nitrate nitrogen has increased substantially since 1910 in a number of major streams in the states of Washington and Oregon, but no well defined universal upward trend in the past 60 years can be seen in the available records for the eastern part of the United States.

While all of the above discussion does not lead to any conclusive evidence in favor of or against fertilizer, let us have a closer look at the future of this problem.

FUTURE NITROGEN USE

The use of nitrogen in American agriculture is likely to increase in the near future, and there is no evidence for a diminution in the rate of rise of the farm site nitrogen requirement. Therefore, environmental problems related to nitrate will undoubtedly be intensified.

A question may arise. Can we afford to let this magnify? Of course not. Intensive efforts are underway to combat nitrogen losses by the use of nitrification inhibitors which will keep ammonium as such in the soil and conserve it against leaching losses. Another promising area is to adopt the use of slow or timed release fertilizers. Their technique could be brought in at any time, but the economics of their use has been prohibitive for the farmer. Technological advances are being sought to produce them at an economical scale.

The lack of direct means for identifying the sources of nitrogen in many ground waters and surface waters and evaluating the extent to which increasing nitrate levels in watersheds are due to fertilizer, complicates the task of locating farmers who may be applying excessive amounts of nitrogen. Thus, it is essential to determine whether industrially supplied nitrogenous fertilizers have become so cheap that they are being used too liberally to the detriment of the environment.

Careful attention should be directed to some other areas which may be potentially useful:

1) Design agricultural extension programs to educate farmers to proper use of fertilizers
2) Agronomists should develop a better understanding of nitrogen release character of soil
3) Develop means for maximizing plant uptake of nitrogen
4) Develop crop varieties that will scavenge the soil of inorganic nitrogen and "depollute" it to greater depths. At present many crop varieties have very small N-use efficiency.

ENACTMENT UNDER PUBLIC LAW 92-500

In the Federal Water Pollution Control Act Amendments of 1972, agricultural pollution, of which fertilizer pollution is a part, has been treated in the same status as urban and industrial pollution with respect to meeting the national goal to eliminate the discharge of all pollutants into navigable waters by 1985, and interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water by July, 1983.

Sub-section P of Section 104 relates specifically to the agricultural pollution. It states that "Environmental Protection Agency in cooperation with the Secretary of Agriculture, other federal agencies, and the states carry out a comprehensive study and research program to determine new and improved methods and better application of existing methods of preventing, reducing and eliminating pollution from agriculture, including the legal, economic, and other implications of the use of such methods."

To carry out the provisions of Sub-section P, EPA authorized $10 million for the fiscal 1973-1974. Some more money may come here from $75 million appropriated to states and interstate agencies to assist them in administering programs for the prevention, reduction, and elimination of pollution.

The amount of appropriations make the author leery of accepting a conclusion that drastic improvements are going to be brought about in this area in such a short time. It seems that the amenders of the Federal Water Pollution Control Act have underestimated the notoriety of N which is one of the areas most studied but equally confused in certain aspects.

CONCLUSIONS

Pristine conditions may neither be possible nor desirable when there is a conflict between quality and economy. Also they will not be achieved overnight nor without heavy commitments of efforts and money as well as time. But certainly the attitude of the people will be regarded in restoring and preserving the quality of environment from agricultural, industrial and other pollutants. Several things remain unclear such as, just what kind of environment do people want when the cold hard choice between jobs, aesthetics and economics must be made, what levels of quality are people really willing to pay for, and whether present laws and technology will provide that. While some aspects remain cloudy, one thing is certain: all sources of pollution will come under closer scrutiny than ever before no matter what the origin.

LITERATURE CITED

Federal Water Pollution Control Act Amendments, 1972. Research and related programs. U.S. Congress (92nd). October 8, pp 1-89.

Kilmer, V.J., 1969. "Fertilizer Can Add to Water Pollution, but Banning all Fertilizer Would Triple Food Prices." C and En., September 22, pp 73-74

Miller, F.P., 1970. "Pollution: Are Fertilizers at Fault?" Crops and Soils August - September, pp 15-20.

National Academy of Sciences, 1972. Accumulation of Nitrate, Washington, D.C. p. 106.

Stewart, B.A., F.G. Viets, Jr., G.L. Hutchinson, W.D. Kemper, F.E. Clark, M.L. Fairbourn and F. Strauch, 1967. Distribution of Nitrates and Other Pollutants Under Fields and Corrals in the Middle South Platte Valley of Colorado. U.S. Department of Agriculture, Agricultural Research Service 41-134. P. 206.

U.S. Department of Agriculture, 1971. Managing Our Environment - Report on Ways Agricultural Research Fights Pollution. Agricultural Information Bulletin #351. P. 48.

A SUBSYSTEM APPROACH TO MANAGING NON-POINT SOURCES OF POLLUTANTS

by

Robert Jay Hasheider

In Public Law 92-500 (1972) Congress addressed itself to the continued degradation of the nation's waterways. The stated objective of the Act, to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters", was backed by a planned schedule for controlling the effluent quality of water being discharged into navigable streams. Although the plan was directed at those entities which have effluents coming from a point source, there are references (Sec. S 208, 303, 304, 305) concerning the contol and management of non-point sources. Thus, although Congress did not initiate a detailed surveillance and enforcement program in regards to non-point contributing sources, it did in the referred sections and overall objective, realize that these are also contributing to the degradation of water quality and will have to be controlled before the objective will be fulfilled.

In order to control the point sources of pollution, the "permit system" was established and currently is in the process of being implemented by EPA. It is easily seen, however, that this management system cannot, at least without major alterations, be extended to the control of non-point sources. Prior to establishing a system for regulating non-point sources of pollutants, it will be necessary to develop mechanisms to differentiate the types of contaminates they produce.

A review of mechanisms which predict amounts and types of pollutants is given in EPA's Methods For Identifying and Evaluating the Nature and Extent of Non-Point Sources of Pollutants. The reference is a compilation of existing methods for quantitative evaluation of pollutant discharges from non-point sources. Because it relies heavily on the Universal Soil Loss Equation which is not applicable west of the Rocky Mountains, and because many of the other given equations require data which is not available for many watersheds both in the East and the West, I would like to propose an alternative system. This, although more qualitative in nature, would be of use to water quality managers in the Western Regions and those in the East where data is limited.

First it is necessary to consider what type of pollutants come from non-point areas. Compiled below is an outline suggested by Wadleigh and others (7,4).

Presently a candidate for M.S. in Soil Science at the University of Idaho, College of Agriculture. Received a B.S. in June, 1974 from the University of Missouri in Soil Science.

CONTAMINANTS CONTRIBUTED BY NON-POINT SOURCES

I. Surface Runoff

- A. Suspended Sediments
  - 1. Actual Particulates
    - a. organic matter
    - b. minerals (solids)
  - 2. Associated Compounds
    - a. nutrients
    - b. organic + inorganic pesticides
    - c. inorganic - non-nutrient elements
- B. Dissolved Matter
  - 1. Salts
  - 2. Nitrates
  - 3. Microorganisms - pathogens

II. Subsurface Percolation (Groundwater Contamination)

III. Wind Movement of Pollutants

This would cover most contaminants contributed by non-point areas, however there are others (thermal effects caused by shade cover removal on a stream, erosion caused by channel scour, etc.) which can cause quality problems.

Of the pollutants listed it is generally accepted that sediment is the most significant problem in regards to water quality degradation. This was stated by Daniel Petke in his presentation as the factor which EPA is desiring to control. It is the accepted vehicle of transport for phosphorous compounds, pesticides, and many organic materials. (7) Besides this, it creates problems with the solid material that it moves (i.e. upland flood damage, reservoir filling, unsightly water quality). This being so, it is sediment that the water quality manager wants to control.

Evaluating Sediment Production Potential

A necessary prerequisite to controlling any pollutant, such as sediment, in a water system is determining the contributing source of that substance. Thus, if the water quality manager finds that certain sediments are contributed from non-point sources he must evaluate where, at least in general, they are coming from.

The Universal Soil Loss Equation is a good place to start when considering erosion in general. Developed by Wischmeier and Smith (8), this equation can be used for predicting erosion rates in tons/acre/year. Its use, however, as mentioned previously, does have restrictions which prevent its direct application in all drainage basins.

The major drawback of the erosion equation is the limited application to areas east of the Rocky Mountains. Although there is work being done to extend the equation to apply to the Western Regions, there are no values which accurately predict erosion in these areas. Even in the East there are areas which do not have the data available to calculate the values necessary for the water quality to predict erosion.

A further limitation in the strict use of the Soil Loss Equation is that it gives a value for any one particular soil at a certain slope and under a particular management and conservation system. If any of these factors are changed a recalculation is necessary to predict potential erosion. Thus, without a sophisticated sampling procedure involving the use of computer analysis it would be impossible for one to calculate each different field in a drainage basin of any size.

The Subsystem Approach

If the erosion equation is impracticable or impossible to use in certain areas, it becomes necessary to evaluate the potential for erosion in qualitative terms. To do so it is important to see which factors are responsible in causing erosion. Certain areas will have similar erosion causing factors and can thus be grouped together into one unit, or subsystem, which can then be managed accordingly.

Erosion = Resource + Management

Erosion is produced by the interaction of two factors; resources and the management of the resources. The erosion equation combines both of these in its prediction, they are grouped together in the brackets below:

$$A = [RLSK]\ [CP]$$

A = erosion (tons/acre/year)

Resource
- R = rainfall factor
- S = steepness of slope factor
- L = length of slope factor
- K = soil erodability factor

Management
- C = cropping system factor
- P = conservation system factor

As it stands, the equation applies only to agricultural practices, it has however, been extended to other management systems (4) which may contribute sediment through non-point sources. The four main non-point management systems as classified by EPA are: (1) Agriculture, (2) Forestry, (3) Mining, and (4) Construction.

Each of the above systems can be subdivided into relevant management practices which may cause differing types of potential pollutants. An example would be to divide Forestry as such:

Forestry Management Systems

A. Road Construction
B. Logging
C. Fire Prevention & Control
D. Range Management

The resource categories can similarly be subdivided into different classes, these would include a combination of soils and climate. Since the soil survey incorporates the slope length, gradient, and type of soil material it can be used to differentiate the resource factors into any generality or specificity desired. The rainfall factor is more complicated but can be used in a relative sense depending on length intensity and time of rainfall if there are precipitation differences in the drainage considered.

Thus, we have the requirements to create a subsystem approach for evaluating erosion potential anywhere. By delineating similar resource and management interactions, the water quality manager can divide a drainage basin into subsystems which can then be used to investigate for pollutant contributions. The erosion in any single drainage area would be a summation of any single drainage basin would be the summation of the erosion from each subsystem. In more strict language:

$$\text{Erosion}_{\text{total}} = \Sigma\ E_a + E_b + \ldots E_n$$

(Where a, b, ...n) are Subsystems)

However, all the erosion which occurs does not necessarily reach the water course. Instead a fraction of the erosion becomes sediment; where the delivery ration depends on drainage size.

SY (Sediment Yield) = Erosion x Delivery Ratio

Thus the subsystem equation becomes:

$$SY_{\text{total}} = \Sigma\ SY_a + SY_b + \ldots SY_n$$

which is a numerical expression for evaluating and catagorizing the sources of non-point pollutants.

An Application of Subsystems

Idaho is divided into five major drainage basins as delineated on the map in Figure 1 (6). The Southwest Basin (No. 3) can be looked at in view of gaining an understanding of how the subsystem approach works. The precipitation map given in Fugure 2 shows that the rainfall factor is relatively uniform over the drainage area except for the northeast corner. The sub-

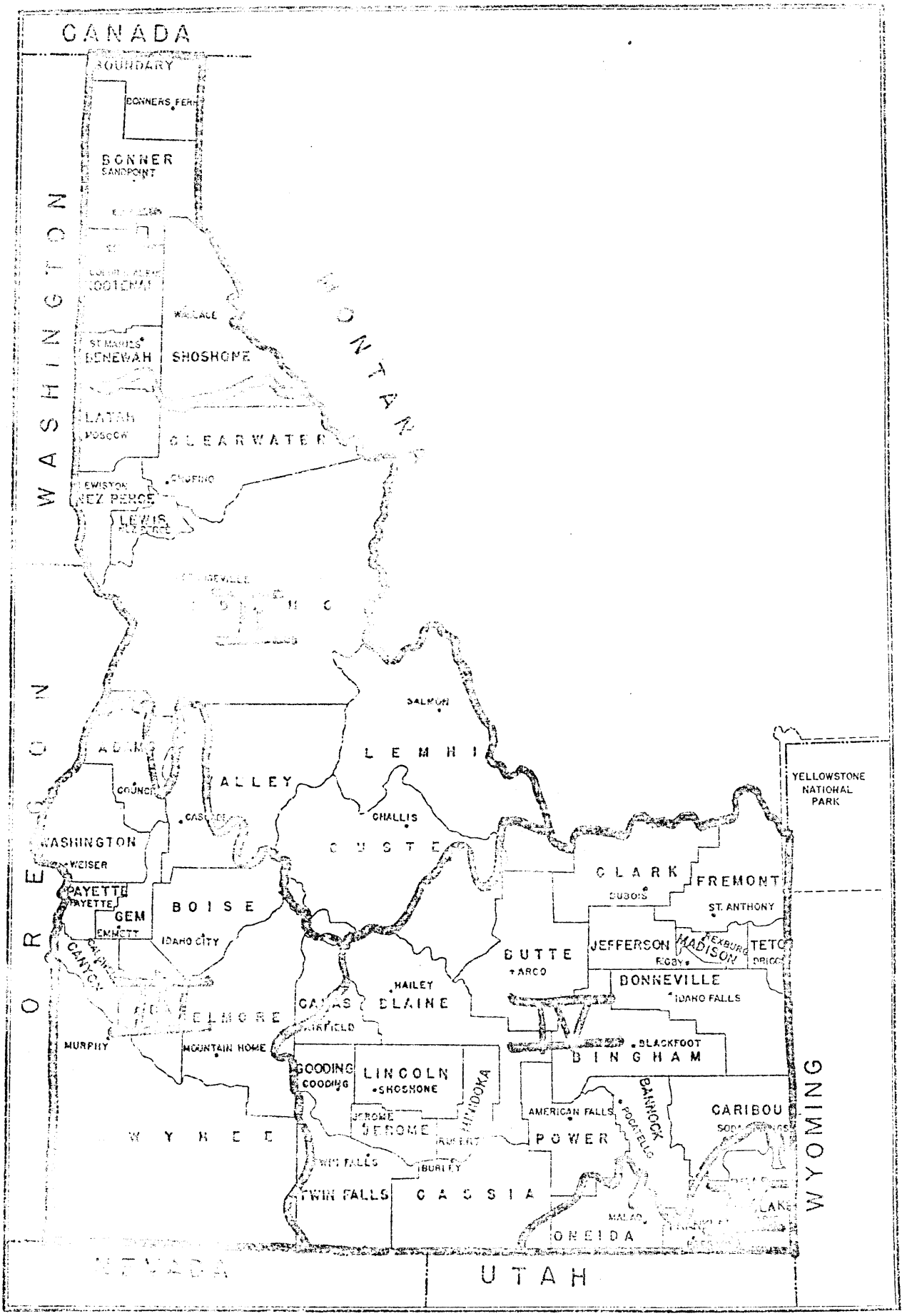
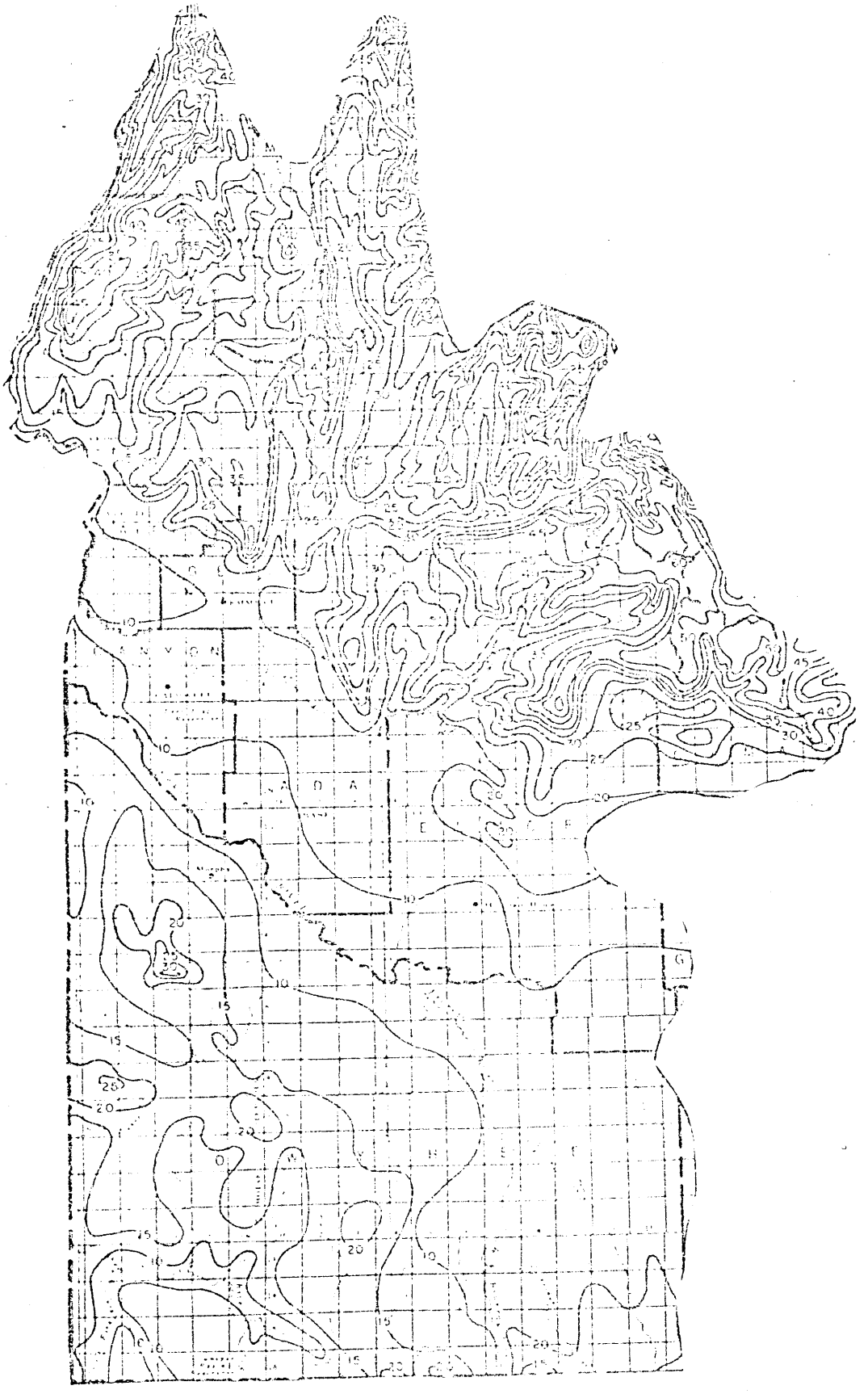


Figure 1. Five Major Drainage Basins in Idaho.


A
B
C
D
E
F
G

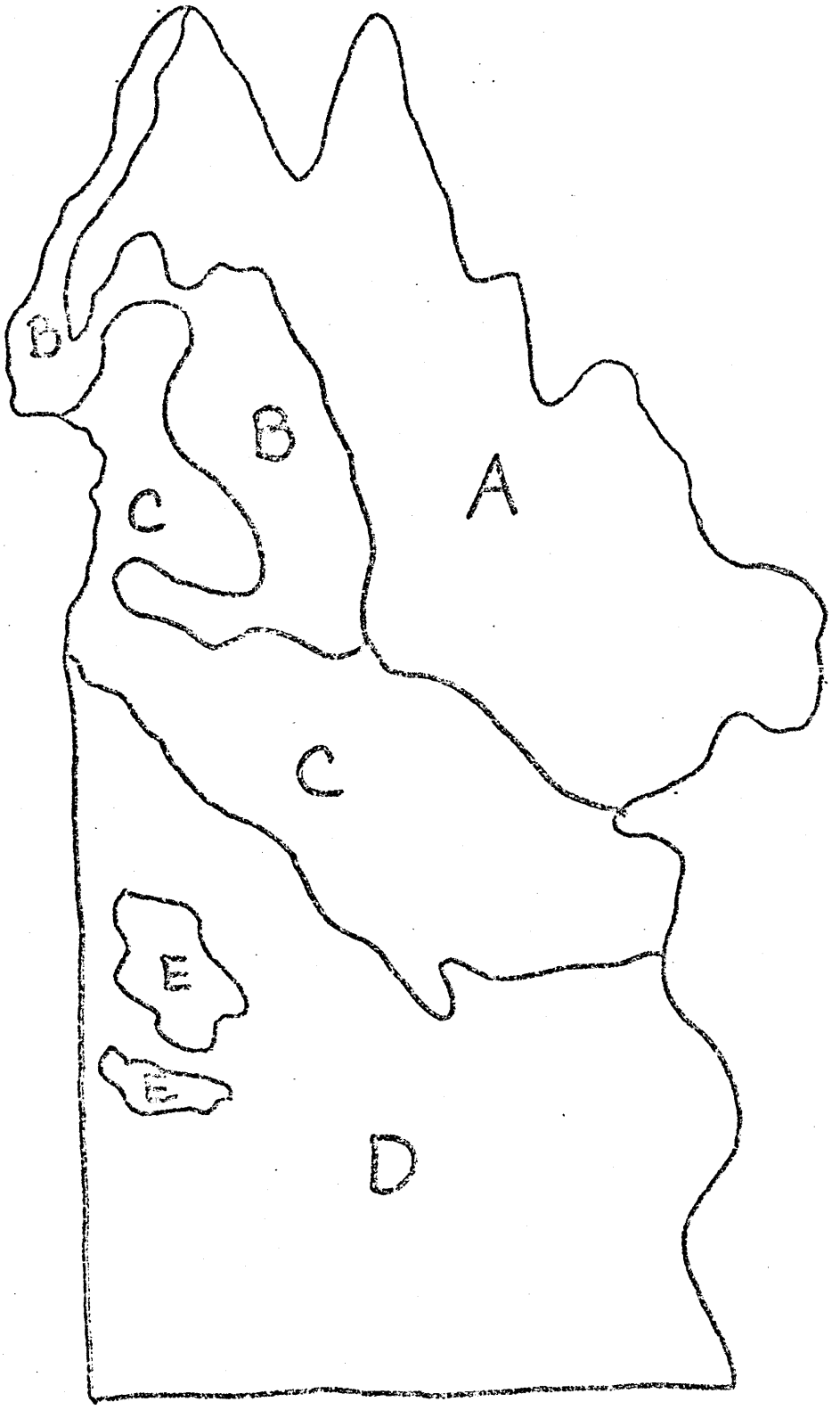


Figure 3. Subsystem Map of Southwest Basin

system map (Figure 3) for this drainage is primarily derived from the general soils map of Idaho (2). Because the management patterns coincide with the different soils on such a general level the subsystems naturally fall into soil zones.

Description of Subsystems

A. Soils - Stony medium to coarse textured, light and dark colored soils, moderately steep and steep mountainous - dominantly forested.

   Management - Forestry and Mining.

B. Soils - Medium and moderately coarse textured dark colored soils, steep and moderately steep, mountainous - grassland, forest.

   Management - Grazing and Dryland Farming.

C. Soils - Medium and stony medium textured, light colored soils that are mostly shallow and moderately deep over bedrock and nearly level and undulating - grassland, shrubs.

   Management - Irrigation, Dryland Farming, Construction.

D. Soils - Medium and gravelly medium textured, deep and moderately deep light colored soils, formed in wind-laid silts, undulating - dominantly grasslands, shrubs.

   Management - Grazing.

E. Soils - Same as in A, however, precipitation is significantly less.

   Management - Forestry, Mining.

Thus by dividing the drainage basin into these subsystems, one can begin to see differing types of non-point sources all of which eventually add to sediment in the Snake River. In subsystem A there are the coarse materials which may be released through forestry and mining activities. In B there are fairly erosive lands which, because of oversteepened slopes, may discharge sediment through overgrazing or tillage practices which exercise no conservation measures. In C there is runoff from irrigated areas which may carry nutrient and pesticidal materials in the suspended load. Also in C are construction activities which can leave bare slopes available to rain waters with consequent erosion inevitable. In D there again is the potential for sediment caused by over grazing. In subsystem E the soils and management practices are similar to A, however, the precipitation is much less and accordingly, though there is less runoff, there may be more suspended material during runoff periods.

This, to be sure, is a very general picture of how to look at the subsystems which may comprise a drainage basin. The benefits of this method, however, become clear when trying to establish a monitoring system for non-point areas.

Monitoring Non-Point Sources

Monitoring non-point areas is possibly the most difficult problem the water quality manager has to face. In the permit system, as is well known, each permit recipient has the obligation of monitoring its own discharge. This concept may well be extended to Forest Service land and possibly to construction and mining operations as well, through the permits which are already required for these activities. It does not seem conceivable that any method can be devised which will make agricultural operations monitor their effluent. Thus making necessary an outside monitoring service, either by government or private agency.

By dividing the total area into subsystems which have similar resource and management patterns a monitoring system can be established which would measure the contributions of all contributing sources. This can then be extended into each subsystem when the guidelines for water quality are breached to find the actual field or operation that is causing the problem. Thus with a limited number of samples and analysis a seemingly unlimited number of sources can be measured. Don McCool mentioned in this regard that possibly different groups of farms would be monitored as one entity, this would follow directly with all the farms falling into one subsystem.

One such method is to analyze the type of compound which is found. For example, inorganic phosphorous compounds found in waterways may exist as ortho-phosphate which is the primary phosphate found in fertilizer, or it could exist as poly-phosphate which is the type used in detergents and industries. Distinguishing between the two would give a good indication of the source which contributed the phosphorous in the first place.

Another such method utilizes the isotopic differences between possible sources. This was used in Illinois to determine the source of nitrates which were causing problems in a reservoir (3). Another possible method would be to examine the mineralogical characteristics of the sediment and relate these to the areas in a watershed which have similar mineral types.

In conclusion, the objectives of Congress in Public Law 92-500 make it inevitable that non-point sources will be regulated at some time in the future. The problem of establishing a regulating mechanism for such sources is the vast areas which are potential contributors (2.19 billion acres in the 50 states). Through use of already existing inventory material; soil surveys, meteorlogical data, census reports, this land area can be systematically divided into manageable entities, subsystems, and thereby the goal of clean water can be achieved in an efficient manner.

USE OF BENCH TERRACES WITH TILE OUTLETS

A Solution to Prevent Water Pollution By Controlling Soil Erosion

By

Abdallah Sadik Bazaraa

Wastes arising from man's activities that affect the quality of water come mainly from municipal, industrial, mining, marine and agricultural sources.

Although the major effort appears to be in the treatment and control of municipal and industrial wastes, agriculture is by no means exempt from the war on pollution.

It has been found that the major elements damaging the streams and the lakes is siltation. The volume of suspended solids in the nation's streams amount to at least 700 times the loadings caused by sewage discharge, and that the major portion of these suspended solids or sediment comes from erosion of agricultural lands. The extent to which sediment is depleting the storage of reservoirs is estimated at one million acre feet a year which is costing the public over 500 million dollars annually in increased water bills and taxes.

When precipitation produces field runoff, the running water will pick up and move anything that is movable. It not only will move soil particles, it will move plant residues, manure particles, silts, and pesticides that may be on the soil surface.

THE PROBLEM OF CONTROLLING SEDIMENT

The main factors that brought about the revolution in American agriculture are:

- The increased use of fertilizer.

- The increased size of farm machinery.

Both of these have helped to bring about increased cropping

Presently a candidate for MS in Agricultural Engineering, at Washington State University, College of Engineering. Received a BS in Civil Engineering from Cairo University in Egypt.

intensity without resorting to rotations. At the same time the use of large multi-row farming equipment has caused the farmer to discontinue such erosion control practices as contouring, strip cropping, and conventional terracing because of difficulty in maneuvering large machinery on crooked rows or in point row areas.

EFFECT OF CONSERVATION PRACTICES ON SILT LOSS

Soil conservation practices are designed to reduce the amount and rate of water runoff. Their effects can be clearly seen in Tables (1) and (2).

TABLE (1)

Conservation Practice	Silt loss (ton lack 1 yr)
- Up and downhill farming	11.4
- Contour farming	5.7
- Contour and Terraces	3.4
- Contour Terraces and wheel track plant	2.4

Note: Walker

TERRACE SYSTEMS

Terraces are earth embankments, channels or combinations of embankments and channels constructed across the slope to suitable spacings and with acceptable grades for one or more of the following purposes:

- reduce soil erosion.
- remove surface runoff water at a non-erosive velocity.
- refarm land surface
- reduce sediment content in runoff water.
- reduce peak runoff rates.

Terraces alone usually will not provide the desired control of runoff water on sloping land. This control requires a complete water disposal system which may include waterways, underground outlets, diversion channels and structures, plus supplemental

TABLE (2)

Possible Reduction of Soil Erosion On

Nine Illinois Reservoir Watersheds

Reservoir	Watershed Area Sq. Mile	Sediment Deposition Rate Ton/Acre/ Yr.	Computed Soil Loss from Watershed		Reduction of Soil loss by Conservation %
			Present Condition	After Cons. Program	
- Ridge Lake	1.41	4.36	4.36	1.87	43*
- Lake Carthage	2.90	2.50	3.80	1.03	73
- Carbondale Reservoir	3.10	7.68	11.6	.95	92
- West Frankport Reservoir	4.03	4.00	4.36	.65	85
- Lake Bracken	9.14	3.37	7.02	.78	89
- Lake Calhoun	13.1	2.00	8.27	.91	89
- Spring Lake	20.2	1.44	4.55	.88	81
- Crab Orchard Lake	196	2.80	5.37	.51	91
- Lake Springfield	258	1.03	3.25	.72	78

* Correct value appears to be 57%.

Note: Walker

practices such as contour farming, strip-cropping, crop rotations, minimum tillage, and good soil management. Properly located fences, field roads, and other related measures must also be considered. Each measure must be planned to interfere as little as possible with farming operations and be of maximum benefit to conservation of soil and water.

All types of terrace systems can be classified according to cross-section, alignment, grade and outlet.

I. Classification by Cross-Section :

1. Broadbase terrace
2. Flat-channel terrace
3. Steep backslope terrace
4. Narrow base terrace
5. Ridgeless channel terrace

II. Classification by Alignment :

1. Parallel terrace
2. Nonparallel terrace

III. Classification by Grade :

1. Level terrace
2. Graded terrace
3. Ridgeless channel terrace

IV. Classification by Outlet :

Terraces may be classified by outlet such as infiltration in terrace channel only, vegetated waterway, underground outlet, and combination of these outlets.

BENCH TERRACES AND TILE OUTLET

A Method to Control Sediment Deposition

In the early sixties, terraces were improved in several ways, making them more adaptable to modern farm machines and, therefore, more acceptable to farmers. These improvements consisted of building the terraces from the downhill side, using steep downhill slopes, and installing the drains for outlets. This method of construction reduced the slope of the farmed area making machine operation easier. These terraces are called "Bench Terraces with the Outlets." The principle use was to provide enough capacity in the terrace channel to store all the runoff. The tile outlets allow the stored water to be removed slowly within a 24-hour period through open intakes.

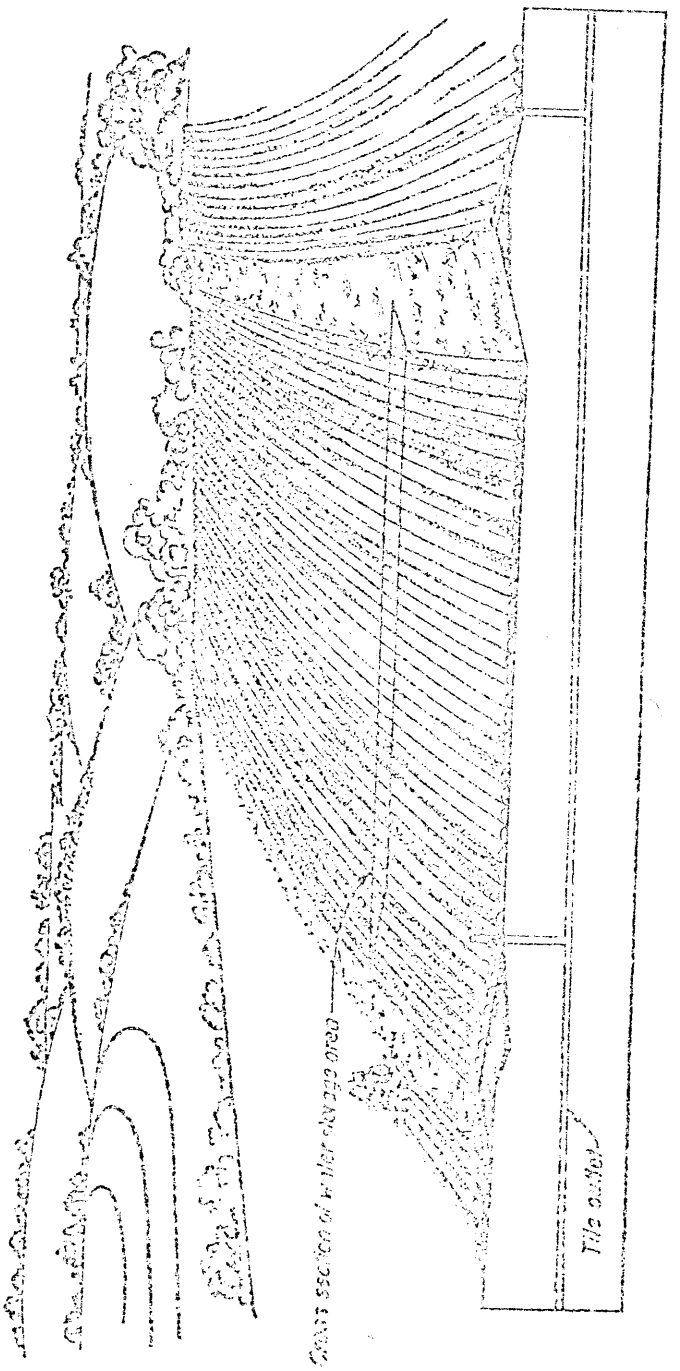
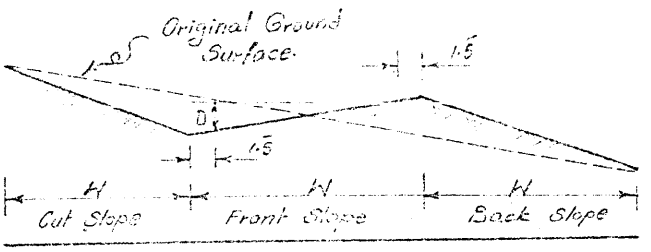


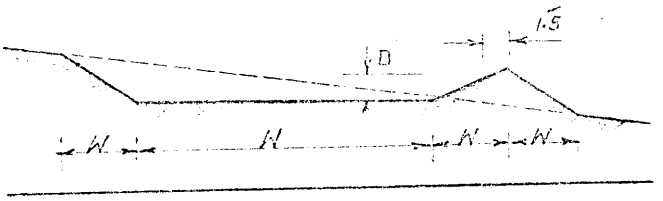
Fig. 81. Bench Terraces And Tile Outlets.

Ref.

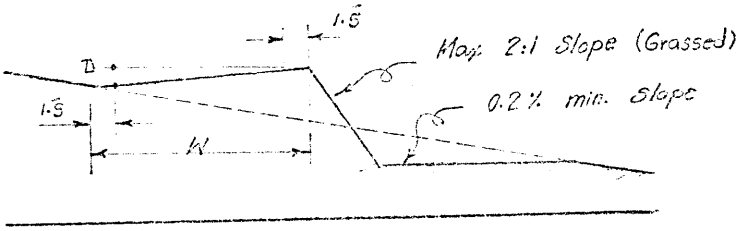
*** W is multiple of machinery width used to farm the land.



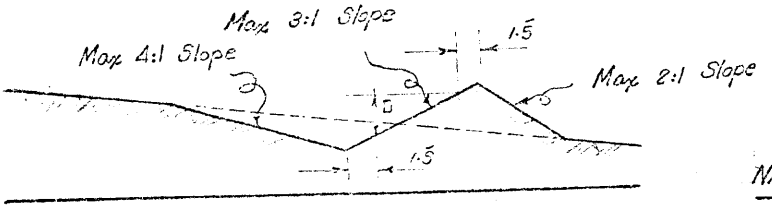
BROAD BASE TERRACE



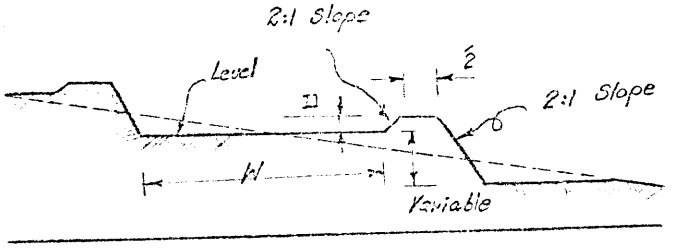
FLAT CHANNEL TERRACE



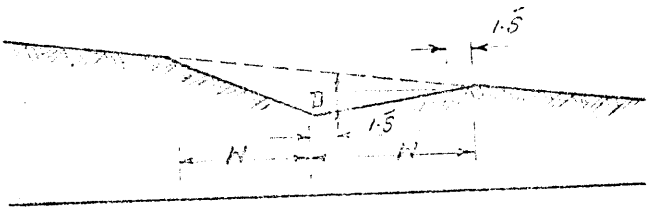
STEEP BACK SLOPE TERRACE.



NARROW BASE TERRACE



BENCH TERRACE



RIDGELESS CHANNEL TERRACE.

In bench terraces with tile outlets, surface water from rain and snow melt is stored temporarily on the land and most of the soil picked up by runoff water has a chance to settle in the ponded areas behind the bench terraces. Over time as this process of sedimentation goes on, the areas between terraces will level off, and slopes be reduced to such a degree that erosion no longer occurs. On land with deep topsoil, this process of leveling or benching can be accelerated by the use of two-way plow throwing all furrows downhill.

When this type of terrace was introduced, it was considered adaptable only to deep soils. However, recently bench terraces with tile outlets were constructed in New Brunswick, Canada where shallow soils over rock are common. Here, benching by the use of a plow is not recommended; erosion must be kept to a minimum and any benching should be limited to the slower process of soil moved by natural erosion. The system of plowing for shallow soils should be similar to the system used on level land. This is illustrated in Figure (2).

The loss of phosphate from farm land only occurs with the loss of soil. When soil loss is prevented the loss of phosphate is also prevented. Since the addition of large amounts of phosphate to the lakes and streams contributes to heavy algal growth, the elimination also does away with the problem.

ECONOMICS OF THE SYSTEM

Many farmers, inconsidering the economics of their farming operation, fail to include all costs involved in production. Erosion of farm land is a cost to society in several ways, such as destroying the value of recreational waters and filling drainage or highway ditches, or navigable streams. It is conceivable that some day society will rebel against paying more taxes to cover the costs of removing such sediment or rebuilding the recreational lakes that were damaged. It is also conceivable that laws may be enacted to require that erosion of farm lands be restricted to certain acceptable level. If this becomes necessary the use of bench terraces with the outlets is the most practical and economically sound means to prevent erosion.

However, increased benefits that will accrue to the farmer from bench terraces with tile outlets as a result of increased farm income are in most instances more than sufficient to justify installation costs. Increased benefits accrue from several sources, including:

1. More intensive row cropping as a result of an improved topography.

2. Increased efficiency of machinery operation.

3. Increased yields resulting from conservation of moisture and plant nutrients.

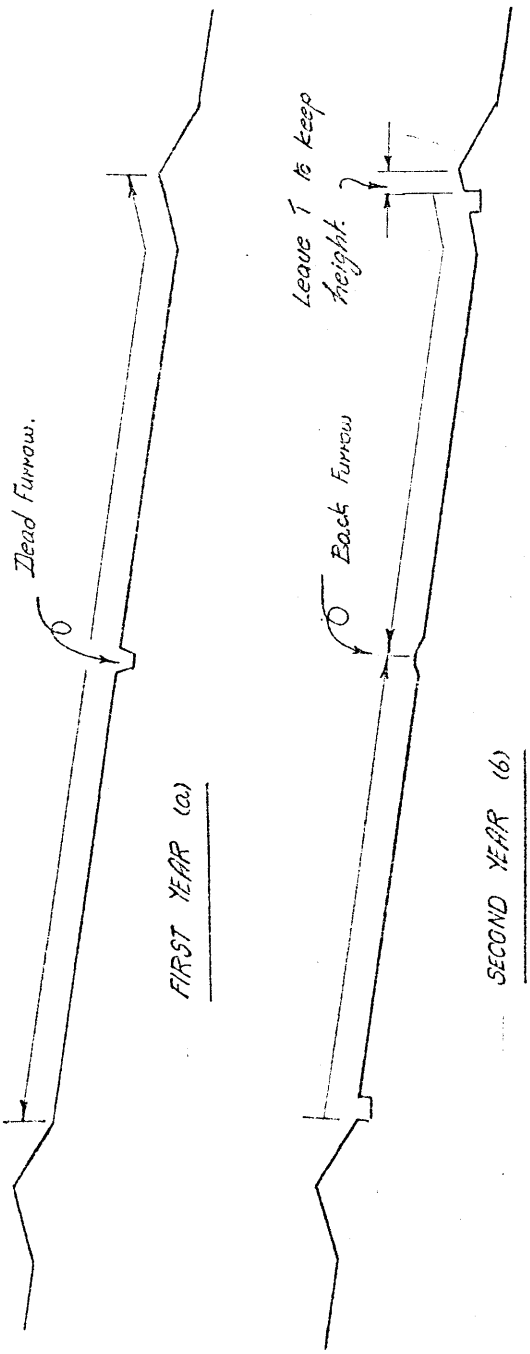


Fig. (2) Plowing Terrace for erosion control on shallow soils.

BENEFITS FROM BENCH TERRACE

An economic study by Iowa State University of a farm in the deep loess soil area of western Iowa illustrates the magnitude of the direct benefits to farmers from bench terraces with the outlets. The economic analysis of the bench terraces for this farm assumed an annual soil loss, based on land with 14% slope, varying from a low of nearly zero with bench terraces or continuous grass to about 8.5 tons of soil loss might be acceptable in the deep loess soils from the standpoint of maintaining continuous farm production but might not be acceptable if a recreation lake were located downstram.

In tables (2) and (4) a comparison is made of capital investment and income for the 311 acre farm managed in several different ways without and with bench terraces. The intensity of farming varied from all grass on non-terraced land to continuous corn on terraced land. The estimated purchase price of the farm before terracing including 14 acres in farmstead averaged $185 per acre. Table (5) gives the capital earnings for the same farm operated by custom labor and machinery with the corn sold to the cash grain market. Fertilizer rates were increased so corn yields were estimated at 100 bushels per acre. The capital investment for this basis would be the purchase price plus the cost of terraces or a total of $72,535.

Another study on the watershed of Crab Orchard Lake in southern Illinois showed that the total cost of conservation program would be approximately $38 per acre per year. Increased production would pay for the conservation program in 4 years.

CONCLUSION

Sediment loss can be kept to a minimum by use of bench terraces with the outlets. These terraces provide erosion control and at the same time provide a good economic return for the money invested. Farmers will not accept this type of control, however, unless the benefits to them can be shown.

TABLE 3.[a]

Types of Farming Enterprise, Capital Investment, and Labor Requirement

Crop and Yield	Not Terraced			Terraced
	All Meadow	COM_4[b] (Contour)	COM_2[b] (Contour)	Continuous Corn
Corn	--	46A 65 bu.	69A 70 bu.	250A 80 bu.
Oats	--	46A 40 bu.	69A 40 bu.	-
Hay	94A 2.7T	59A 2.7T	44A 2.7T	-
Pasture	201A 2.7T	124A 2.7T	93A 2.7T	-
Total used	295A	275A	275A	250A
Livestock				
Beef cow and calf	142	88	66	-
Hog Litters	0	22	30	58
Capital				
Land and facilities	$ 57,535	57,535	57,535	57,535
Livestock	44,280	33,715	27,597	10,005
Machinery	5,000	8,000	9,000	12,000
Total	$106,815	$99,250	$94,132	$79,540
Labor Required (months)	12	12	12	12

[a]Table 3 and 4 represent a study by Herbert Howell, Extension Economist of Iowa State University. Table 5 is an analysis for the farm custom-operated on a cash grain basis.

[b]C = corn, O = small grain, M = meadow, M_2 = 2 years meadow, etc.

Note: Jacobson, 1968

TABLE 4.

Comparison of Income, Expense and Capital Earnings

	Not Terraced			Terraced
	Meadow	COM_4 (Contour)	COM_2 (Contour)	Continuous Corn
Income				
Crop production	$ 8,908	$10,326	$11,740	$24,517
Increased added by Livestock	7,438	7,454	7,336	7,499
Gross production	$16,346	$17,780	$19,076	$32,016
Expenses				
Taxes, insurance, facilities	2,496	2,531	2,443	2,480
Machinery and power	2,516	3,749	3,968	7,276
Fertilizers	2,832	1,237	1,607	4,525
Terraces	--	--	--	4,207[a]
Other	1,617	1,797	2,108	2,187
Total Expenses	$ 9,461	$ 9,314	$10,126	$20,675
Net Operating				
Income	$ 6,885	$ 8,466	$ 8,950	$11,341
Operating Labor				
at $350 per month	$ 4,200	$ 4,200	$ 4,200	$ 4,200
Capital Earnings, with terrace costs amortized over five years				
Net income	$ 2,685	$ 4,266	$ 4,750	$ 7,141
Percent	2.5	4.3	5.0	9.0
Capital earnings with $15,000[b] terrace cost considered as capital investment				
Net income	$ 2,685	$ 4,266	$ 4,750	$11,348
Percent	2.5	4.3	5.0	12.0

[a]Cost $60 per acre, amortized over 5 years at 7% interest total per acre $16,83 per year.

[b]Cost of terraces 250 acres at $60 per acre. Total $15,000

Note: Jacobson, 1968

TABLE 5

Farm Custom-Operated on a Cash Grain Basis

Income	
250 acres of corn at 100 bushels	$27,500
Expenses	
Taxes and Insurance facilities	2,000
Seed corn 250A at $4.00/acre	1,000
Custom operation 250A at $22,50	5,630
Fertilizer	
Nitrogen 150# at 8 cents, 250A at $12.00	3,000
Phosphorus 100# P_2O_5 at 8 cents, 250 at 8.00	2,000
Starter 125# at 4 cents, 250 at $5.00	1,250
Herbicide Atrazine 250A at $3.30	825
Insecticide 250A at $1.25	315
Shell and deliver corn 250A at $6.00	1,500
Other	500
Total Expenses	$18,020
Capital Earnings	
Available for Management and capital	9,480
Percent return	13.0

Note: Jacobson, 1968

REFERENCES

1. ASAE Terrace and Related Slope Modification Systems Committee. 1972. "Design, Layout, Construction and Maintenance of Terrace Systems." Agricultural Engineering Year-Book.

2. Walker, R. D., 1966. "Role of Silt in Water Pollution." Journal of American Water Works Assosiation, Vol. 58, No. 11.

3. Jacobson, Paul. 1968. "Prevention of Water Pollution by Controlling Soil Erosion is Good Farm Business." Proceeding, American Water Resource Conference. American Water Resources Association.

4. Robinson, C. R., 1971. "Sediment Our Greatest Pollutent." Journal of ASAE, Vol. 53.

5. Anonymous, 1971. "Influence of Sedimentation on Water Quality an Inventory of Research Needs." ASCE, Rec. 97, HY 8.