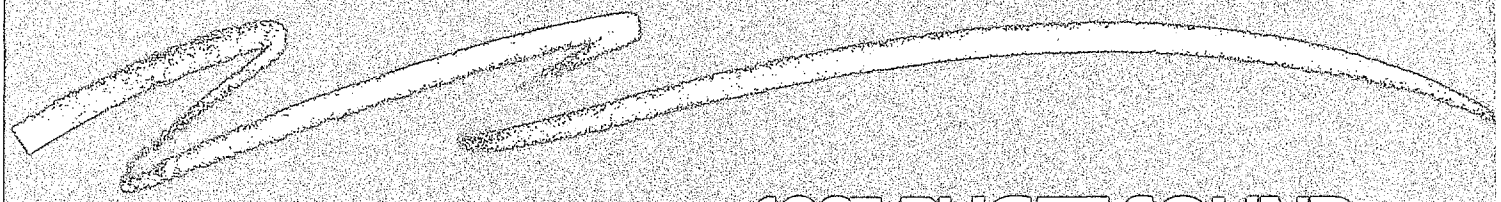

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PUGET SOUND WATER QUALITY AUTHORITY

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January, 1987

To the Governor and Members of the Washington State Legislature:

It is with great pleasure that we present you with the 1987 Puget Sound Water Quality Management Plan. In May of 1985 you enacted legislation re-authorizing the Puget Sound Water Quality Authority and gave us an ambitious mandate--to prepare and adopt the first comprehensive plan for water quality protection in Puget Sound. This plan represents over a year of hard work on the part of our Advisory Committee and Scientific Review Panel, our staff and the staffs of many federal, state and local agencies, and hundreds of citizens who participated in our planning process. We are pleased to report that this plan was adopted unanimously. We believe that this plan is "a positive document prescribing the needed actions for the maintenance and enhancement of Puget Sound water quality."

We ask your support in achieving the goals of the statute and of this plan so that, through our stewardship, Puget Sound will remain a resource of unparalleled richness and diversity.

Katherine Fletcher
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The members of the Authority wish to acknowledge that the preparation of this plan would not have been possible without the tireless dedication of a talented staff. The effort has been carried out by employees of the Authority and by individuals working at the Authority through all or part of the planning process under interagency loan agreements and other contractual arrangements.

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The Authority is grateful for the assistance of the four subcommittees of the Issue Advisory Committee (Point Source Pollution, Nonpoint Source Pollution, Shoreline Resources and Development, and Institutional and Regulatory Issues) and the Scientific Review Panel. Their dedication and commitment throughout this intense year-long effort have contributed greatly to producing the first Puget Sound plan. The following lists all committee and panel members including those who may have served through only a portion of the process.

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Technical Illustrations: Entranco Engineers, Cath Carine
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Base Map: Washington Sea Grant

Executive Summary

This document is the 1987 Puget Sound Water Quality Management Plan, adopted by the Puget Sound Water Quality Authority according to its statutory mandate in RCW 90.70.

The document is organized into seven chapters. The action plan is contained in Chapter 5. Chapters 1 through 4 provide an introduction, background information on the resources and condition of Puget Sound, demographic analysis, and a summary of the existing laws and programs affecting Puget Sound. Chapter 6 discusses procedures to oversee compliance with the plan. Chapter 7 outlines the "unfinished agenda"--issues to be evaluated in the preparation of the 1989 revision of the plan. A glossary, a list of acronyms, and a copy of RCW 90.70, the statute establishing the Authority, are provided at the end of the document.

KEY FINDINGS

Key findings on which the plan is based include:

- Water and pollutants are recirculated within Puget Sound, and some inlets and bays experience only limited tidal exchange.

- Toxic contaminants bind to particles and settle out in the sediments. High concentrations of toxic contaminants have been associated with adverse biological effects in urban bays. Toxic contaminant concentrations in sediments in the central basin and rural bays are much lower but are still elevated over levels found prior to industrialization in the Puget Sound region.

- None of the known sources of toxicants is adequately controlled. Wastewater treatment can transfer a toxicant to another location or medium.

- Secondary treatment is an effective way to remove toxicants from municipal sewage and some industrial processes, although the cost of upgrading to secondary is a significant problem for many jurisdictions around the Sound.

- Pathogens pose a threat to human health through eating shellfish or swimming in water contaminated with pathogens. None of the sources of pathogens is adequately controlled.

- Conventional pollutants, especially oxygen-depleting substances and nutrients, are not currently a general problem for Puget Sound although there are localized problem areas. Historical data show that conventional pollutants can be a problem if point sources are not properly located or adequately treated.

- The rate of habitat loss from conversion of wetlands to other uses has decreased in the last 15 years as the result of regulation. However, there continues to be incremental loss of some estuarine wetlands from development, and a significant percentage of inland wetlands are not adequately protected.

- Water quality programs are inadequately funded to accomplish legislated goals.

- There are existing programs to deal with point sources, dredging, and shoreline development. Problems are associated with inadequate implementation of these programs. Neither nonpoint pollution sources nor terrestrial wetlands are regulated by a coordinated and clearly defined institutional framework for environmental protection.

- Public involvement, education, training, and technical assistance are necessary for effective programs to control both point and nonpoint sources, but generally have not been a high priority for funding.

- Land use patterns cause different sources and contaminants to be important in differing areas of the Sound, although there are many problems in common throughout the basin.

Perhaps most significant of all is the fact that population projections show that between 800,000 and one million more people may live in the Puget Sound basin by the year 2000, increasing the threats to Puget Sound's water quality.

Finally, despite the problems cited, there are significant success stories where water quality has been improved around the Sound. Industrial and municipal pollution control have had dramatically positive effects, and the banning of certain toxic chemicals and restrictions on others have begun to be reflected in the lower rates at which they are accumulating in the bottom sediments of the Sound. Individual and local efforts have also begun to reduce sources of nonpoint pollution in some areas.

THE ACTION PLAN

The purpose of the plan is to restore and protect biological health and diversity of Puget Sound. The strategy for achieving that purpose is the protection and enhancement of three resources: the Sound's water and sediment quality; its fish and shellfish; and its wetlands.

Each of the programs in the plan is prefaced by a problem definition and a goal addressing the specific purpose of the program. Cost estimates and target dates are also given for each program.

Key features of the plan:

NONPOINT SOURCE POLLUTION CONTROL

"Nonpoint" pollution sources are numerous and dispersed, including all the forms of contamination that enter the water in runoff and from boats. Individually, sources may be insignificant, but taken together, they can have a substantial effect on water quality.

The plan requires locally determined and implemented nonpoint pollution control action plans in priority watersheds. "Early action" priority watersheds will be selected in the near term based on nominations and including some existing shellfish protection projects. Later, local jurisdictions will determine priorities by ranking all watersheds within county areas. All jurisdictions within watersheds will participate in the watershed projects; all jurisdictions within counties will participate in watershed ranking. Involvement of the public is required. The nonpoint sources to be addressed in priority watersheds include on-site septic systems, farm practices and stormwater, as well as other sources. The priority watershed approach will be complemented by countywide actions to prevent nonpoint pollution problems--an education program and an examination of how water quality considerations affect land use decisions, with particular attention to on-site sewage treatment.

Local efforts will be augmented by several state government programs. A boaters task force will tackle pollution problems from boats. Several initiatives are included that deal with on-site sewage treatment, including a proposal to ensure that on-site systems are functioning properly at the point of property sale. The Authority endorses the Timber/Fish/Wildlife process--an effort to modify forest practices regulation based on an agreement negotiated by industry, tribes, environmentalists, and agencies--and has not separately adopted an action program addressing water quality impacts of forest practices.

SHELLFISH PROTECTION

In addition to an emphasis on shellfish protection in the priority watershed approach to nonpoint pollution, the plan includes an aggressive program to better protect recreational shellfishing, including public education and involvement, and requires periodic testing for toxicants in shellfish as well as the more common bacteria testing.

MUNICIPAL AND INDUSTRIAL DISCHARGES

The plan requires a substantial strengthening of the state Department of Ecology's regulation of point sources, including controlling toxicants in permits, increasing the frequency of inspections (including unannounced inspections), aggressively seeking out unpermitted discharges, requiring more complete discharge monitoring, using certified laboratories, and implementing pretreatment requirements. An expansion of the existing efforts to clean up urban bays will complement the systemic improvements in the point source regulatory program. Increased discharge permit fees are proposed to fund a significant portion of the improvements in the program.

CONTAMINATED SEDIMENTS AND DREDGING

In addition to source controls required in other programs, the plan includes goals for sediment quality and dredging and disposal programs, and requires standards for dredged material disposal, a feasibility study of multi-user

disposal sites for contaminated sediments, and an expansion of targeted efforts in urban bays to include a methodical program of finding and responding to high levels of sediment contamination wherever they occur in the Sound. The plan lays out close coordination between the Authority and the Puget Sound Dredged Disposal Analysis (PSDDA), and calls for later examination by the Authority of the need for local governments to conform their shoreline programs to the PSDDA dredged disposal program.

STORMWATER AND COMBINED SEWER OVERFLOWS

The plan requires stormwater control programs in all the cities and other urbanized areas in the Puget Sound basin, phased in over the next 13 years. Programs will emphasize source controls and best management practices rather than end-of-pipe treatment. In addition to the urban stormwater programs aimed at existing urbanized areas, all jurisdictions are required to control quantity and quality of stormwater from new development and to ensure that existing stormwater control systems are adequately maintained and operated. Stormwater considerations are also integrated with the nonpoint program, where stormwater is one of the pollution sources addressed in priority watersheds. Technical assistance, including manuals and model ordinances, will be provided by the Department of Ecology. The plan incorporates Ecology's current program of guidelines and other efforts to address combined sewer overflows.

LABORATORY SUPPORT

The plan proposes a laboratory certification program designed by the Department of Ecology, and requires a plan to assure adequate laboratory capacity for an effective water quality control program.

WETLAND PROTECTION

The plan includes a state-level wetland preservation program, including acquisition, augmented by enhancement of local regulatory programs. The state-level program will use a systematic approach to identify wetlands to be preserved, and will be designed to complement similar efforts of private organizations. The local regulatory programs will be guided by regulations developed by the Department of Ecology. They will be reinforced by assisting local governments with resources for improved enforcement of local shoreline master programs and other requirements.

OIL SPILL RESPONSE PLANNING

The plan requires revisions of contingency plans and follow-through on the work of Ecology's Oil Spill Advisory Committee. Contingency plan revisions will be based on a spill response policy which specifies Ecology responsibilities, roles of response personnel, staffing levels, cost recovery, damage assessment, local government participation, volunteer assistance, and other items.

MONITORING

The plan calls for an interagency committee to recommend a comprehensive monitoring program to the Authority. This committee, including citizens, dischargers, scientists, and other nongovernmental representatives, as well as the various state, federal, and local agencies involved in monitoring programs, has already begun work and will report to the Authority in summer 1987. The Canadian government has also agreed to participate in the committee.

RESEARCH

The plan establishes a Committee on Research in Puget Sound to develop recommendations on research priorities, structures to set research and funding priorities, and data and information management strategies. The program also includes an annual meeting to discuss research related to Puget Sound.

EDUCATION AND PUBLIC INVOLVEMENT

The plan places heavy emphasis on education and public involvement. It addresses the long-term need for a coordinated strategy. It also includes an immediate emphasis on education and public involvement, through a grant program, requirements associated with specific plan elements, and a variety of other means. Coordination and lack of duplication will be emphasized by using an advisory group to develop the long-term strategy, publishing a directory of water quality programs, and implementing other specific proposals.

HOUSEHOLD HAZARDOUS WASTE

The plan calls for phased implementation of recent legislation that requires local household hazardous waste plans, including accelerated implementation of programs in a few counties. In addition, education is required, focusing on local plans and on less-toxic alternatives for household products.

LEGAL AND PERSONNEL SUPPORT

The plan addresses the need for adequate staff and legal support at both the state and local levels in order to carry out the Puget Sound plan. The plan requires evaluations of the need for state agency personnel and attorney support and assistance in the short term. At the local level, it calls for financial assistance to support augmented enforcement of requirements for shoreline protection, on-site sewage systems, and other laws and regulations related to water quality.

COSTS AND FINANCING

The plan is accompanied by cost estimates for each of the programs. It also includes a discussion of some of the potential revenue sources to fund the plan, including the state water quality account (cigarette tax), permit fees, the state general fund, and local funding.

The cost of the plan in the FY 1988-1989 biennium is $36.6 million. Over six years, the projected public sector cost is $119 million. Costs have not been estimated after FY 1992, although the programs are designed to continue. The target dates and cost estimates in the plan take into account the need to phase in programs over time.

Preface

The legislature finds that Puget Sound and related inland marine waterways of Washington state represent a unique and unparalleled resource. A rich and varied range of marine organisms, composing an interdependent, sensitive communal ecosystem reside in these sheltered waters. Residents of this region enjoy a way of life centered around the waters of Puget Sound, featuring accessible recreational opportunities, world-class port facilities and water transportation systems, harvest of marine food resources, shoreline-oriented life styles, water-dependent industries, tourism, irreplaceable aesthetics and other activities, all of which to some degree depend upon a clean and health marine resource.

The legislature further finds that the consequences of careless husbanding of this resource have been dramatically illustrated in inland waterways associated with older and more extensively developed areas of the nation. Recent reports concerning degradation of water quality within this region's urban embayments raise alarming possibilities of similar despoliation of Puget Sound and other state waterways. These examples emphasize that the costs of restoration of aquatic resources, where such restoration is possible, greatly exceed the costs of responsible preservation.

The legislature declares that the utilization of the Puget Sound resource carries a custodial obligation of preserving it. The people of the state have the unique opportunity to preserve the gift of nature, an understanding of the results of inattentive stewardship, the technical knowledge needed for control of degradation, and the obligation to undertake such control.

The legislature further finds that the large number of governmental entities that now affect the water quality of Puget Sound have diverse interests and limited jurisdictions which cannot adequately address the cumulative, wide-ranging impacts which contribute to the degradation of Puget Sound. It is therefore the policy of the state of Washington to create a single entity with adequate resources to develop a comprehensive plan for water quality protection in Puget Sound to be implemented by existing state and local government agencies.

--excerpt from the 1985 legislation creating the Puget Sound Water Quality Authority (RCW 90.70.001)

Chapter 1: Introduction

Puget Sound is recognized worldwide as an extraordinary natural resource. The region's 2.9 million residents enjoy boating, beachcombing, and other activities on the Sound's waters and beaches. Its deep waterways support international commerce, abundant commercial and recreational fisheries, and varied wildlife habitats.

Preservation of the Sound's abundance and beauty requires careful management. A steadily increasing population in the region has led to urbanization and industrialization of many nearshore areas. In the pattern of older American waterways we are witnessing early symptoms of inadequate management of this valuable resource.

But we in the Puget Sound region are fortunate. We have detected these problems comparatively early. We have faced and overcome similar problems before, when municipal waste was fouling Lake Washington and when pulp mill effluent was damaging some of our bays. Moreover, we do not face the same magnitude of difficulties confronting older, more developed regions in this country--such as Chesapeake Bay, Boston Harbor, or Narragansett Bay--yet we can draw on these for valuable lessons. We can recognize that it is far easier and less expensive to prevent degradation than it is to correct it (when correction or restoration is even possible). We can also see the price to be paid when these problems are ignored.

In recognition of these lessons and in response to increasing indications that our Sound and its resources are facing serious threats to their well-being, the 1985 Washington State Legislature passed ESSB 3828, restructuring the Puget Sound Water Quality Authority (PSWQA) and charging it with developing a comprehensive management plan for Puget Sound and its related waterways.[1]

[1] The previous PSWQA was established in 1983. It consisted of 21 members appointed by the governor and was charged with identifying pollution-related threats to Puget Sound marine life, evaluating pollution threats to human health, and investigating the need for coordination among agencies responsible for protecting Puget Sound water quality. Among the recommendations in its 1984 annual report was the call for "a long-range coordinated plan...to protect and improve water quality throughout the Sound."

In establishing the Authority, the Legislature found:

"that Puget Sound and related inland marine waterways of Washington state represent a unique and unparalleled resource..."

"that the consequences of careless husbanding of this resource have been dramatically illustrated in inland waterways associated with older and more extensively developed areas of the nation..."

"that the costs of restoration of aquatic resources, where such restoration is possible, greatly exceed the costs of responsible preservation..."

"that utilization of the Puget Sound resource carries a custodial obligation for preserving it..."

and

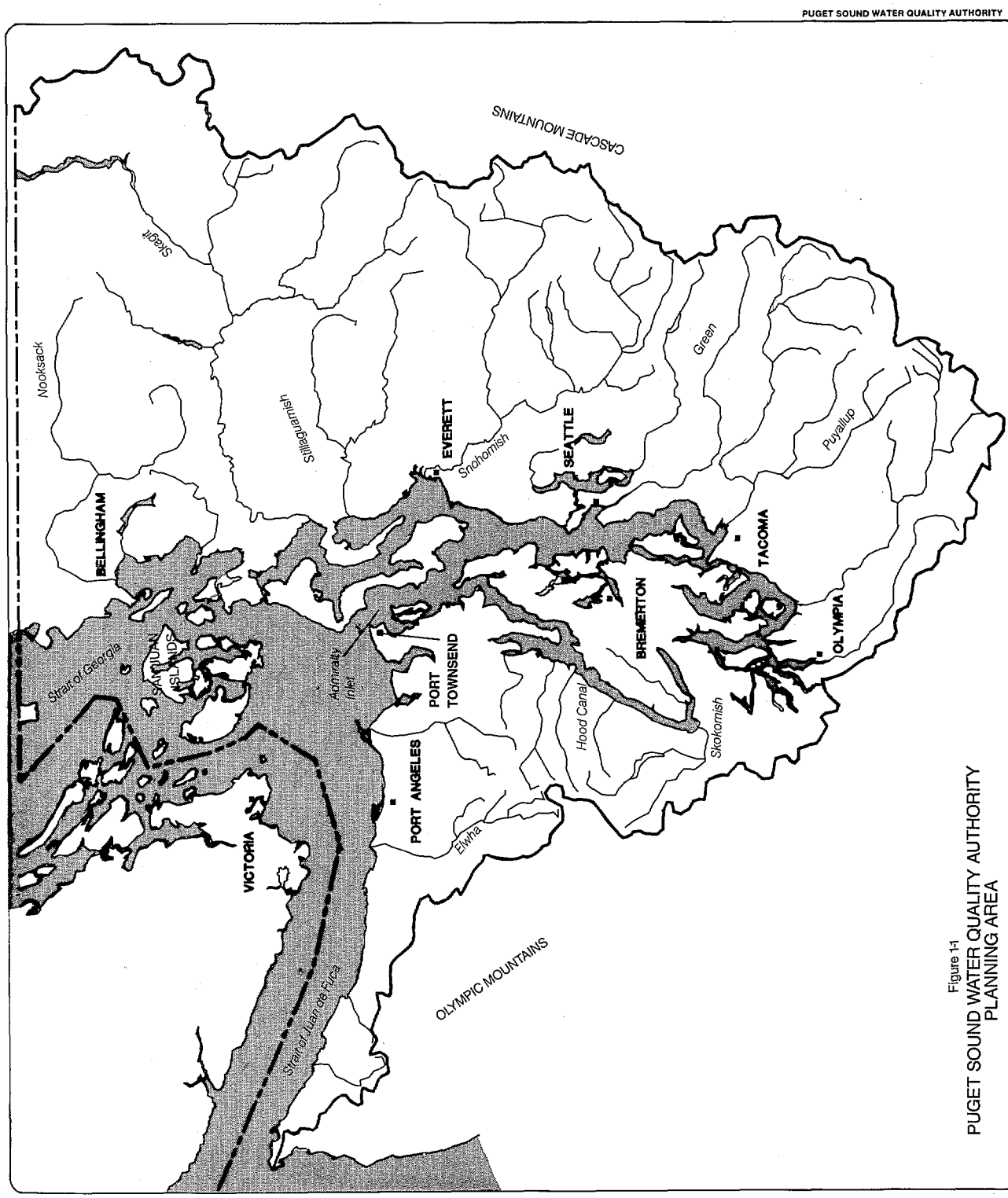
"that the large number of governmental entities that now affect the water quality of Puget Sound have diverse interests and limited jurisdictions which cannot adequately address the cumulative, wide-ranging impacts which contribute to the degradation of Puget Sound."

The principal responsibility of the Authority is to develop, adopt, and oversee the implementation of the Puget Sound Water Quality Management Plan. The plan is to include:

- Long- and short-term goals and objectives for water quality management in the Sound;
- An assessment of the Sound's resources;
- An analysis of laws, regulations, programs, and policies affecting water quality with recommendations for improving these;
- Priorities for water quality management and cleanup activities;
- Ways to assure local government-initiated planning for Puget Sound water quality protection; and
- Better coordination of federal, state, and local efforts affecting water quality.

The legislation also specifically requires the plan to address nonpoint source management, industrial pretreatment of toxic wastes, dredge spoil disposal, and the protection, preservation, and restoration of wetlands, wildlife habitat, and shellfish beds.

The planning area defined by the Legislature includes Puget Sound south of Admiralty Inlet (including Hood Canal and Saratoga Passage); the waters north to the Canadian border, including portions of the Strait of Georgia; the Strait of Juan de Fuca south of the Canadian border, extending westward to Cape Flattery; and all the land draining into these waters. There are 12 counties in the planning area. The terms "Puget Sound," "Puget Sound basin," "Puget Sound region," and "the Sound" are used interchangeably in this document to refer to the planning area (see Figure 1-1).



1-3. Puget Sound Water Quality Management Plan

Recognizing the magnitude of the problems confronting the Sound, the Legislature commissioned the Puget Sound Water Quality Authority to engage in a continuing planning process through 1991. The Authority is to revise the plan every two years, evaluating progress toward previous goals and addressing additional concerns. A "State of the Sound" report is also required every two years. The legislation requires state agencies and local governments to evaluate and incorporate applicable provisions of the plan into their policies and activities. The Authority is to propose funding mechanisms, propose new legislation as needed, and oversee the implementation of the plan.

THE PLANNING PROCESS

The Puget Sound Water Quality Authority consists of seven members who were appointed by Governor Booth Gardner in July 1985. In addition, the Director of the Department of Ecology and the Commissioner of Public Lands serve as ex-officio members. The Authority holds official monthly meetings in different locations around the Sound, listening to local governments and citizens. The Authority was assisted in the preparation of this plan by an advisory committee and a scientific review panel whose members were chosen to represent a spectrum of expertise in the issue areas and to include local government, business and industry, state and federal agencies, tribes, scientists, and public interest groups.

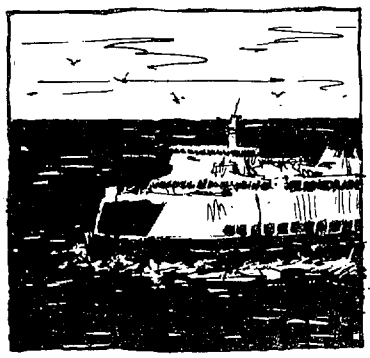
The Authority's first task was to establish the scope of the initial plan. The agency held a series of public meetings throughout the region to identify what the public viewed as the most pressing problems facing the Sound. These were augmented with the opinions of the advisory committee and through reviewing previous studies and reports. From this pool of information and with the specific mandates from the legislation, the Authority adopted a set of preliminary goals for the plan and a range of issues to be analyzed in detail. These major issue areas included: point and nonpoint sources of pollution, contaminated sediments and dredging, and wetlands.

The Authority then investigated the chosen issue areas to identify the extent of problems, the existing institutional and regulatory framework, the current state of knowledge, and shortcomings of the existing system for managing water quality. These investigations resulted in nine issue papers which outlined alternatives for problem solving in each area.[2]

The issue papers were then widely circulated for comment in April, May, and June 1986. In addition to monthly public Authority meetings, the Authority held public forums in each of the 12 Puget Sound counties to solicit comments on the issue papers and on the scope of the environmental impact statement (EIS). Written comments were encouraged as well. The issue papers were

---

[2]These included papers on Combined Sewer Overflows, Monitoring, Industrial Pretreatment, Nonpoint Source Pollution, Industrial and Municipal Discharges, Contaminated Sediments and Dredging, Habitat and Wetlands Protection, Response to Oil Spills, and Public Involvement in Water Quality Policymaking. Oil spills were not specifically within the initial scope of review, but after the *Arco Anchorage* oil spill in Port Angeles Harbor, the Authority elected to undertake a case study of cleanup response.



reviewed by federal, state, and local agencies and officials, the advisory committee, the scientific review panel, and by public and private interest groups. These comments assisted the Authority in formulating proposals to consider in the draft plan.

In July 1986 the Authority issued its first State of the Sound Report. This report reviewed the status and condition of Puget Sound's resources and current and foreseeable trends in water quality of Puget Sound. It emphasized the importance of looking ahead because of the strong tie between population growth and water quality.

On September 17, 1986, the Authority released the draft 1987 Puget Sound Water Quality Management Plan and environmental impact statement. The document described a "preferred plan" and alternatives and provided extensive information and analysis.

Over 340 letters were received commenting on the draft plan/EIS, and about 275 people testified at the 13 public hearings held on the draft plan/EIS throughout the Puget Sound region.

The plan elements that generated the most comment pertained to nonpoint source pollution and municipal and industrial discharges, but all components of the plan received at least some comment. Some of the major themes of the commenters were:

- An expression of general support for the plan or for cleaning up Puget Sound but with specific suggestions for changes in strategies or for top priority items.
- The need to better identify problems, set priorities and clear objectives, and evaluate the cost-effectiveness of solutions.
- The need for education and public support.
- The need for realistic deadlines and a clarification of the responsibilities of various entities.
- Concern over the costs and sources of financing to carry out the plan.

The Authority responded to the public comments by proposing a revised preferred plan, which was issued on December 10, 1986, as part of the final environmental impact statement. The revised proposal dealt with the majority of the concerns expressed during the comment period.

On December 17, 1986, the Authority adopted this final plan. It addresses the identified problems in a comprehensive manner and lays out an ambitious but feasible agenda. It calls for action by all of us who live and work in the Puget Sound basin. It incorporates a heavy emphasis on preventing problems rather than responding after damage has occurred. It recognizes that only a long-term program of wise and comprehensive management will protect Puget Sound for future generations.

Chapter 2:
The Puget Sound Basin

INTRODUCTION

The Puget Sound basin is a complex system composed of a large fjord-like estuary, numerous bays, sub-basins, and straits connecting the estuary to the Pacific Ocean. Sculpted by tectonic and glacial activity, this basin is drained by over 10,000 rivers and streams. One of the world's most productive temperate forests lies between the Sound and the mountains that surround it. Below these forests, the Sound itself supports a rich diversity of plants and animals, from valuable shellfish to abundant marine mammals.

PROCESSES OF THE PUGET SOUND BASIN

Estuarine circulation, the hydrologic cycle, and sediment dynamics are the major processes that move nutrients, sediment particles, and contaminants throughout the Sound. In turn, they influence the productivity of these waters and the fates of contaminants within them.

ESTUARINE CIRCULATION

The movement of outflowing surface water in the Sound is influenced by tides, fresh water, winds, temperature, the topography of the bottom, the shape of the surrounding shorelines, and the properties of the adjacent ocean waters.

The general circulation pattern in these waters is characteristic of partially mixed estuaries: it consists of two layers of water in which the less salty, denser water in the upper layer flows seaward, and the saltier, heavier seawater in the lower layer flows landward. The tides of Puget Sound flood landward and ebb seaward twice a day, recirculating the surface layer and driving this circulation pattern.

Variations on this general circulation pattern are created by sills, inlets, channels, and other local conditions. Massive glacial deposits heaped in mounds on the bottom of the Sound create shallow areas, known as sills, which divide the Sound into several sub-basins and influence its circulation. At these sills, strong mixing occurs and some of the outflowing surface water can be recirculated. For instance, at the sill at Admiralty Inlet up to two-thirds of the outflowing water may become a part of the deeper layer where it will flow southward instead of exiting to the Pacific.

This recirculation of water means that contaminants may not be readily flushed out of Puget Sound as was once believed. This is particularly true of contam-

inants that do not stay in solution or suspension. An experimental computer model designed by the National Oceanic and Atmospheric Administration showed that of 400 parcels of water discharged to East Passage--between Vashon Island and Des Moines (see Figure 2-1)--almost half were still south of Admiralty Inlet after three months. After six and 12 months respectively, 25 and five percent remained. Many of the inlets and bays of Puget Sound, such as Carr, Henderson, and Budd, have limited mixing and exchange. Thus contaminants introduced to these waters are not readily carried out.

HYDROLOGIC CYCLE

Fresh water can both nurture and harm the water quality of Puget Sound. It creates the highly productive estuarine conditions found here and, simultaneously, it carries contaminants from the land to the waters of the Sound. Fresh water enters the Sound from the following sources:

- Precipitation falling as rain or snow
- Rivers and streams flowing into the Sound (usually fed by melting snow or glaciers)
- Groundwater

Various locations within the Puget Sound basin receive between 16 and 96 inches of precipitation each year, producing an annual average fresh water inflow of 45,000 cubic feet per second. Approximately three-quarters of the yearly precipitation occurs in the cool season from October through March when the predominant winds are from the south. During this time soils around the Sound can become saturated with water, and their capacity to process wastes from septic tanks and manure applications is reduced. In the summer the high pressure system of the north Pacific Ocean moves northward, reversing the wind direction and reducing the amount of precipitation the Sound receives.

As rain falls and snow melts at higher elevations, water soaks into the soil where it recharges the groundwater and helps to maintain a steady supply of fresh water. Contaminants from septic tank effluent, pesticides, landfill leachate, and military wastes have entered the groundwater in several areas throughout Puget Sound.

Figure 2-2 illustrates the estimated average annual runoff for the major rivers that flow into the Sound. The largest flows come from the rivers on the east side of the Sound which are fed by the Cascade Mountains and Mount Rainier. On the west side of the Sound, the Olympic Mountains feed more than ten rivers which flow into the Strait of Juan de Fuca and Hood Canal. North of the planning area, the Fraser River in British Columbia contributes more fresh water to the Straits of Georgia and Juan de Fuca than all of the Puget Sound rivers combined, and has a major influence on the circulation in the Strait of Georgia.

The annual pattern of fresh water entering from each river and stream generally depends on its dominant source. The flows of smaller rivers, such as the Deschutes, which do not drain high mountains, generally follow rainfall patterns with maximum flows occurring during winter and rainstorms. Other rivers, such as the Nisqually and most of the rivers in the north Sound, are

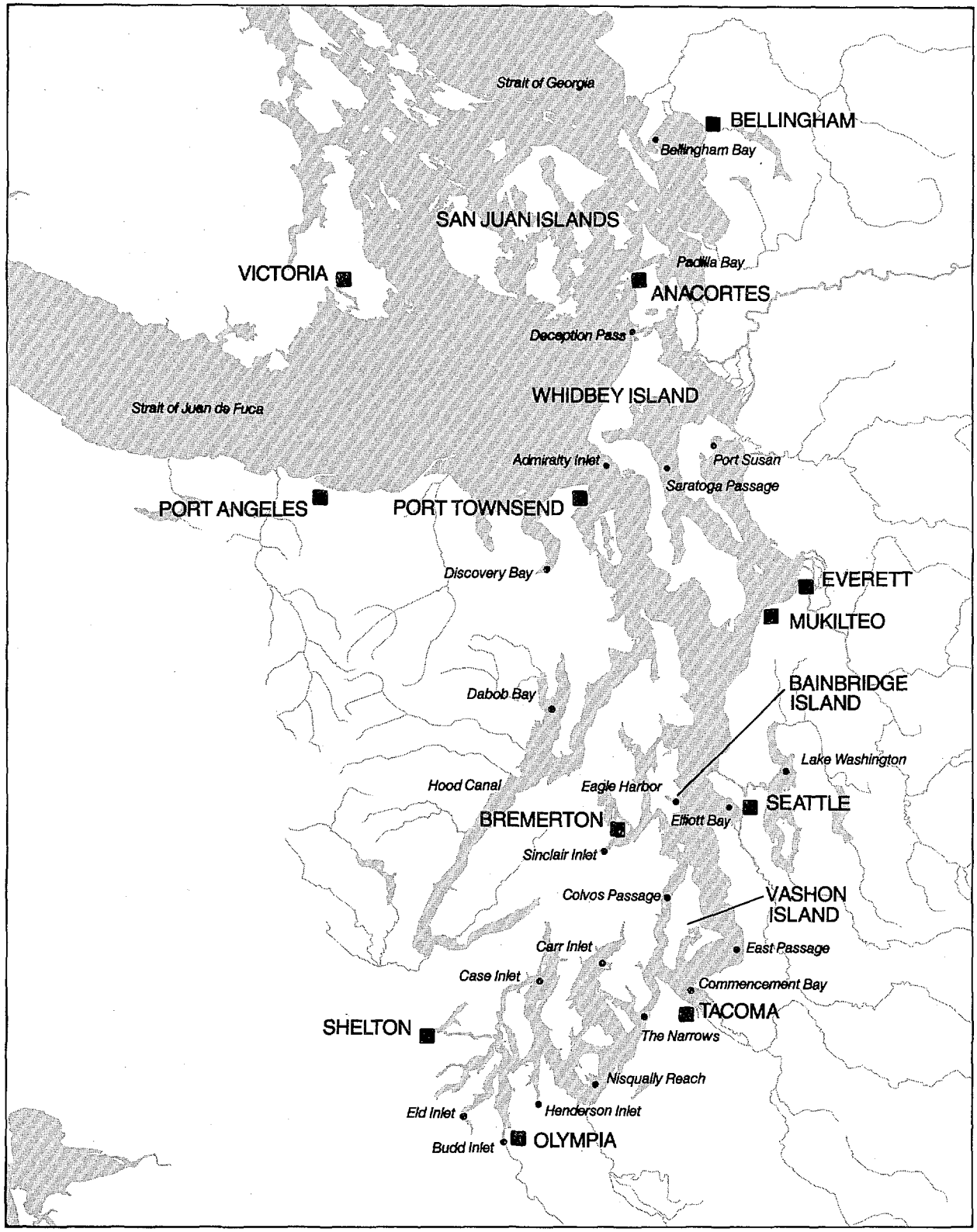


Figure 2-1

PUGET SOUND LOCATIONS

fed by snowfields and melting glaciers; they experience peak flows from snowmelt during the late spring and again during winter rainstorms. The Fraser River experiences peak output during June and July when meltwater flows into it.

During peak river flows, massive amounts of sediment are delivered to the Sound where they are deposited. The Sound's waters become more stratified, salinity is reduced, and, in heavy rainstorms, contaminants are washed off the land and into the rivers.

SEDIMENT DYNAMICS

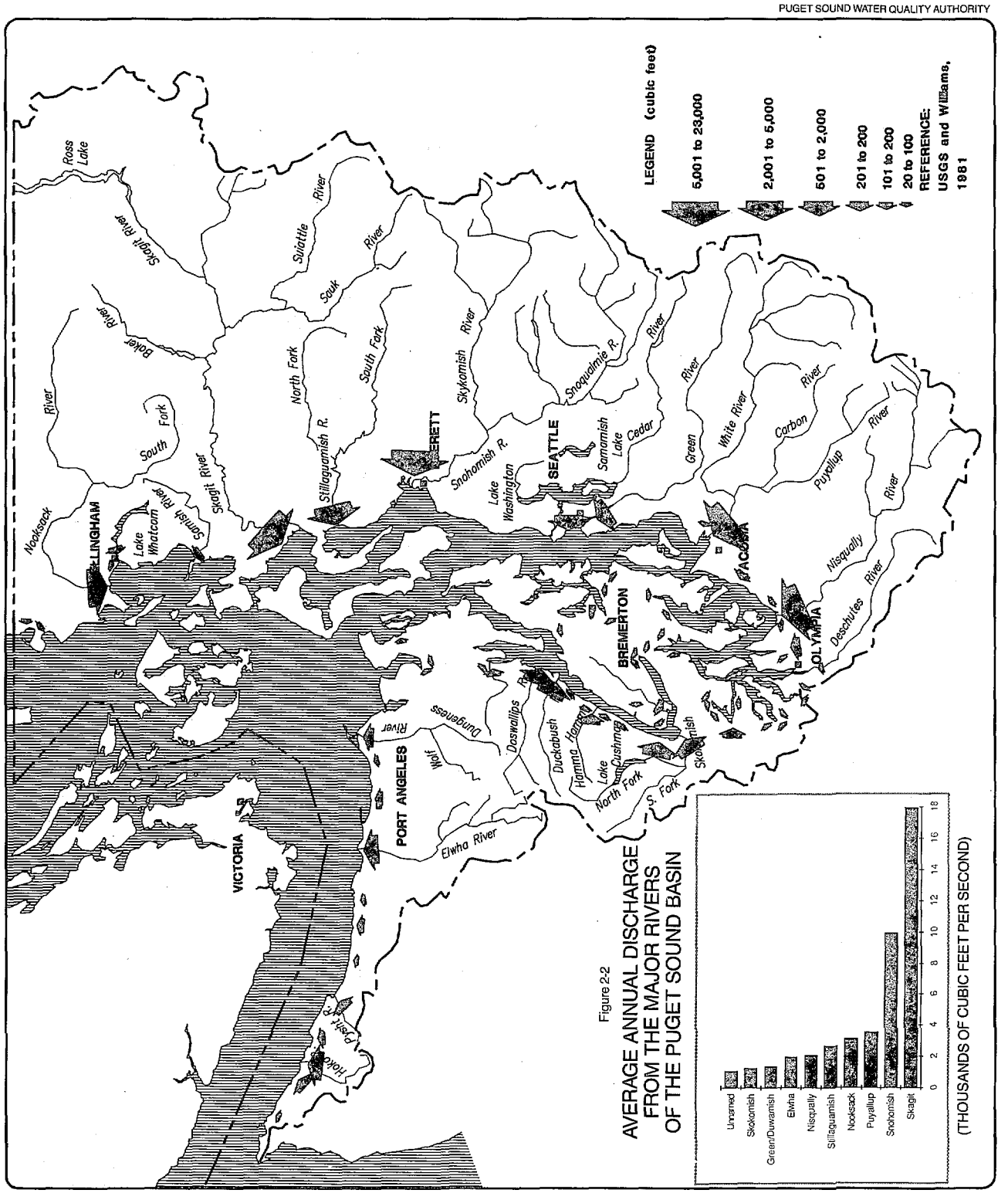
Like most estuaries, more sediment enters the Sound than leaves it. Sediment is released both through natural processes, such as weathering of coastal bluffs and river channels, and through human activities such as forest practices (i.e., road building) and construction which can release unnatural quantities of sediment. Some contaminants attach to sediment particles and are transported or deposited with them. Detritus (dead organic matter) is also associated with sediments and plays an important role in the food webs of Puget Sound.

Substantial amounts of riverine sediment enter Puget Sound. Six rivers--the Skagit, Snohomish, Duwamish, Puyallup, Nisqually and Stillaguamish--contribute 6.5 billion pounds of sediment per year. Some of the sediment carried by rivers never reaches the Sound but is blocked by dams. Much of the sediment that reaches the Sound is deposited at the river mouths where it creates the rich estuarine deltas of Puget Sound. Puget Sound's three largest ports are located at river mouths--the Port of Tacoma at the mouth of the Puyallup, the Port of Seattle at the mouth of the Duwamish, and Port of Everett at the mouth of the Snohomish. Consequently, these areas are routinely dredged to maintain navigational channels.

Glacial deposits forming the shores and bluffs of Puget Sound also contribute massive quantities of sediment to the Sound. As with rivers, the heavier material tends to settle out closer to the source of sediment, and the finer material is carried further out into the Sound.

Many sediment particles that are released to Puget Sound are retained within it. This occurs because particles settle out of the brackish surface layer and into the deeper layer where they are carried toward the land. Because this settling process occurs so readily, sediments tend to accumulate in Puget Sound and the straits rather than being carried out to sea.

A major barrier to the outward flow of sediment in Puget Sound is the sill at Admiralty Inlet. This sill creates an underwater wall that recirculates water into the deep layer carrying sediment particles with it. Other areas that are deep and/or that experience low currents also tend to accumulate sediments. These areas include the central basin, Budd Inlet, Eld Inlet, and Elliott and Commencement Bays. Estimates of sediment accumulation in the central basin show that approximately 0.18 to 1.20 grams of sediment accumulate each year on one square centimeter of the bottom of Puget Sound (one-twentieth to two-fifths of an inch).


PUGET SOUND WATER QUALITY AUTHORITY
LEGEND (cubic feet)
5,001 to 23,000
2,001 to 5,000
501 to 2,000
201 to 200
101 to 200
20 to 100
REFERENCE: USGS and Williams, 1981
Ross Lake
Skagit River
Baker River
South Fork
Nooksack
BELLINGHAM
Lake Whatcom
Samish River
Skagit River
Suiattle River
Sauk River
North Fork
South Fork
Stillaguamish R.
EVERETT
Skykomish River
Snohomish R.
Lake Washington
SEATTLE
Snoqualmie R.
Sammamish Lake
Cedar River
Green River
White River
Carbon River
Puyallup River
TACOMA
Nisqually River
Deschutes River
OLYMPIA
BREMERTON
Dungeness River
Wolf
Dosewallips
Duckabush
Hamma Hamma
Lake Cushman
North Fork
S. Fork
Skokomish
PORT ANGELES
Elwha River
VICTORIA
Pysht R.
Hoko
Figure 2-2
AVERAGE ANNUAL DISCHARGE FROM THE MAJOR RIVERS OF THE PUGET SOUND BASIN
Unnamed
Skokomish
Green/Duwamish
Elwha
Nisqually
Stillaguamish
Nooksack
Puyallup
Snohomish
Skagit
0 2 4 6 8 10 12 14 16 18
(THOUSANDS OF CUBIC FEET PER SECOND)

Once deposited, sediments can be resuspended by currents, wave action, biological activity, channel dredging, mechanical shellfish harvesting, and other human activities. This is especially true of lighter particles which are never really deposited and instead form a cloud-like mass above the bottom of the Sound, moving around with the currents. This movement redistributes contaminants and other particles that may be associated with the sediments. Conversely, the trapping of sediment particles in parts of Puget Sound means that the contaminants that are bound to them are not transported out of the Sound.

HABITATS AND BIOTA

About 2,000 miles of inland marine shores wrap around the Sound creating a wide diversity of habitats. These include exposed rocky shores, sheltered bays, sand spits, and broad tidal flats. Over 200 species of fish and 14 species of marine mammals live in Puget Sound. The San Juan Islands support one of the world's highest concentrations of breeding eagles. Shorebirds and waterfowl stop at Puget Sound's rich deltas to rest and feed during their migratory flights. For centuries, resident puffins, rhinoceros auklets, and pigeon guillemots have nested in the bluffs on Protection Island.

The habitats of the Puget Sound basin can be distinguished by the extent to which they are saturated with water: nonwetland terrestrial areas; wetlands; and the deep/open water. The boundaries between these habitats are blurred by the continual movement of water and life across them. This movement is exemplified by coho salmon which emerge from eggs in the shallow streams of the forests, feed as juveniles in the shallow estuarine waters of Puget Sound, and finally swim out to the open waters as adults where they feed until returning to their natal streams to give birth to a new generation of salmon.

OPEN WATER AND THE HABITATS BENEATH

The open waters of the Puget Sound basin provide critical feeding habitat for thousands of organisms including many of Puget Sound's commercial fish species. "Pelagic" organisms swim or float freely in the open waters; "benthic" organisms (bottom dwellers) live on or in the sediments of Puget Sound.

Primary inhabitants of the open waters include phytoplankton and zooplankton, and the pelagic fish such as the baitfish (herring, surf smelt, and sandlance), the salmonids, hake, pollock, and cod. Larger species of the pelagic realm include marine mammals and birds such as loons, grebes, and auklets.

Phytoplankton

Phytoplankton are a major contributor to the food web in Puget Sound. Their abundance and distribution follow the seasonal variations in sunlight, mixing of waters, and presence of fresh water. Of the annual 465 grams per square meter per year of carbon that plankton produce through photosynthesis, approximately 80 percent is generated from April to August when conditions are optimum for growth in the top 90 feet of the water column. This rate of production makes the main basin of Puget Sound one of the most productive deep-water estuaries in the world. Phytoplankton blooms in the Sound influence the abundance of zooplankton, which feed on these blooms and, in turn, are eaten by the fish and mammals of the Sound. Many of the smaller

invertebrates of the Sound release their eggs during phytoplankton blooms when a food source for the hatching larvae is assured.

Eggs and Larvae

At certain times of the year the eggs and larvae of numerous organisms can be found drifting with the currents of the Sound where some of them are exposed to the surface "microlayer"--the upper 50 microns of the sea surface. Species that come into contact with the microlayer in their early life cycles include cod, hake, English sole, octopus, Dungeness crabs, shrimps, snails, sea urchins, and worms. Some of these larvae, such as those of the Dungeness crab, may be found in the surface microlayer during certain times of the day when they feed on the bacteria that concentrate here. The microlayer concentrates organic compounds produced by plankton as well as many organic contaminants. Larvae of benthic organisms such as marine worms can also be exposed to contamination in sediments as they settle into the bottom. Thus at early stages in their life cycles, when they tend to be most vulnerable, these species may be exposed to contaminants.

Pelagic Fish

The pelagic fish of Puget Sound generally feed offshore in the open waters and enter the estuarine waters of the Sound to spawn and to feed as juveniles. Many of them are major food sources for marine mammals and other pelagic organisms. They also support the commercial fisheries of Puget Sound. Table 2-1 lists the estimated annual value of Puget Sound fisheries.

TABLE 2-1: ESTIMATED 1984 VALUE OF PUGET SOUND FISHERIES

Fishery	Annual Value
Commercial Salmon	$26.7 million
Sport Salmon	28.8 million
Herring, Smelt	.3 million
Commercial Groundfish	3.6 million
Sport Groundfish	1.5 million
Commercial Shellfish	9.4 million
Sport Shellfish	3.6 million
TOTAL	$73.9 million

(Sources: Solomon and Mills, 1983; WDF, 1984)

Although not entirely pelagic, salmon spend the majority of their lives in the open waters. First harvested thousands of years ago by Northwest Indians, they remain the most important component of the commercial and sport fishery in Puget Sound. Estimated average annual (1974-1978) total commercial salmon catch for all five species migrating through the Strait of Juan de Fuca (including Fraser River stocks) is 117,000 tons. In 1984 the salmon harvest accounted for approximately 67 percent of the value of Puget Sound's commercial fisheries. Sport catch is estimated at 800 tons in the Strait of Juan de Fuca and approximately 1600 tons in the main basin.

The salmon fishery would not be surviving today without the stringent management measures which limit catches for all species and frequently close entire fisheries. Natural runs of spring chinook are nearly extinct. Coho, the most abundant species in the main basin and south Sound, are maintained by hatchery propagation. Chinook, coho, pink, and chum salmon, as well as steelhead trout, are also artificially propagated in hatcheries and rearing pens throughout the Sound. While this creates more fish, it also interferes with the natural gene pool and may influence the health and viability of wild salmon populations. Destruction of spawning and rearing habitat by logging, dam and lock construction, shoreline development, and urban runoff has had a negative impact on the health of the Sound's salmon.

Herring, a major source of food for hundreds of marine birds and mammals, is the most important baitfish species in Puget Sound. It once supported a sac-roe fishery, a general purpose fishery, and a recreational bait fishery. In 1978 a significant decline in herring stock was detected, and less than half of the original stock was estimated to be present in the Sound's waters. In 1980 the Canadian government closed the sac-roe fishery due to low populations of surviving young. The northern all-purpose herring fishery which centered around the San Juans and Bellingham Bay was closed by the Washington Department of Fisheries in 1984 and 1985 due to concerns over low recruitment. Surf smelt, another baitfish, support a small commercial industry averaging 37 tons per year.

Groundfish, which are captured on or near the bottom of Puget Sound, include the hake-pollock and cod, rockfish and surfperches, flounder and sole, and spiny dogfish. The majority of English sole are taken from the central Sound and Hood Canal. Cod and pollock are fished primarily in the outer waters of the Strait of Juan de Fuca. Over the past 20 years, the total groundfish yield has gone up to about 5,000 tons per year. This is thought largely to be a reflection of new fishing habits induced by new markets and possibly depletion of other fishing stocks.

WETLANDS

Wetlands include tidal flats, shallow subtidal areas, swamps, marshes, wet meadows, bogs, and similar areas. They also include kelp beds, eelgrass beds, oyster and clam beds, and unvegetated riverbanks and lakeshores.[1]

Wetlands are some of the most productive ecosystems in the world. They cycle nutrients and make them available to thousands of species. Over 175

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[1]For the purpose of this plan the definition of wetlands used by the U.S. Fish and Wildlife Service has been adopted:

> Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoils and is saturated with water or covered by shallow water at some time during the growing season of each year.

species of birds and marine mammals use wetlands for primary feeding habitat. In addition, over 140 species of birds and mammals rely on them for breeding grounds. Many species are nurtured by wetlands during their critical life stages before they move on to other habitats. Wetlands also serve several other useful functions, including shielding shorelines from wave action, erosion, or storm damage; storing storm and flood waters; recharging groundwater; improving water quality through natural filtration and absorption (such as for stormwater runoff); providing recreation areas; and providing scenic and aesthetic benefits.

Estuarine Wetlands

Ranging from mudflats to kelp beds, the estuarine wetlands of the Sound can be described as rocky, sandy/cobble, or muddy habitats, each having a characteristic group of plants or animals adapted to live in association with that type of substrate.

The majority of the *rocky* intertidal and subtidal habitats are found in the northern part of the Sound. This environment is typified by the San Juan Islands, submerged mountain tops which the glaciers scoured but could not crumble. Species adapted to changing tides and wave exposure are characteristic of this area. The largest diversity of seaweeds in the Sound grows in this rocky zone. Kelp beds grow offshore, where they create a system of layered habitats providing food, shelter, and spawning and schooling areas to numerous species including herring and sea urchins. During the winter when there are fewer phytoplankton blooms to nourish organisms, these kelp forests die down and decompose, contributing large amounts of detritus to the food chain.

The *sandy/cobbly* habitats, which are found throughout the Sound, support many of the clams of Puget Sound--cockles, manila, littleneck, horse, and butter clams, and subtidal geoducks which burrow into the mud below. These burrowers filter phytoplankton and detritus from the overlying waters. Contaminants that accumulate in their tissue are often used as an indicator of water quality.

The *muddy/fine grained* bottom habitats, found mostly at the heads of protected bays and near river mouths, support numerous species. They are feeding grounds for migratory birds such as snow geese, black brant, buffleheads, and shorebirds. They are spawning grounds for surf smelt and herring. They are critical habitat for juvenile salmon which feed here and use the area to slowly adapt to saltwater conditions. Finally, they support the shellfish industry of Puget Sound.

In this muddy habitat, approximately 80 percent of the total West Coast hardshell clam population is grown and harvested. In the sudtidal regions (and occasionally in the intertidal zone) lie Puget Sound's geoducks. Commercial tracts managed by the Department of Natural Resources produce an annual yield of approximately five million pounds of geoducks. Japanese (also known as Pacific) oysters, another major commercial species, thrive in the quiet bays of Puget Sound where they grow on bits of shell or racks on muddy tidal flats. In 1982 their value was estimated to be $7.7 million. Collectively, the commercial production of all shellfish from Puget Sound in 1983 was estimated

to be about 9,000 tons; the recreational amount was estimated to be 1,000 tons. Although it cannot be measured in dollars, recreational harvesting of Puget Sound's shellfish adds to the quality of life that the people of Puget Sound enjoy.

Eelgrass beds are another critical wetland habitat of the Sound. They anchor the substrate and support a diverse community that includes fish, crabs, waterfowl, and shorebirds. In addition, they are the major spawning habitat for herring. Primary eelgrass beds of Puget Sound include Padilla Bay, the Snohomish estuary, a continuous band around Hood Canal, and areas along the Georgia Strait. Like the kelp and seaweeds, these beds die down in the winter and contribute detritus to the food chain. The major organisms that are harvested commercially from this habitat are Dungeness crabs whose harvest ranks fourth behind geoducks, oysters, and hardshell clams.

Wetlands Status

Since the 1880s, human activity has converted over half of the wetlands along the coast and river banks of Puget Sound to other uses such as industrial and residential development. Figure 2-3 indicates the overall changes in habitat for several Puget Sound river deltas. Of approximately 22,500 surveyed acres of coastal wetlands, nearly 14,000 acres--more than half--have been diked, filled, and converted to other uses. Diking for flood control and to accommodate development or agriculture has occurred on over 150,000 acres of flood plains along six major rivers. In stream corridors where pasturing is a primary use, there has been a 50 to 60 percent loss of wetlands. In other farming areas, such as the Skagit Valley, loss is 90 to 95 percent. Finally, commercial development in areas such as the Green/Duwamish and Puyallup river basins has eliminated over 95 percent of the areas' original wetlands. While the rate of loss has been reduced by laws passed in the 1970s[2], preservation or enhancement of the remaining high quality habitat provided by wetlands is critical for maintaining the abundance and diversity of species in Puget Sound.

CONTAMINANTS IN PUGET SOUND

A contaminant is a substance that is not naturally present in the environment or that is present in unnatural concentrations or amounts, and which can, in sufficient concentrations, adversely alter the environment. Thus, substances such as sediments, nutrients, bacteria, and metals that are a natural part of the ecosystem can be considered contaminants when human activity releases them in unnatural amounts or concentrations.

Contaminants of concern in Puget Sound include organic chemicals such as PCBs and PAHs, inorganic chemicals such as metals, biological contaminants such as pathogens, and sediments. Many toxic chemicals persist in the environment for years while biological contaminants are more easily assimilated and the environment generally recovers from their introduction. Toxicants can poison the marine ecosystem while pathogens alter the trophic structure. In both cases, human health is at risk.

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[2] These laws include the federal Clean Water Act, federal Coastal Zone Management Act, and the state Shoreline Management Act.

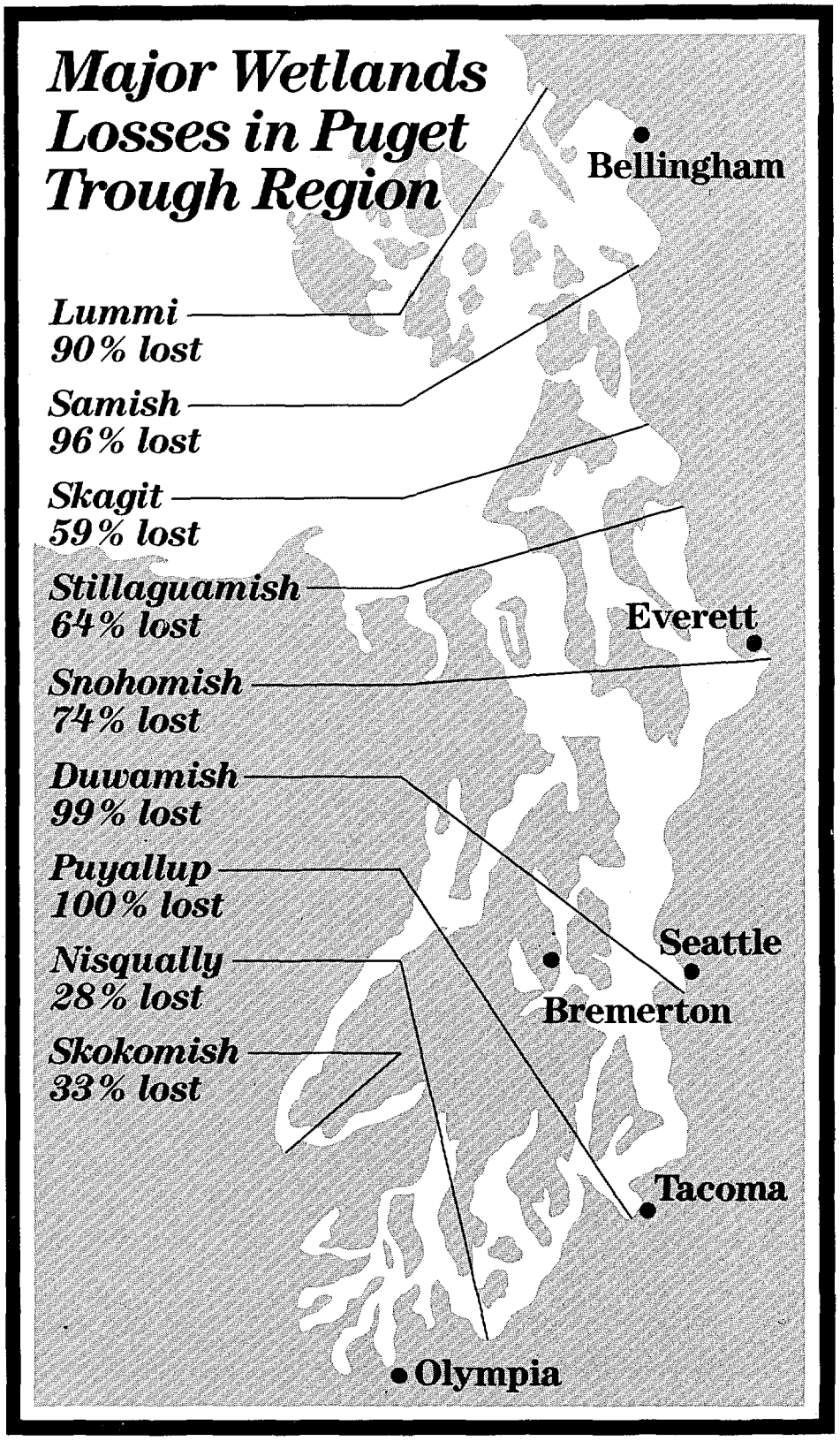

Major Wetlands Losses in Puget Trough Region
Bellingham
Lummi
90% lost
Samish
96% lost
Skagit
59% lost
Stillaguamish
64% lost
Everett
Snohomish
74% lost
Duwamish
99% lost
Puyallup
100% lost
Seattle
Nisqually
28% lost
Bremerton
Skokomish
33% lost
Tacoma
Olympia

Figure 2-3

The effects and fates of contaminants in Puget Sound are influenced by the interactions they have with the Puget Sound environment. Even before reaching Puget Sound, nonpoint sources and stormwater runoff are influenced by numerous factors including soil conditions, rainfall patterns, and the topography of the land. Point source discharges, on the other hand, tend to be more regularly discharged as they are controlled by such factors as production levels and are less influenced by weather patterns and topography.

Once contaminants reach the water they undergo a multitude of physical, chemical, and biological interactions with the water, sediments, and biota of Puget Sound. At this point it matters less whether they are point or nonpoint sources as generally the same mechanisms operate on both sources. Figure 2-4 describes some of these mechanisms in Puget Sound. The estuarine system of Puget Sound is capable of assimilating, diluting, or burying toxicants and pathogens to some extent. Unfortunately, the complexity of the system makes it impossible to predict with certainty the amounts that can be assimilated without causing harm to the system.

ORGANIC CHEMICALS

Organic chemicals include both natural and synthetic compounds containing carbon. Many can be toxic to life, most are poorly understood, and hundreds of new ones are created each year. Many synthetic organic chemicals are known for their resistance to decomposition or breakdown, their toxicity to living organisms, and their insolubility. Processing of food, wood, and oil are important sources of these chemicals to Puget Sound. Many products used in and around households, such as cleaning agents, are toxic organic compounds which make their way into the Sound through urban runoff, municipal treatment plants, and possibly from septic systems.

Over 50 potentially toxic organic compounds have been detected in the water, sediment, or biota of Puget Sound or its tributary rivers. The three groups of organic chemicals which have received the most study in Puget Sound include polychlorinated biphenyls (PCBs), other chlorinated compounds, and arenes (aromatic hydrocarbons). Common to all of these compounds is their tendency to accumulate in the sediments of the Sound. This is because they are poorly soluble and have a tendency to adhere to fine-grained particles containing organic matter. In addition, these contaminants can concentrate in the surface microlayer where eggs and larvae of organisms may be exposed to them.

Synthetic organic matter in unnatural amounts can also harm the environment by providing food for bacteria. In their effort to break down organic matter, bacteria consume large amounts of oxygen and thus limit the amount of oxygen available for fish or other organisms. Fish kills caused by oxygen depletion were common in parts of Puget Sound before cleanup measures were applied to sewage and pulp mill discharges.

INORGANIC CHEMICALS

Inorganic chemicals are compounds that do not contain carbon. Most inorganic chemicals occur naturally, and many are essential to life in certain quantities and chemical forms. They can be harmful to life when present in large enough quantities or in chemical forms not usually found in nature. Of most concern in Puget Sound are the heavy metals: copper, lead, zinc, chromium, cadmium,

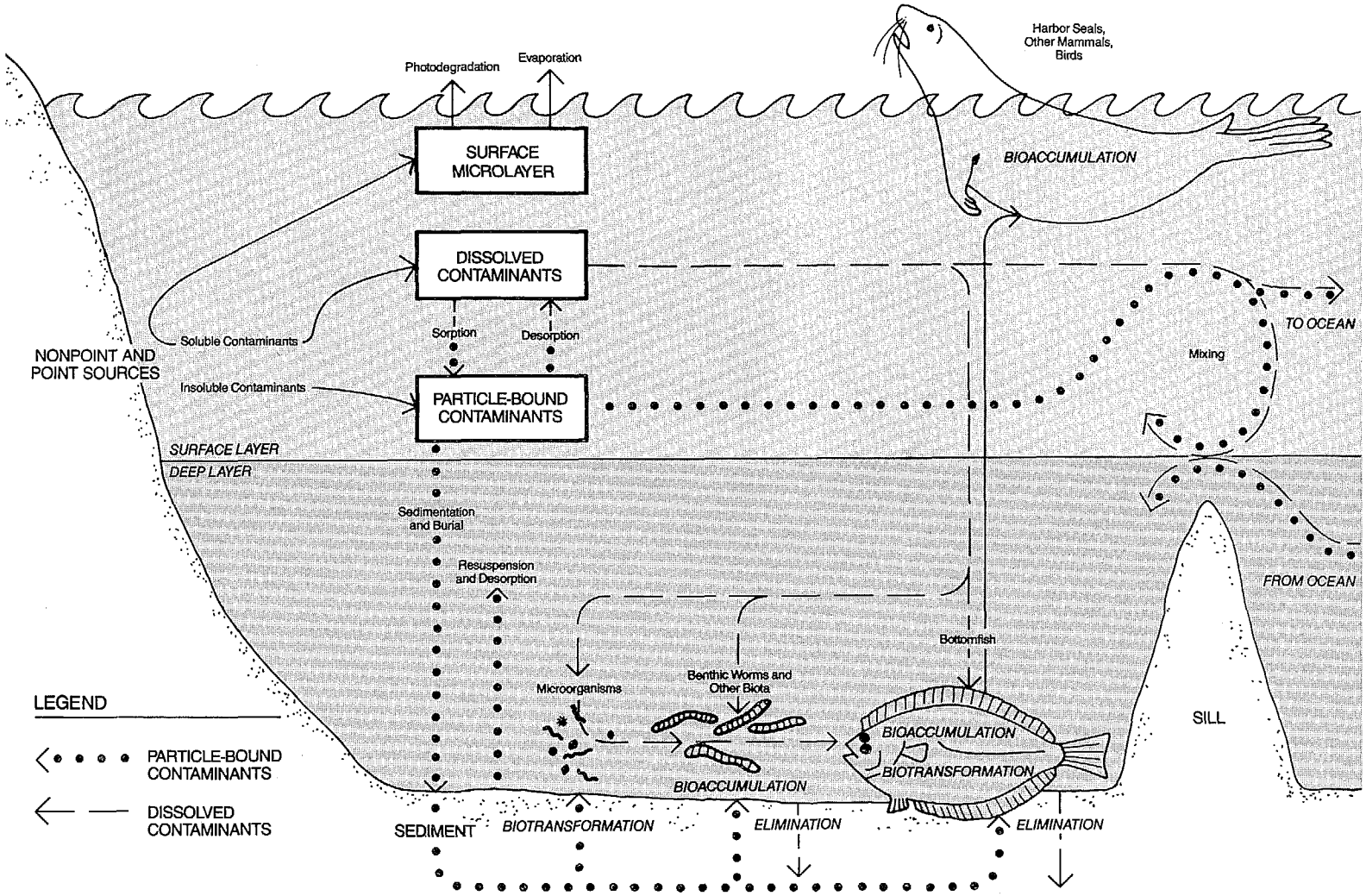


Figure 2-4

GENERALIZED TRANSPORT AND FATES
OF CONTAMINANTS IN PUGET SOUND

arsenic, and mercury. There is also increasing concern about organotin compounds from bottom paints applied to boat hulls to prevent attachment of marine biota. These compounds slough off boat hulls and into the water in a dissolved form where they are toxic to organisms, such as the larvae of bivalves, at the low parts per trillion level.

Nutrients such as nitrogen and phosphorous are also considered inorganic chemicals. These tend to be soluble, and, unlike most organic chemicals which bind to particles, nutrients remain in the water column where they are diluted and transported by the receiving waters. In areas with limited circulation, nutrients can build up and cause overgrowth of algae which can rob the water of oxygen when they die and decay.

BIOLOGICAL CONTAMINANTS

Biological contaminants include living organisms such as bacteria, viruses, and protozoa. They are a natural part of life and can be found in many warm-blooded mammals including people. However, when persistently introduced to the environment by sewage plants, storm drains, combined sewer overflows, and other sources, these organisms can spread diseases to humans and other organisms. The presence of fecal coliform bacteria, found in human and animal waste, has traditionally been used to indicate the presence of pathogens in the water. Because fecal coliform bacteria are believed to die relatively quickly after they enter marine waters, their presence generally indicates an active source of fecal contamination.

SEDIMENTS

Sediments contain both inorganic chemicals from eroded rock and organic chemicals from soil and organisms, including detritus. They can be both a contaminant themselves and a vehicle for other contaminants. Although sediments are a natural part of the Puget Sound basin, excessive amounts of sediment can harm animals, damaging their gills and other sensitive tissues, and can bury eggs or spawning grounds of benthic species. They can also cloud the water, limiting the amount of light that reaches plants, thus reducing photosynthesis.

Relatively insoluble compounds, such as PCBs and PAHs, have a tendency to bind with fine-grained particles with a high organic content. Bacteria can also adhere to organic particles and may be deposited with them. Contaminants bound to particles accumulate in parts of the urban bays where the influence of fresh water (from rivers, outfalls, and other sources flowing into the bays) encourages the settling of particles through a process known as flocculation. Contaminants in sediments in parts of these bays can be up to a thousand times more concentrated than those in the water.

SOURCES OF CONTAMINANTS

This plan addresses contaminants that enter Puget Sound from industrial discharges, municipal sewage treatment plants, combined sewer overflows, dredged material disposal, stormwater runoff, nonpoint sources, and oil spills. Contaminants from "point sources" (such as industrial facilities and municipal treatment plants) enter the Sound from known facilities at discrete points. Contaminants from "nonpoint sources" enter as diffuse waste streams transported to Puget Sound by surface runoff, rivers and streams, groundwater, and

atmospheric fallout. Nonpoint sources addressed in this plan include septic system effluent, agricultural practices, forest practices, stormwater runoff, and discharges from recreational boats.

The types of contaminants that enter Puget Sound and their distribution within it are a reflection of the land and water uses that occur in the basin. Industrialized areas where material goods are processed and transported are generally the most polluted areas of the region. These areas include parts of Seattle, Tacoma, Everett, and Bremerton as well as numerous other cities and ports (see Figure 2-1). Most of the region's oil refineries are found along the shores of the north Sound, and it is here that tankers enter and anchor. Other parts of the Sound, such as the San Juan Islands, the shores of Hood Canal, and numerous inlets in the south Sound, are prime recreational areas for summer homes and recreational boating. Dairies and small noncommercial farms dot the lowland valleys and rural areas of the basin. Each of these land uses produces characteristic contaminants which can enter the Sound either indirectly or directly and be transported throughout it.

Table 2-2 summarizes the sources that discharge potentially toxic substances to Puget Sound. The Puget Sound Estuary Program has defined these substances as "pollutants of concern" based on the following criteria: they are highly toxic (in laboratory studies), tend to persist in the environment, have high potential for bioaccumulation, measured water column concentrations are high, known sources exist, high concentrations are found in sediments relative to reference areas, or they exhibit widespread distribution in Puget Sound.

POINT SOURCES

Each day, approximately 650 million gallons of effluent are poured into Puget Sound from about 400 permitted industrial facilities and municipal sewage treatment plants. Point sources are located throughout Puget Sound but tend to be clustered around the Sound's industrialized, urban areas including Seattle (16 permitted discharges into Elliott Bay), Tacoma (36 into Commencement Bay), Shelton (ten into Oakland Bay), and Olympia (nine into Budd Inlet). In addition, there is an unknown amount of effluent from point sources that do not have permits.

Municipal Treatment Plants

Originally designed to treat human sewage in domestic wastewater, municipal plants are now used to treat a variety of toxic chemicals from industries, businesses, and households. Metro's study of the sources and loadings of flow, heavy metals, and organic toxicants at the West Point sewage treatment plant found that industrial facilities accounted for the majority of the metals while residences accounted for the majority of the flow and certain types of organic chemicals.

Industrial effluent that is discharged to municipal treatment plants without first being treated may introduce chemicals into a system that is generally not designed to treat them. These chemicals can interfere with the sewage treatment processes. Also, they may not be removed by the treatment process. Thus, toxicants may enter Puget Sound with limited treatment.

TABLE 2-2: SOURCES OF POLLUTANTS

POLLUTANT OF CONCERN	POINT SOURCES Municipal (a)	Industrial (b)	CSOs (c)	NONPOINT SOURCES (d)	SPILLS (e)
INORGANIC					
Antimony	A	C,CA,LS,OR	A	UR,IR	OS
Arsenic	A	C,OR,LS,(S)	A	UR	OS
Cadmium	A	CP,C,(M)	A	UR	
Chromium	A	F,CP,(S)	A	UR	C
Copper	A	P,C,CP,OR,CA LS,(M),(L),(S)	A	UR,IR,GW	OS
Lead	A	C,OC,CA,OR	A	UR,IR,GW	OS
Mercury	A	CA,B,OC,CA,OR	A	UR,IR,GW	C,OS
Nickel	A	C,CA,OC,(M)	A	UR	
Silver	A	(CP)	A	UR,IR,GW	
Zinc	A	C,OC,CA,OR,LS, (M)	A	UR	OS
Cyanides	A	CP,C,(F),(M)	A	UR	
ORGANIC					
LPAH	A	L,(M)	A	UR	O
Naphthalene	A	L,P	A	UR	O
Acenaphthylene	C	L	B		O
Acenaphthene	B	L	B		O
Fluorene	B	L	A		O
Phenanthrene	A	L	A	UR	O
Anthracene	A	L	B		O
HPAH	A	L,(M)	A	UR	O
Fluoranthene	A	L	A	UR	O
Pyrene	A	L	A	UR	O
Benzo(a)anthracene	A	L	A		O
Chrysene	A	L	A	UR	O
Total benzofluoranthenes	A	L			O
Benzo(a)pyrene	A	L	B		O
Indeno(1,2,3,c,d)pyrene	A	L	A		O
Dibenzo(a,h)anthracene	B	L	B		O
Benzo(g,h,i)perylene	A	L	B		O
Total PCBs	B		A		C
Hexachlorobenzene	C		C		
Hexachlorbutadiene	C	OC	C		
1,3-Dichlorobenzene	B		B	IR	
1,4-Dichlorobenzene	B		B	IR	
4,4'-DDT	C		C	AR	
4,4'-DDE	C			AR	
4,4'-DDD	C		C	AR	
Aldrin	C		C	AR	
Dieldrin				AR	
Gamma-HCH (lindane)				UR,AR	C
Phenol	A	OC,IC,OR,P,L,LS	A	UR,IR	
4-Methylphenol		(P)			
Pentachlorophenol	B	P,OC,IC,L	C	UR,IR	
Dibenzofuran		L			
2-Methoxyphenol (guaiacol)		(P)			
2-Methylnaphthalene	A				O
N-nitrosodiphenylamine	C		B		
Trichloroethene	A	P,OC,CA,(DC)	A	GW	
Tetrachloroethene	A	P,OC,IC,CA,(DC)	A	GW	
Ethylbenzene	A		A		O
Chloroform	A	P	A		

(Modified from EPA Pollutant of Concern matrix, August 1986. Organotin compounds and 2,3,7,8-tetrachlorodioxin are also on the Pollutant of Concern matrix, but there are insufficient data to categorize sources of these pollutants.)

FOOTNOTES:

Blanks indicate that there are insufficient data to categorize.

(a) Municipal

- A = Chemical occurs in more than 25 percent of samples from Puget Sound municipal discharges.
- B = Chemical occurs in less than 25 percent of samples from Puget Sound municipal discharges.
- C = Chemical not detected based on available information.

(b) Industrial: Industries in which chemical may be found

- S = Ship building/repair
- P = Pulp mills
- C = Copper smelters
- CP = Chrome plating, silver plating
- F = Ferro, silicon, chrome industries
- CA = Chloralkali plants
- B = Bleach plant
- L = Log/wood treatment facility
- OC = Organic chemical manufacturing
- IC = Inorganic chemical manufacturing
- LS = Log sort yards
- M = Primary production of ferrous and non-ferrous metals
- OR = Oil refining
- DC = Dry-cleaning

Codes in parentheses indicate industries which are potential sources but have not been documented in Puget Sound.

(c) CSOs

- A = Chemical occurs in more than 25 percent of samples from Puget Sound CSOs.
- B = Chemical occurs in less than 25 percent of samples from Puget Sound CSOs.
- C = Chemical not detected based on available information.

(d) Nonpoint Sources: Types of nonpoint sources where chemical may be found.

- UR = Urban runoff
- AR = Agricultural runoff
- IR = Industrial runoff
- GW= Groundwater

(e) Spills: Kinds of spills where chemical may be found.

- O = Oil spills
- C = Miscellaneous product spills
- OS = Ore spills

In an effort to reduce pollutant loadings from municipal plants, federal and state requirements call for all municipal plants to provide at least secondary treatment by July 1988. EPA and Ecology are negotiating final compliance schedules for those primary plants that are unable to convert to secondary treatment by the deadline. (See Chapter 4 for further discussion.)

Primary sewage treatment allows solids in the sewage to settle out and also skims the top of the settling tank. Much of the solids, oil, and grease--and a portion of the pollutants--are removed. The liquid that remains is chlorinated and discharged.

The solids that were removed are referred to as primary sludge. Some of the heavy metals and organic toxicants found in the wastewater are captured in the sludge. Sludge is most frequently disposed of in landfills. The use of other management options is increasing; in particular, applying sludge to forest land as a fertilizer.

Secondary sewage treatment is an extension of primary treatment. It uses microorganisms to break down the organic matter left in the wastewater after primary treatment. As with primary treatment, the effluent is then held in large tanks where the solids settle out, producing more sludge, comparable in quality (in terms of concentration of toxicants) to that produced in primary treatment.

Of approximately 130 municipal discharges in the Puget Sound basin, all but 27 of them use secondary treatment. The remainder currently rely on primary treatment plants, large septic tanks, or land application of wastewater. The largest plants still operating on primary treatment are the Metro's West Point plant in Seattle and Tacoma's central plant which currently discharges into the Puyallup River. Both of these plants are in the process of being converted to secondary treatment.

The reduction in pollutant loading that will result from conversion of the Sound's remaining primary treatment plants to secondary treatment is significant. Figure 2-5 illustrates the estimated percent of contaminants (from the water effluent) that remain after primary and secondary treatment. Metro has estimated that implementing secondary treatment at its four primary plants will reduce the total loading of suspended solids to Puget Sound by 16,000 to 18,500 tons/year and the total loading of toxicants by 100 tons/year.

Two thousand tons of sludge are produced each day by treatment plants in the Puget Sound basin. This is expected to double in the next few years as primary plants are converted to secondary treatment technology. Metro has estimated that, of the toxic metals introduced to a secondary plant for treatment, an average of 77 percent will end up in the sludge and the remaining 23 percent will be discharged into Puget Sound (Figure 2-5). A 1981 survey by Ecology showed that the state's "major" municipal treatment plants disposed of 58 percent of their sludge at landfills, 16 percent by land application, 13 percent by lagoon storage, 11 percent by incineration, and 2 percent by other methods. The current trend in sludge management is to use sludge to fertilize crops, forests, and garden landscapes whenever it is sufficiently uncontaminated to do so.

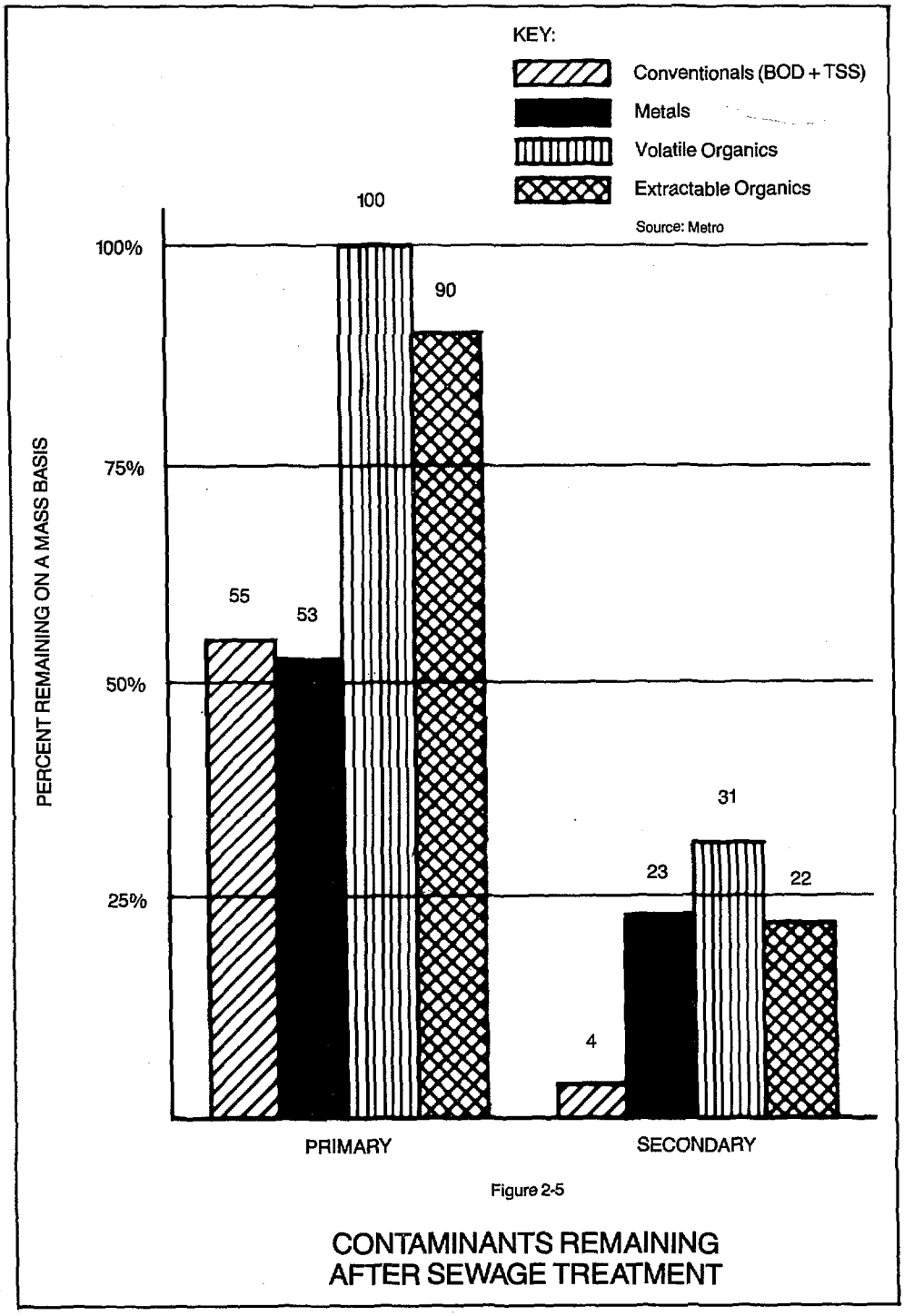


Figure 2-5

CONTAMINANTS REMAINING
AFTER SEWAGE TREATMENT

Combined Sewer Overflows

In several cities around the Sound, the sewer system carries both sanitary sewage and stormwater. During heavy rains, many of these sewer systems cannot hold all of the stormwater and sewage that flows into them. Instead, pipes known as combined sewer overflows (CSOs) shunt the excess raw sewage, industrial wastewater, and urban runoff untreated into Puget Sound or its tributaries. During an average rainfall year, approximately two billion gallons of untreated effluent and stormwater enters Puget Sound from the 20 CSOs in the Seattle area. Although a complete inventory has not been conducted, nearly 200 CSOs periodically flow into Puget Sound from the following areas: Seattle (including Metro), Anacortes, Bellingham, Bremerton, Everett, Marysville, Mount Vernon, Olympia, and Port Angeles. Some CSOs, such as the Denny Way CSO on Elliott Bay in Seattle, overflow almost every time it rains. Others, such as the city of Seattle's Florida Street CSO, overflow only about once every five years.

CSOs are usually located near shoreline areas where they can cause sludge buildup, turbid water, floating material, and extremely high fecal bacterial concentrations. In the Puget Sound basin, only Metro and the city of Seattle have studied the effects of CSOs on the water and sediment quality. Metro investigations concluded that the Denny Way CSO is a major source of heavy metals and organic toxicants to the adjacent sediments, and that it has a detrimental effect on the organisms in the area. During CSO events fecal coliform concentrations up to 5,000 times greater than the state of Washington water quality standards for Class A waters (14FC/100ml) have been measured in effluent from the Denny Way CSO. Results of the Denny Way studies indicate that effluent from other CSOs in Puget Sound which have not been studied could be affecting the waters, sediments, and associated biota.

Industrial Discharges

Approximately 270 industrial dischargers have NPDES permits to release treated wastewater directly to Puget Sound or its tributaries. While effluent from some of these discharges has been improved through new treatment processes, others contain complex mixtures of heavy metals, toxic chemicals, or other harmful compounds despite current treatment. An estimated 170 additional industries hold state permits to discharge wastewater into Puget Sound municipal sewer systems and are subject to pretreatment requirements.

Primary industries in the Puget Sound area include chemicals and related products, lumber and wood products, petroleum refining, primary metals manufacturing, meat and seafood processing, marine cargo, and transportation-related facilities such as aeronautics and shipbuilding.

Most of the major[3] permits are held by oil refineries (eight), pulp and paper mills (nine), aluminum and steel processing plants (two), and chemical compa-

[3] Major municipal systems are generally defined as plants that treat one million gallons per day or more, or a population equivalent of 10,000 people. Major industrial systems are those that score 80 points or more in EPA's rating system which includes such factors as the potential for the pollutants to be toxic, the size and type of the waste stream, potential public health impacts, and whether the effluent limits are water quality or technology based.

nies (two). Of the approximately 400 major and minor NPDES permits in the Puget Sound basin, 30 percent are for municipal services (i.e., electrical services, water supply, and sewage systems) and over 40 percent are for the manufacturing or processing of foods and beverages, related products such as vegetable and animal fats and oils, and prepared foods for livestock.

The cities of Seattle, Tacoma, Everett, Bellingham, and Olympia have the most facilities with industrial permits. Anacortes, Bremerton, Port Angeles, Bellevue, and Shelton also have a significant number of permitted industrial facilities.

Towns near agricultural areas such as Lynden, Auburn, Snohomish, and Mount Vernon have milk, cheese, and fruit/vegetable processing plants. Fish hatcheries are found throughout the Sound. Finally, hospitals, medical labs, and health care homes, which are not normally thought of as industries, contribute significant amounts of wastes to the municipal systems of Puget Sound. In Tacoma alone, there are over 25 such facilities.

The types of contaminants discharged from industrial plants generally depend on what is used in the facilities and how the wastes are treated. Generally, industries that produce organic wastes as a byproduct of their process (such as oil refineries, food processing plants, pulp and paper mills, and some chemical plants) rely on biological treatment. Industries such as aluminum plants, which create inorganic waste, tend to use physical/chemical treatment because their wastes cannot be biologically broken down.

Industries use about two-thirds of the fresh water used in the Puget Sound region. Most of this wastewater is discharged into Puget Sound after the manufacturing process, and some of it carries contaminants with it. EPA has estimated that approximately half of all toxicants introduced to Puget Sound may enter through legal discharges from permitted facilities. However, because most NPDES permits do not reflect all of the toxicants discharged by the industries, it is not possible to define the loadings from the industrial and municipal plants.

Recent investigations conducted by Ecology and EPA in Commencement Bay--a Superfund site--have shown that discharges by major industries with NPDES permits are responsible for much of the ongoing pollution detected in the area. Most of the toxic contaminants found in the effluent are not specifically limited by the facilities' NPDES permits.

Results of the studies found that Pennwalt Chemical, Occidental Chemical, Kaiser Aluminum, and log sort yards were largely responsible for sediment contamination in the Hylebos waterway where elevated levels of metals, PAHs, PCBs, and chlorinated hydrocarbons were found. Other sites where contaminated sediments were identified included the Sitcum Waterway, St. Paul Waterway, City Waterway, Wheeler Osgood Waterway, and the Asarco site. In the Sitcum waterway, the Port of Tacoma ore dock and nearby storm drains were identified as sources of metals. The Simpson Timber kraft pulp mill was found to be a source of phenols and copper in the St. Paul Waterway. Storm drains were identified as sources of contamination to the City and Wheeler Osgood Waterways. Runoff from the Asarco site was determined to be the

primary source of arsenic, other metals, and PCBs in the vicinity. The cost of identifying these sources has amounted to over $2 million. The cost to clean up the 12 most contaminated sites may exceed $65 million.

Studies of the pollutant loadings to Elliott Bay and the Duwamish River (conducted by Harper-Owes for Metro) concluded that 75 to 98 percent of the toxicant loadings could not be attributed to known sources such as upriver nonpoint sources, the Renton sewage treatment plant, sources reflected in NPDES permit data, and combined sewer overflows. Researchers attributed this to a variety of factors, including industrial runoff, spills, point sources without permits, and/or dischargers whose NPDES permits did not require them to monitor or limit many of the toxicants in their effluent.

DREDGED MATERIAL DISPOSAL

Construction and maintenance of navigational channels and docks requires dredging the sediments of Puget Sound. This need is likely to continue and, with it, the need to dispose of the sediments that are dredged. Because many of the sediments being dredged in Puget Sound are contaminated, there is the problem of finding areas for safe disposal. Of the 17 million cubic yards dredged between 1970 and 1985 from Seattle, Tacoma, and Everett, approximately 40 percent was deposited in unconfined open water disposal sites. The remainder was placed in upland and nearshore areas. The Fourmile Rock site in Elliott Bay received approximately 70 percent of the material discharged into the open water. Because upland sites are becoming more scarce, pressure to use open water sites has increased.

OIL SPILLS

Due to its proximity to Alaska, Puget Sound, especially the northern portions, is used for the storage and transport of oil. With this use comes occasional oil spills which can harm the water quality and biota of the region. Since 1982, when the Coast Guard began a computerized database, about 500 spills per year of varying sizes have been documented in Washington.

Most recently, approximately 240 million gallons of crude oil spilled into Port Angeles Harbor when the oil tanker *Arco Anchorage* went aground. Thousands of marine birds died. The less noticeable effects of this spill are still being evaluated. These effects depend on numerous factors, including the type of oil that is spilled and the condition of the environment it enters. The long-term chronic effects of oil spills are not yet well understood; the effects are difficult to detect and they have not been the subject of much research.

NONPOINT SOURCES AND STORMWATER RUNOFF

Stormwater Runoff

Stormwater runoff can be considered both a point and a nonpoint source. Like point sources, it is often channelled to and eventually discharged into Puget Sound or its tributary streams through ditches or pipes. Runoff can be viewed as a nonpoint source when it does not flow into ditches or pipes or when it flows over the land before reaching pipes.

The contaminants in stormwater runoff are determined by the land uses it drains. Stormwater runoff from urban and urbanizing areas is characterized by a complex mixture of untreated contaminants that includes suspended solids, nutrients, bacteria/viruses, metals, and organic toxicants. Results of a year-long monitoring project conducted by the Thurston County Health Department in Henderson Inlet found that stormwater diverted into the inlet from the city of Lacey and adjacent urban areas showed fecal coliform levels as high as 2,400 fecal coliforms/ml--more than 40 times the Class AA standards for these waters. These coliform levels contributed to the closure of shellfish beds at the head of the inlet.

Sampling conducted by Metro in the Seattle area found that average storm-water concentrations exceeded water quality criteria for cadmium, copper, lead, nickel, and zinc. (Researchers cautioned that the metals generally did not exist as free ions--the chemical form most available for uptake by organisms. They do, however, bind to particles which settle to the bottom where benthic organisms can be exposed to them). Sources of these metals included fuel combustion products, lubricant and fuel leakage, and tire and mechanical wear from motor vehicles.

Washwater, spills, improper maintenance of industrial facilities, and illegal dumping of household and/or industrial wastes also contribute toxicants to runoff. Metro's Duwamish Industrial Nonpoint Source Investigation identified several storm drains as significant sources of heavy metals and organic toxicants to Elliott Bay. As described previously, the Commencement Bay studies also identified storm drains as major sources of toxicants contributing to sediment contamination in the bay. Fish kills in several Puget Sound tributaries, including Woodland, Kelsey, and Des Moines Creeks, have been caused by toxic materials which were transported over the land and discharged to the creeks through storm drains. Depending on the type and intensity of land use, septic systems, forest practices, and agricultural practices can also contribute contaminants to stormwater runoff.

Regardless of the contaminants it contains, stormwater from all developed areas can have a significant effect on adjacent water bodies through flooding and resultant streambed scouring and habitat degradation which can affect salmon and other species who rely on this habitat. Periodic flooding is caused by the increased volume and velocity of runoff that accompanies increasing amounts of impervious surfaces (roofs, parking lots, streets) from development and decreased vegetation. Results of studies comparing an urbanized stream (Kelsey Creek in Bellevue) with a less urban one (Bear Creek) found that organisms in Kelsey Creek were types that are more tolerant of environmental degradation. Up to three-fourths of the fish in Kelsey Creek had respiratory anomalies. The researchers concluded that the differences were probably associated with the increased peak flows in Kelsey Creek and the resultant increase in sediment carrying capacity and channel instability. Other streams in Puget Sound have been similarly affected by increased stormwater volume and velocity.

Forest Practices

Forest practices which may adversely affect the water quality and biota of the Puget Sound basin include logging, road building and maintenance, and post-

harvest activities such as slash burning, reforestation, and herbicide applications. These activities can cause increased sediment loads, elevated water temperatures, chemical contamination, generation of organic debris, loss of salmon habitat, and alteration of the natural species composition of the forests. These effects have been documented in rivers but not necessarily in the Sound itself. Log storage and rafting, which occur in many of Puget Sound's bays, inlets, and ports, limit the amount of light reaching benthic areas. Logs can release large amounts of bark to the water which can affect the benthic communities below and may, in certain cases, cause periodic oxygen depletion in the adjacent waters. Several storage sites in Tacoma, where contaminated slag from the Asarco smelter was used as fill material, release contaminants to adjacent waters.

Agriculture

Roughly 1,000 commercial dairies and a growing number of small noncommercial farms are found throughout Puget Sound. When operating without adequate management practices, these farms can be sources of fecal coliforms, sediments, nutrients, and organic materials to Puget Sound and its tributaries. Cattle access to streams has destroyed streamside buffers and caused accelerated bank erosion in several areas throughout the Sound, including parts of Newaukum Creek, Burley-Minter watershed, and Woods Creek in the Snohomish watershed. As discussed in the PSWQA Nonpoint Source Pollution Issue Paper, there are numerous rivers and creeks where a probable link between agricultural practices and elevated fecal coliform counts has been established. These include parts of the Samish, Skagit (South Fork), Stillaguamish, Snohomish, White, Sammamish, Puyallup, and Deschutes Rivers and parts of Johnson, Newaukum, Chimacum, South Prairie, and Baker Creeks. Elevated fecal coliform levels in segments of these water bodies have violated the water quality standards for the state of Washington. Periodic violations of these standards increase the possibility that pathogens are present and may cause harm to humans.

On-site Septic Systems

Approximately 30 percent of the human population in the 12 counties surrounding the Sound relies on on-site septic systems for sewage treatment. This is particularly true of rural areas such as Hood Canal, Eld and Totten Inlets, and Vashon Island. New developments in unsewered areas also use on-site treatment. Older systems designed and installed as temporary facilities (to be used until an area was sewered) now function as permanent systems. Because they were designed prior to current siting and design regulations, many of them are now considered poorly sited and have high failure rates. In addition, current regulations do not ensure that new systems will always be properly sited and installed.

Effluent from systems that are inadequately treating waste create the potential for bacteria, viruses, protozoa, worms, and toxic chemicals from household hazardous wastes to enter nearby aquifers and water bodies. This potential is increased by glacial soils, which can have a limited capacity to absorb septic waste, and heavy rains which saturate the ground and reduce its capacity to absorb and process waste. Improper design, construction, installation, and lack of maintenance can also increase the potential for on-site system failures. With an estimated failure rate of 3.5 to 5.0 percent, it is possible that between

13,400 and 19,150 systems in the Puget Sound basin are failing at any given moment. An investigation of the systems bordering Henderson Inlet surveyed 342 on-site sewage systems during the winter months and found that 8.2 percent of them were noticeably failing. Although the amount of contamination from failing on-site systems has received limited study in Puget Sound, they have been identified as contributing to the closure of four of Puget Sound's commercial shellfish beds. These closures are discussed and illustrated in the section on health effects later in this chapter.

Recreational Boating

Recreational boating contributes nonpoint pollution from sewage, petroleum products, and antifouling paints. Illegal discharges of raw sewage are of particular concern in Puget Sound because of the threat to recreational and commercial shellfishing. Impacts are potentially greatest at popular overnight anchorages and "destination" marinas, particularly in shallow water bays with poor tidal flushing. As with other nonpoint sources, attempts to determine the contribution of pollution from boats have frequently been inconclusive. Recreational boating is a highly variable, intermittent source. The ability to detect pollutants from boats can depend on the presence of other sources, the tide, and, most of all, dilution in the receiving water. Nevertheless, indications of problems from boats have been found in Puget Sound. Violations of water quality limits for fecal coliform bacteria have been attributed to pleasure craft in Port Ludlow and Eagle Harbor following peak boating weekends, and violations of shellfish standards for fecal coliform bacteria have been attributed to recreational boating in several state parks (Jarrell Cove, Penrose Point, and Squaxin Island). In addition, some commercial shellfish beds near marinas or other heavy boat traffic areas have been decertified or conditionally closed during the boating season due to either actual elevated measurements of fecal coliform bacteria or the threat of fecal coliform contamination (see Table 2-5).

Nonpoint Source Loading Studies

Several studies conducted in Puget Sound have used water quality sampling and/or land use models to describe the nonpoint source loadings in the study area. These include investigations in Newaukum and Bear-Evans Creek watersheds, located in King County; and the Big Beef Creek, Burley/Minter and Henderson/Eld watersheds, located in Kitsap, Kitsap/Pierce, and Thurston counties respectively. (These studies were described in the 1986 State of the Sound Report and the PSWQA Nonpoint Source Pollution Issue Paper). Due to the high cost of sampling toxicants and attempting to link them to sources, most of these studies investigated the loadings of fecal coliforms and did not analyze the presence of toxicants.

All of these studies found that nonpoint source pollution from human activities created elevated contaminant levels, which in some cases violated water quality standards, caused commercial shellfish beds to be closed, and threatened public health. Results of the Newaukum Creek study indicated that during periods of base flow, concentrations of most pollutants were lowest at a forested site and highest at an urban site. During rainfall events, researchers found that runoff from an agricultural site accounted for 79 to 92 percent of the total contaminant loadings and that it had the highest concentrations of phosphorous, nitrogen, bacteria, and BOD.

Studies conducted by the Department of Ecology in Burley Lagoon and Minter Bay watersheds concluded that about three-quarters of the stream areas examined in the Burley watershed and half of those in the Minter watershed contained levels of bacteria that violated the water quality standards of the area. Although specific sources could not be traced, in both watersheds the areas with the most development had higher levels of contamination. Similarly, a study of the Bear-Evans Creek watershed concluded that as land use went from forested to rural to urban/suburban, the loadings of fecal coliform bacteria would increase up to 60 times. Results of the Henderson/Eld Inlet study reached similar conclusions. Researchers found that streams flowing into Henderson Inlet violated water quality standards 61 to 92 percent of the time. In contrast, violations in Eld Inlet, a less populated area, occurred zero to 25 percent of the time. The sources of nonpoint pollution identified in Henderson Inlet were stormwater runoff, noncommercial farms, and failing or inadequate on-site systems. During heavy rainstorms when pollutants were washed off the land, levels of bacteria increased up to ten times the average level.

EVIDENCE OF CONTAMINANTS

WATER

Contaminants which are often found in the water itself include nutrients, pathogens, organic matter, and some toxicants. Many of these contaminants tend to remain in the water column where they can be widely distributed by mixing and circulation. However, in poorly mixed areas of the Sound, such as Budd Inlet and Hood Canal, nutrients and organic matter can accumulate and limit the amount of dissolved oxygen available to other organisms.

Three sources of data suggest a potential problem in the water column of parts of Puget Sound. First, the data in the EPA's Pollutant of Concern matrix indicate that water column concentrations of arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, and cyanides that exceed the EPA chronic effects criteria (saltwater criteria to protect aquatic life from chronic effects) have been observed in Puget Sound. The EPA acute effects criteria have been exceeded for arsenic, copper, lead, nickel, zinc, and cyanides. Although these comparisons are made with the maximums reported in the matrix (medians are not reported), the data indicate the existence of problems.

Second, samples of suspended matter collected in the water column by various researchers show elevations in five metals (arsenic, copper, lead, silver, and zinc) and numerous organic compounds in urban areas. Third, NOAA researchers have placed fish in cages suspended in the water column, and these fish have shown uptake of toxic contaminants.

SURFACE MICROLAYER

Trace metal and organic chemical concentrations ten to 10,000 times greater than those in the underlying water column have been detected in the surface microlayer. Many eggs and larvae come into contact with the microlayer during certain times of the year. Preliminary research by NOAA has found that, in contrast to the rural sites, approximately half of the urban bay microlayer samples resulted in increases up to 100 percent in flatfish embryo mortality and spinal abnormalities, as well as decreased trout cell growth. High concentrations of polycyclic aromatic hydrocarbons (PAHs), chlorinated

hydrocarbons, and heavy metals were found in many of the samples. Along with metals and toxic chemicals, nutrients and bacteria can accumulate in the microlayer.

Although the highest concentrations of contaminants were found in the urban bays and at their outer edges, researchers are concerned that winds and currents could carry contaminated surface films to intertidal beach areas where other organisms could be adversely affected.

The EPA Pollutant of Concern matrix indicates that the following chemicals have been detected in the microlayer at concentrations greater than that in the water column: cadmium, copper, lead, silver, zinc, naphthalene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3,c,d)pyrene, dibenzo(a,h)anthracene, benzo(g,h,i)perylene, total PCBs, 4,4'-DDT, 4,4'-DDD, aldrin, and 2-methylnaphthalene. Although more study of the microlayer is required, the listed compounds are clearly of concern since microlayer contamination indicates current, rather than historical, sources of toxicants.

SEDIMENTS

The sediments are the repository for many of the toxic contaminants discharged into Puget Sound. Several hundred synthetic organic chemicals have been identified in Puget Sound sediments. Chemicals that have been frequently detected by NOAA, EPA, Ecology, and Metro include heavy metals, polychlorinated biphenyls (PCBs), pesticides, and two classes of organic chemicals: phenols and polycyclic aromatic hydrocarbons (PAHs).

The EPA Pollutant of Concern matrix describes observed sediment concentrations of 41 pollutants of concern and their apparent effects threshold (AET) values. These values are estimates of the sediment concentration at which adverse biological harm is actually occurring. Of the 41 chemicals for which there are data, 40 have been found in recent sediments at levels that exceed some AET values. (The matrix presents four different AET values which are based on four different biological measures. For 16 chemicals, more than ten percent of the samples exceeded some AET values and can be considered to be harming marine life. These chemicals are antimony, chromium, mercury, nickel, benzo(a)anthracene, ideno (1,2,3)pyrene, dibenzo (a,h)anthracene, benzo(g,h,i)perylene, PCBs, hexachlorobenzene, 1,4-dichlorobenzene, 4,4'-DDT, 4-methylphenol, N-nitrosodiphenylamine, tetrachloroethene, and ethylbenzene. In addition, Metro has reported elevated levels of PAHs, PCBs, and metals in sediments from the inland waters of Lake Washington, Lake Union, and the Ship Canal.

Tables 2-3 and 2-4 and the accompanying Figure 2-6 describe our current understanding of the distribution and concentration of contaminants in the sediments of Puget Sound. Sediments near the heavily industrialized areas have been identified as some of the most contaminated sediments in Puget Sound. These areas include parts of Elliott Bay (e.g., the West Waterway of the Duwamish River) and Tacoma (e.g., Hylebos Waterway). Parts of Eagle Harbor, on Bainbridge Island at Winslow, are highly contaminated with hydrocarbons believed to have come from creosote which was used to treat

wood at a nearby plant. Portions of Everett Harbor and Sinclair Inlet have received sufficient study to identify them as areas of high contamination but not enough to define all of the major chemicals present, their distributions, and their likely sources. Because most sediment samples have been collected from urban areas, little is known about the less developed areas of the Sound and the possible transport of contaminated sediments throughout it. Intermediate levels of contamination have been found in central Puget Sound between Seattle and Tacoma. It is probable that water movements have carried contaminated sediments to other areas in Puget Sound.

Historical trends in contamination of central Puget Sound by PCBs, PAHs, and lead reflect industrial practices and pollution control efforts. PCBs show an increase during the 1930s and a corresponding decrease during the early 1970s when their manufacture was banned. PAHs--derived from the combustion of organic materials such as wood, coal, and oil--have natural sources, but slash burning and coal burning beginning in the 1880s increased their levels in Puget Sound. Their presence in the sediments increased during the 1900s when the use of motor oil and fossil fuels also increased. PAH concentrations up until the 1950s are approximately two to three times the present day concentrations and more than 30 times the concentrations found in central Puget Sound sediments deposited in the 1880s. The decrease may be due to improvements in industrial practices and conversion from coal to cleaner-burning oil. Lead concentrations have also leveled off, and this trend may continue with the increasing use of unleaded gasoline.

THE BIOTA

Levels of Contaminants in the Biota

High concentrations of certain contaminants, tissue abnormalities, and changes in species composition indicate that biota in the urban bays of Puget Sound are being adversely affected by contaminants. EPA and others have been concerned enough about the levels of contaminants in some of the biota of Puget Sound that they have assessed the health risks associated with consuming fish from the urban bays of Puget Sound.

The contaminants most often detected in the biota of Puget Sound include certain polycyclic aromatic hydrocarbons (PAHs), halogenated hydrocarbons (PCBs, DDT, and their breakdown products), phthalate esters (from plastics), and metals. Residues of organic contaminants, such as PCBs and DDT, have been found to accumulate in the body tissues of Puget Sound organisms to a greater degree than metals do.

PCBs and DDT are the most frequently reported compounds in the fish, birds, and marine mammals of Puget Sound. Although their use has been banned since 1972, they are persistent toxic chemicals that bioaccumulate and are generally not degraded. Average concentrations of PCBs in biota collected from the Duwamish and Hylebos Waterways have been from two to 66 times higher than those found in the same organisms from the reference areas--Port Madison and Case Inlet. Levels of PCBs found in harbor seals from southern Puget Sound are comparable to the highest levels observed worldwide (up to 750 ppm wet weight). Average levels of DDT in the livers of English sole from the Hylebos and Duwamish Waterways have been found to be four times

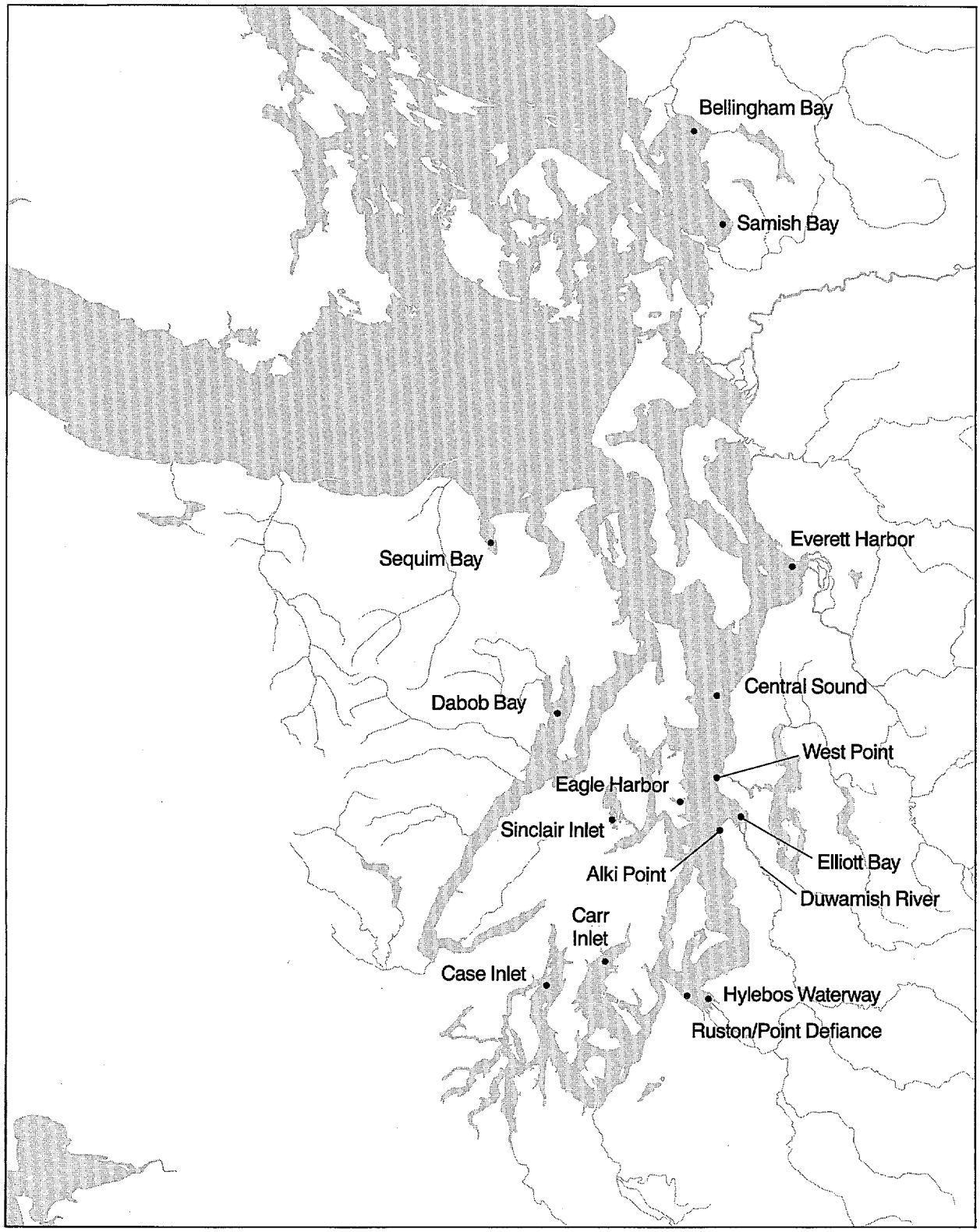
TABLE 2-3: DISTRIBUTION OF CONTAMINANTS IN PUGET SOUND SEDIMENTS
AVERAGE Concentration in PPM (mg/kg dry weight sediment)

	Arsenic	Copper	Lead	Mercury	Zinc	PAH	PCB
Alki Point	13	9.0	9.9	0.042	34	0.29	0.019
Bellingham Bay	9	0	70	0.89	113	2.4	0.039
Case Inlet	7.4	49	16	0.092	78	ND[1]	ND
Carr Inlet	3.4	6.4	9.2	0.04	19	0.089	ND
Central Puget Sound	18.4	36	38	0.14	100	2.4	0.13
Dabob Bay	3.2	46	5.3	0.029	84	0.073	ND
Duwamish River	10.7	47	85	0.34	230	2.1	0.75
Eagle Harbor	6	63	67	0.16	98	500.16	
Elliott Bay	12	98	158	0.66	390	17.7	0.40
Everett Harbor	10	82	38	0.20	289	6.2	0.36
Hylebos Waterway	39	120	86	0.32	144	11.5	0.28
Ruston-Point Defiance	2100	2400	1000	6.6	830	11.4	0.31
Samish Bay	5.6	36	5.5	0.071	76	0.32	ND
Sequim Bay	6.7	46	8.3	0.056	83	0.16	ND
Sinclair Inlet	25	305	192	1.32	365	7.7	0.63
West Point	8.1	26	35	0.25	76	18.5	0.15

TABLE 2-4: DISTRIBUTION OF CONTAMINANTS IN PUGET SOUND SEDIMENTS
MAXIMUM Concentration in PPM (mg/kg dry weight sediment)

	Arsenic	Copper	Lead	Mercury	Zinc	PAH	PCB
Alki Point	31	18.4	16	0.056	39	0.86	0.034
Bellingham Bay	11	400	46	1.69	135	6.8	0.074
Case Inlet	8.2	59	23	0.12	98	ND[1]	ND
Carr Inlet	3.8	8.0	13	0.10	24	0.11	ND
Central Puget Sound	24	58	46	0.6	152	15	0.70
Dabob Bay	5.6	74	9.9	0.047	102	ND	ND
Duwamish River	57	115	700	2.3	2600	9.3	5.4
Eagle Harbor	26	204	492	0.61	298	270	1.2
Elliott Bay	31	165	607	1.69	687	60	0.69
Everett Harbor	18	111	82	0.26	1070	24	0.97
Hylebos Waterway	113	260	180	3.2	360	34	2.0
Ruston-Point Defiance	12000	14000	6300	52	4200	51	0.58
Samish Bay	8.0	40	6	0.08	81	0.33	ND
Sequim Bay	7.3	48	9.0	0.068	88	ND	ND
Sinclair Inlet	67	807	360	2.07	873	31	1.7
West Point	29	74	290	0.88	140	106	1.08

(Source: 1986 State of the Sound Report)



Data from Bortleson et al. (1980)

Figure 2-6

LOCATIONS TESTED FOR CONTAMINANTS IN SEDIMENTS

higher than levels from the reference areas. Although historical discharges are the likely sources of PCBs and DDT, currently existing sources such as spills, illegal dumping, and leaching from disposal sites may also be releasing these contaminants to the Sound.

PAHs are an active, largely uncontrolled source of contamination to Puget Sound. Unlike PCBs and DDT, organisms usually convert them to other products through metabolism and it is these products that can be carcinogenic to marine organisms. Worms, clams, shrimp, and crabs, from Commencement Bay Waterways (especially Milwaukee and City Waterways), Elliott Bay and the Duwamish Waterway, Sinclair Inlet, Eagle Harbor, and Mukilteo, have shown levels of PAHs that are much higher than levels found in other parts of Puget Sound and which may be causing harm to the biota.

Researchers with the Northwest Alaska Fisheries Center recently completed the first phase of a study attempting to estimate the uptake of toxic chemicals by juvenile Chinook salmon migrating through chemically contaminated estuaries and to evaluate the effects of the contaminants on the salmon. They found that the mean concentrations of PAHs (98,500 parts per billion, dry weight) and PCBs (3,200 parts per billion, dry weight) in the food organisms eaten by the salmon from the Green River/Duwamish Waterway were respectively 650 times and three times higher than levels in salmon taken from the Nisqually River. Mean concentrations of bile metabolites (1,300 parts per billion, wet weight) of PAHs were 24 times higher in the urban salmon than those from the Nisqually River. These results indicate that juvenile salmon are taking up contaminants during their residence time in the Duwamish and that their health and survival are likely being impaired.

The tissues of bivalve shellfish and crustaceans, fish livers, and birds taken from industrialized areas of Puget Sound (e.g., Duwamish River, Commencement Bay Waterways and Ruston shoreline, Bellingham Bay, and inner Everett Harbor) have shown high concentrations of potentially toxic metals such as mercury, lead, and copper. These high concentrations are generally found in areas of the Sound where sediment contamination is more severe. In other less developed areas of the Sound, such as Carr Inlet and Discovery Bay, concentrations of these metals are generally much lower.

Effects of Contaminants on the Biota

Much of the current knowledge of the effects of contamination has been provided by sediment bioassays and by examination of English sole, a fish that feeds on organisms associated with the sediments and whose eggs may come into contact with contaminants in the surface microlayer.

Results of sediment bioassays conducted by NOAA at 22 sites located in the three urbanized embayments of Elliott Bay and the Duwamish River, Commencement Bay and associated waterways, and Sinclair Inlet found significant biological impacts. Eighteen of the 22 stations tested were considered to be capable of causing toxic effects such as mortality and/or abnormalities to oyster larvae. In the surf smelt bioassays, 20 of 22 stations indicated some evidence of toxicity to surf smelt eggs and larvae. Surf smelt are intertidal spawners and hence spawning would not normally occur near the subtidal sediments where they were tested. However, researchers concluded that the

sediments from parts of the urban bays could cause long-term developmental effects such as reduction in hatching success, reduction in larval survival, and/or premature hatching.

Bottomfish and crabs in parts of Puget Sound have been found to have numerous tissue abnormalities including fin erosion, protruding lumps of skin, kidney and gill lesions, and liver tumors. Areas with the greatest incidence of disease are the Duwamish Estuary, Elliott Bay, Commencement Bay, Eagle and Everett Harbors, and Mukilteo.

Tumors have been found in about five percent of English sole from the urban areas of Puget Sound, and pre-tumors have been found in about 13 percent. In the non-urban areas of the Sound these figures are approximately one and two percent respectively. In laboratory tests pre-tumors generally developed into tumors, but not all necessarily became tumors. Although a strong association between contaminated sediments and liver tumors and pre-tumors has been established in the urban bays of Puget Sound, other conditions such as nutritional imbalance, genetic disorders, infections by microorganisms, and other environmental stresses may influence the prevalence of these abnormalities.

Changes in the species composition of benthic organisms in the Sound's urban bays have included decreases in the abundance of brittle stars (sensitive to pollution) and increases in several mollusks and one species of polychaete (more tolerant of pollution). These changes have been attributed to contaminated sediments. Sewer outfalls and CSOs have caused organic enrichment. Other sources such as spills, storm drains, and industrial outfalls may be responsible for species composition changes caused by the presence of toxic chemicals.

HEALTH EFFECTS

Pathogens and Phytoplankton in Shellfish

Consuming shellfish contaminated with certain pathogens that can be present in both point and nonpoint sources can cause gastroenteritis, nausea, diarrhea, and hepatitis. The Department of Social and Health Services (DSHS) tests the water and shellfish tissue from commercial areas for the presence of fecal coliform bacteria (which is used to indicate the presence of pathogens). They consider all areas closed to commercial harvesting until they have tested the levels of fecal coliform bacteria in the shellfish and adjacent waters. Ecology has estimated that current restrictions on commercial shellfish harvesting reduce the usable harvest by an amount worth approximately $3 million annually.

Shellfish beds within approximately one-half to one mile from a municipal treatment plant outfall are automatically considered "prohibited" areas where shellfish harvesting poses a health risk. The entire east shore of Puget Sound from Tacoma to Everett is considered prohibited due to continuous contamination from sewer outfalls and industrial discharges. (See also Chapter 4 for a discussion of DSHS's shellfish classification system.)

In the last four years, DSHS has restricted commercial shellfish harvesting in several prime growing areas. These areas, as well as other areas that have been surveyed and classified are illustrated in Figure 2-7 and listed in Table 2-5. Nonpoint sources have been implicated as the cause for most of the recent restrictions, indicating an increasing trend toward contamination of shellfish beds in the rural areas of Puget Sound. This trend is related to increasing populations in the area and associated land uses.

Paralytic shellfish poisoning also threatens the harvesting of the shellfish resource of Puget Sound. Often referred to as PSP or (incorrectly) "red tide," it occurs throughout Puget Sound during certain times of the year when a particular species of phytoplankton blooms and is ingested by shellfish. While PSP is not toxic to shellfish, it can kill humans who eat contaminated shellfish. It is also the presumed cause of several fish and bird kills along the Northwest coast and in Alaska. PSP occurs in many parts of the world, including South Africa and Japan. It was first documented in Puget Sound in 1793 when one of Vancouver's crew members died from it and others became very ill.

It is not known how human activity may influence PSP outbreaks. However, it is clear that PSP outbreaks have increased and have spread to areas of Puget Sound where they previously did not occur. PSP was not detected east of Dungeness Spit until the late 1960s and early 1970s. Since then it has spread south, and, as of the summer of 1985, the only waters that had never been closed for shellfish harvesting due to the presence of PSP were Hood Canal and south of the Tacoma Narrows. The PSP-producing organism has been also been found in the Nisqually Delta and south of the Narrows in Budd, Totten, and Skookum Inlets.

Chemical Contaminants and Health Risks

Although human health risks from eating chemically contaminated seafood have not been fully established, PCBs and PAHs--both suspected carcinogens--have been identified as the primary problem chemicals in bottomfish and shellfish from contaminated bays.

With possible risks in mind, county and state health agencies have issued public advisories to limit consumption of fish and shellfish from the Commencement Bay waterways, inner Elliott Bay and the lower Duwamish River, Eagle Harbor, inner Everett Harbor, Budd Inlet, and the Mukilteo fishing pier. All of these are located near industrial areas of Puget Sound. The human health risk from eating PCB-contaminated bottomfish from the Commencement Bay waterways or the Elliott Bay/Duwamish River system has been estimated to be five to 30 times greater than the corresponding risk of eating bottomfish from Carr Inlet. This risk is based on the assumption that fish are eaten at the rate of approximately 6.5 grams per day every day for 70 years.

Due to the levels of contaminants that have been found in some of the biota of Puget Sound, EPA is currently in the process of establishing health risks associated with eating seaweed, clams, and the resident blackmouth salmon.

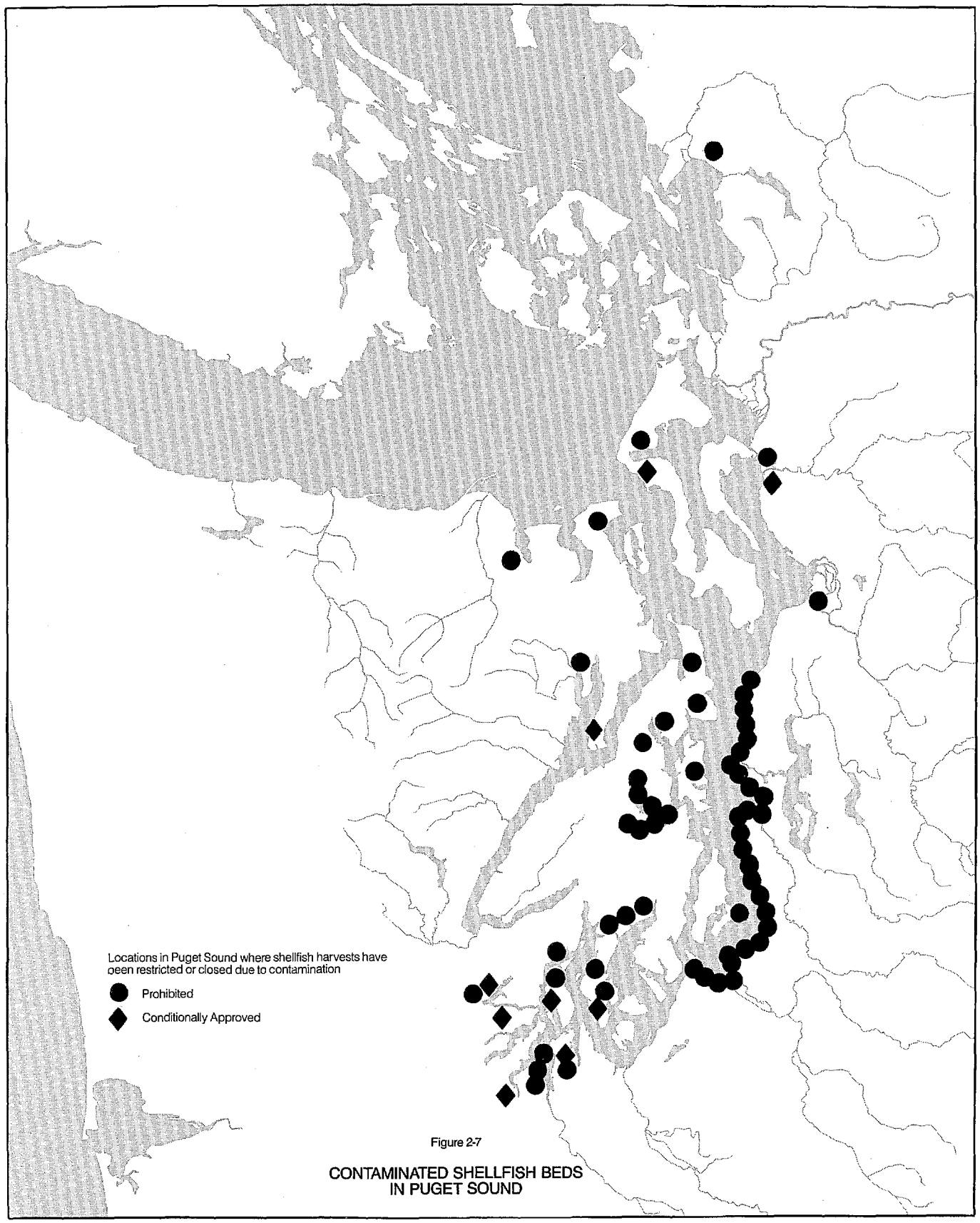


Figure 2-7

CONTAMINATED SHELLFISH BEDS
IN PUGET SOUND

TABLE 2-5: PUGET SOUND SHELLFISH BEDS WHERE HARVESTING IS RESTRICTED DUE TO CONTAMINATION[1]

Date	Location	County	Cause
PROHIBITED[2]			
1950s	Dyes Inlet, all	Kitsap	STP[3]
1950s	Sinclair Inlet	Kitsap	STP
1950s	Oakland Bay/Hammersley, vicinity of Shelton	Mason	STP, mill
1950s	Budd Inlet	Thurston	STP, Deschutes River
1960s	Liberty Bay, east	Kitsap	marina, pump station
1981	Port Susan, 1/3 tideflats, near Stillaguamish**	Snohomish	STP, dairy runoff
1981	Burley Lagoon, all**	Kitsap	nonpoint
1981	Minter Bay, all**	Kitsap	nonpoint
1983	Penn Cove, north**	Island	STP
1983	Jarrell Cove*	Mason	boating
1983	Mayo Cove*	Pierce	boating
1983	Van Gelden Cove*	Pierce	boating
1984	Glen Cove*	Pierce	marina, nonpoint
1985	Quilcene Bay, north	Jefferson	nonpoint
1985	Henderson Inlet, south 1/4**	Thurston	nonpoint
East Shore of Puget Sound, Tacoma to Edmonds***		Pierce, King, Snohomish	STPs, industrial
Hartstene Island, north***		Mason	STP
Port Townsend***		Jefferson	STP
Winslow***		Kitsap	STP
Appletree Cove, Kingston***		Kitsap	STP
Port Gamble, north***		Kitsap	STP
Port Gardner***		Snohomish	STP, industry, nonpoint
Bellingham Bay***		Whatcom	STP, mills, nonpoint
Sequim Bay, near marina***		Clallam	boating
CONDITIONALLY APPROVED[4]			
1960s	Oakland Bay, Hammersley, north	Mason	STP
1960s	Squaxin Island, north of state park	Mason	boating
1960s	Port Susan, west	Island	STPs
1960s	Filuce Harbor	Pierce	boating
1982	Eld Inlet, south**	Thurston	nonpoint
1983	Penn Cove, south	Island	STP, nonpoint
1985	Fisherman Harbor	Jefferson	boating
1985	Henderson Inlet, south of center	Thurston	nonpoint

Source: DSHS and Department of Ecology

[1] DSHS considers all waters closed to the commercial harvest of shellfish until the Shellfish Sanitation Program has surveyed and classified them. Once surveyed and classified, these classifications may change as conditions improve or deteriorate. There are approximately 77 shellfish areas in Washington state which DSHS can't certify or would decline requests for certification due to contamination. Commercial shellfish harvesting is generally prohibited in all areas located adjacent to marinas, sewer treatment plants, and other outfalls.

[2] DSHS defines prohibited growing areas as follows: a growing area is classified prohibited if there is no current sanitary survey or if the sanitary survey or other monitoring program data indicate that fecal material, pathogenic microorganisms, poisonous or deleterious substances, marine biotoxins, or radionuclides may reach the area in excessive concentrations. The taking of shellfish for any human food purposes from such areas is prohibited.

[3] Sewage treatment plant.

[4] DSHS defines conditionally approved growing areas as follows: growing areas that are subject to intermittent microbiological pollution are classified as conditionally approved. This option is voluntary and is used when the suitability of an area for harvesting shellfish for direct marketing is affected by a predictable pollution event. The pollution event may be predicated upon the attainment of an established performance standard by wastewater treatment facilities discharging effluent, directly or indirectly, into the area. In other cases, the sanitary quality of an area may be affected by seasonal population, nonpoint source pollution, or sporadic use of a dock or harbor facility.

*These are areas where certification has been requested but water quality monitoring data required denial of the request.

**These are the growing areas listed by the Department of Ecology in its 1984 Shellfish Protection Strategy as "closed/correctable." The department may include additional areas in this category in 1987.

***These areas are not approved by DSHS for shellfish harvest and are generally located near persistent sources of contamination. This list is not exhaustive.

CONCLUSION

This chapter has introduced the key characteristics of the Puget Sound basin, the kinds of contaminants that are released to it, and their fates. Certain uses of the land and waters of the Puget Sound region introduce contaminants into the Sound ranging from disease-carrying organisms--known as pathogens--to toxic chemicals, many of which do not exist naturally in the environment. Pathogens contaminate shellfish beds and pose health risks. Elevated levels of toxic chemicals are found in the sea surface microlayer, the water column, and sediments in parts of the Sound, especially in the urban bays. Some of these contaminants are harming the organisms that live in Puget Sound. Understanding the contamination of the Puget Sound basin depends, in part, on how well we understand the relationship between this estuarine system and the uses that surround it now or may in the future. The better we understand this relationship, the more likely it is that we can prevent future levels of contamination as high as those now existing in the urban bays of Puget Sound. The following chapter discusses population growth and associated land uses projected to occur in the Puget Sound basin.

Chapter 3: Demographic Analysis

Population growth and its distribution can have a marked effect on the water quality of Puget Sound. The state Legislature recognized this fact when it required the Puget Sound plan to include "demographic information and assessment as it relates to future water quality impacts on Puget Sound."

CURRENT POPULATION AND DISTRIBUTION

The 1985 population in the Puget Sound region was 2.9 million (Bureau of the Census estimates). This corresponds to 65 percent of the state's population in only one quarter of the state's land area. The greatest concentrations of people are found in King, Pierce, and Snohomish counties. Metropolitan areas--historically central cities and more recently both the cities and the urbanizing suburbs--have accounted for the majority of population. The spatial distribution of population is shown in Figure 3-1.

GROWTH TRENDS AND DYNAMICS

Since the growth rate in the Puget Sound region intensified in 1940, population has risen at a rate of slightly less than one million people every 20 years. Migration, once the principal source of population growth for the region, has now been exceeded by the birth rate.

Between 1970 and 1980 the population of the 12-county Puget Sound region increased by nearly half a million--approximately half of the statewide growth (Figure 3-2). In the 1970s King, Snohomish, Pierce, Thurston, and Kitsap counties grew by the greatest amounts, adding 110,000; 72,000; 73,000; 47,000; and 45,000 respectively. Jefferson, Mason, San Juan, and Skagit counties experienced the least absolute growth--each adding less than 13,000 persons.

In contrast to absolute numbers, percentage increases were particularly large in less populated counties. Between 1970 and 1980 the population of San Juan County more than doubled, from under 3,900 to more than 7,800. The next fastest growing counties were Island County, with a 63 percent increase from 27,000 to 44,000, and Thurston, with a 62 percent increase from 77,000 to 124,000.

Natural amenities such as scenery and recreation have been important magnets for the growth and development of shoreline areas. Together with rising income and improved transportation systems, they explain much of the growth

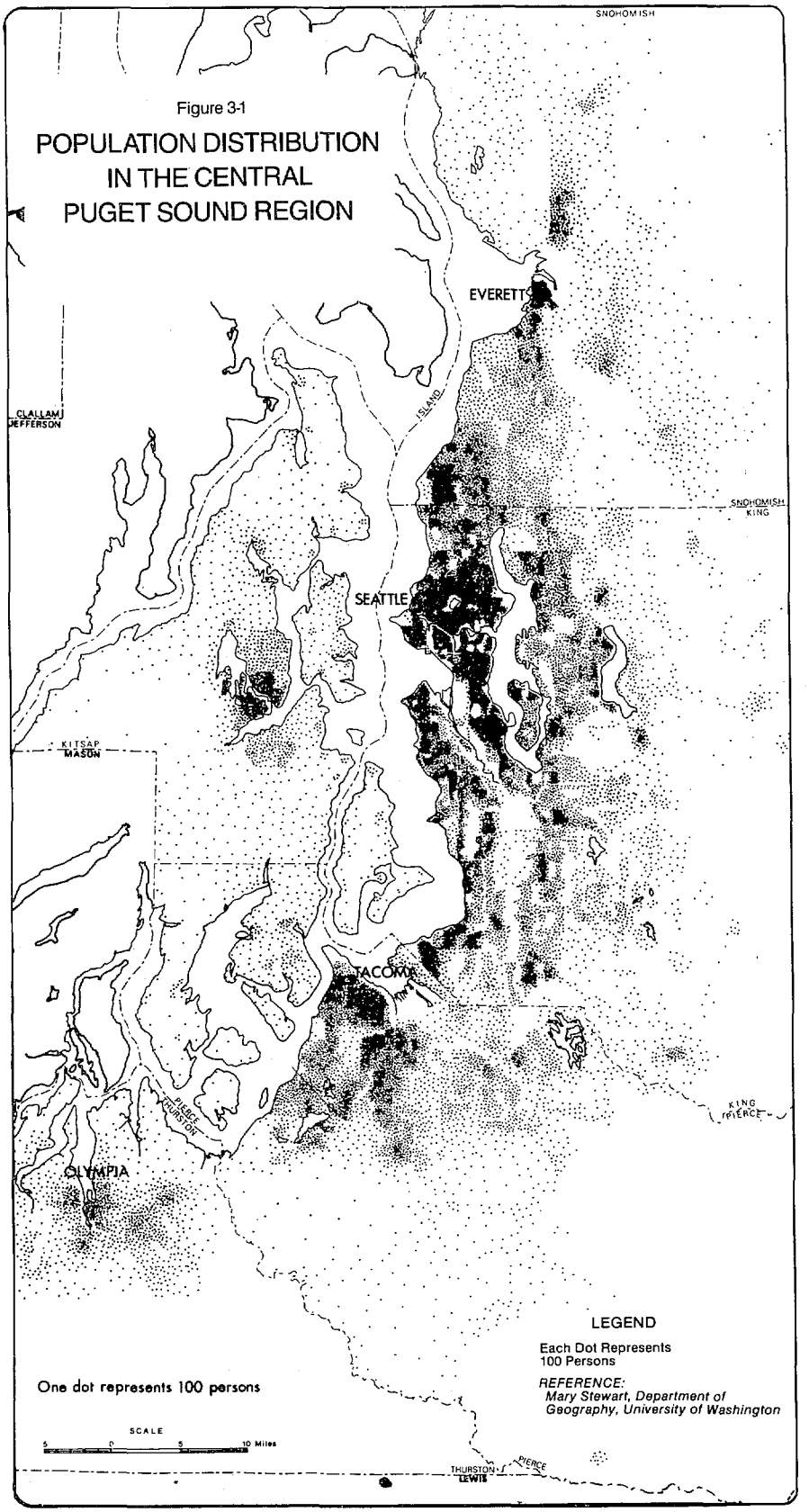


Figure 3-1
POPULATION DISTRIBUTION IN THE CENTRAL PUGET SOUND REGION
SNOHOMISH
EVERETT
CLALLAM
JEFFERSON
ISLAND
SNOHOMISH
KING
SEATTLE
KITSAP
MASON
TACOMA
KING
PIERCE
PIERCE
THURSTON
OLYMPIA
LEGEND
Each Dot Represents 100 Persons
REFERENCE:
Mary Stewart, Department of Geography, University of Washington
One dot represents 100 persons
SCALE
5 0 5 10 Miles
THURSTON
LEWIS
PIERCE

of the San Juans, Island County, southern Hood Canal, and other shoreline areas. Growth in Thurston County in the 1960s and 1970s primarily reflected the expansion of state government.

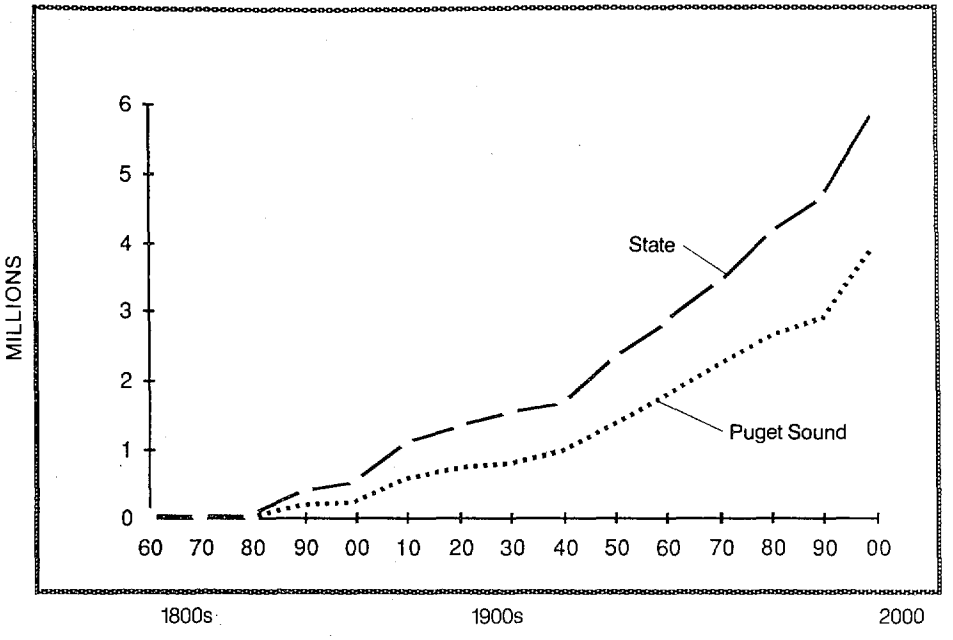


Figure 3-2

POPULATION GROWTH IN WASHINGTON STATE AND THE PUGET SOUND REGION, 1860–2000

URBAN-SUBURBAN SHIFTS

During the 1970s unincorporated areas in the 12 counties of Puget Sound grew faster than incorporated areas. This reversed the previous pattern characterized by growth of cities and loss of population or slow growth in rural areas. Over twice as many people were added to unincorporated areas between 1970 and 1979 than to cities. Of the 12 Puget Sound counties, only Skagit County experienced greater growth in incorporated than in unincorporated areas. With the exception of relatively high growth in nine cities (Bellevue, Redmond, Lynnwood, Bellingham, Auburn, Kent, Renton, Edmonds, and Lacey), the population of most incorporated areas in the region remained stable.

The construction of bridges, freeways, and extensive road systems throughout the region has greatly expanded the distance people could commute to work. As people commuted to urban jobs from suburban or rural areas with larger lot sizes, the average population density in urbanized areas decreased. The new suburbs supported the bulk of the 1.1 million people added to the Puget Sound region since 1960. In the same 25-year period the suburbs also became the location of much of the new service industry employment. Shopping malls such as Southcenter, Bellevue Square, and the Tacoma Mall appeared in previously undeveloped areas. The east side of Lake Washington was transformed from an area of sparsely developed vacation homes into a major bedroom community, and the entire Everett-Seattle-Tacoma corridor became a metropolitan region.

LAND USE PATTERNS AND TRENDS

Agricultural land uses (cropland and pasturage) cover from four to 25 percent of the main Puget Sound sub-basins. Approximately six percent of the basin as a whole is in agricultural use. Throughout the Sound the acreage devoted to commercial farmlands has been declining. The most notable reductions have occurred in King, Thurston, Whatcom, Snohomish, and Pierce Counties. However, the number of small noncommercial farms, which are generally between one-half and five acres in size, has been increasing for the last 20 years. Development has been stimulated by road improvements which allow one or more household members to commute to a job in urban areas. Significant concentrations are found on the islands in the central Sound, in the vicinity of Marysville, Lake Stevens, and Monroe in Snohomish County, on the Kitsap Peninsula, in Thurston County, and on the plateaus above the Snoqualmie, Green, Puyallup, and other major rivers on the east side of the Sound.

Forest land comprises from 63 to 92 percent of each of the nine Puget Sound watersheds, totalling approximately seven million acres. Although the amount of land managed for forestry remains large, it has declined. It is estimated that more than 200,000 acres of commercial forest land in Puget Sound counties were converted to other uses during the 1950s and 1960s, with 40 percent to urban or industrial use, 20 percent to roads, and 20 percent to farms and pasture.

Urban and suburban areas cover from one to 24 percent of the nine Puget Sound watersheds and approximately six percent of the land area in the central Puget Sound region. Best available evidence indicates that intensive urban land use has approximately doubled since 1966, with the urban land area increasing from 337,000 to 651,000 acres.

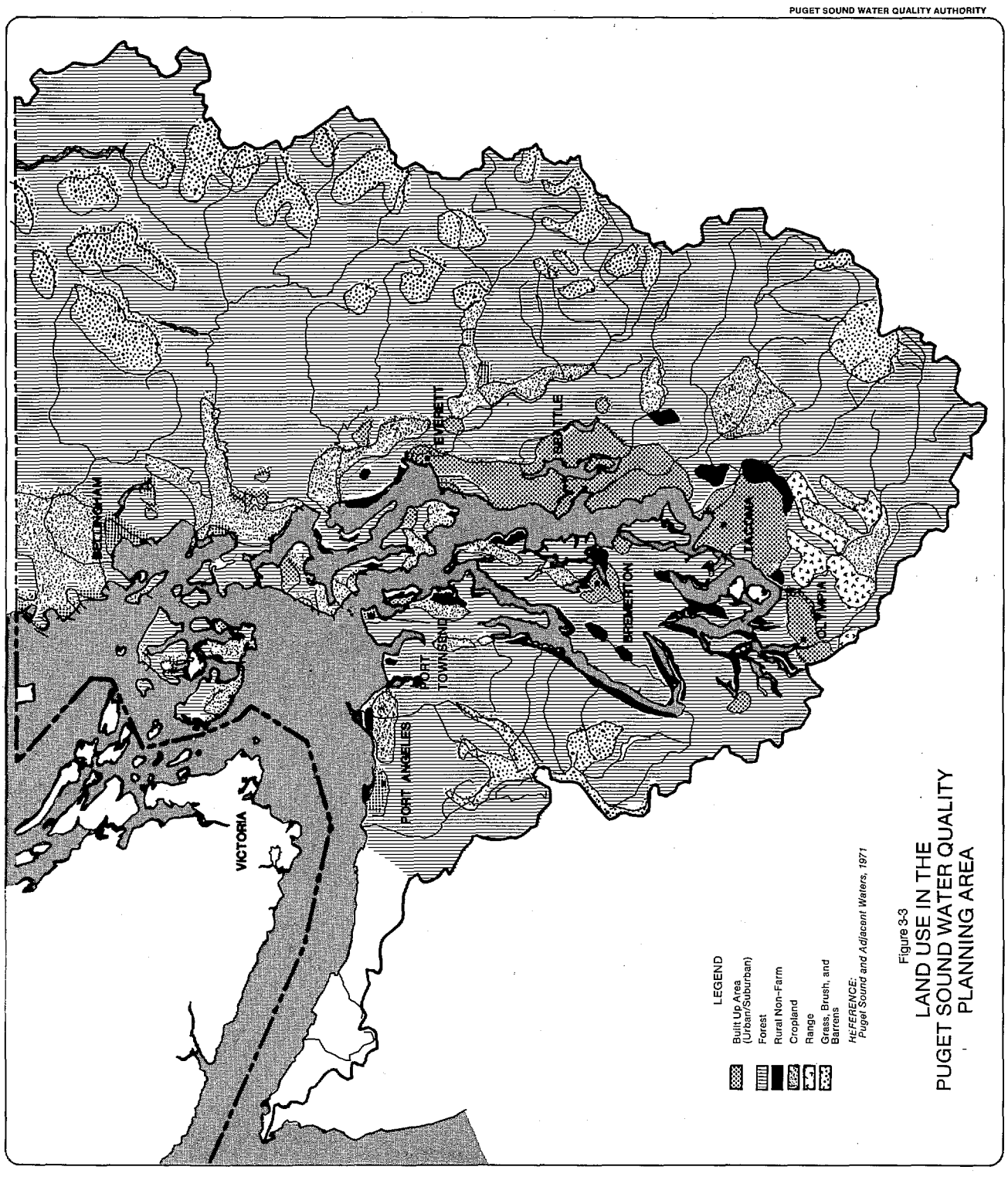
General land use distribution in the Puget Sound region is shown in Figure 3-3.

ECONOMIC GROWTH AND INDUSTRIAL DEVELOPMENT

During the 1950s and 1960s an increasing number of industries located outside the central cities and major urban areas. The Boeing Company, for example, located most of its new facilities adjacent to Everett and in Kent and Auburn. Many wholesaling and manufacturing firms sought to expand onto larger tracts of land than were available in older industrial areas. Thousands of acres of productive farmland in the Green, Sammamish, and Puyallup river valleys were converted to industrial or housing uses.

The economic climate of the area has been generally favorable since the recession of the late 1960s and early 1970s. The economic base has expanded and diversified. This has included the development of a larger service sector, expanded foreign trade, and the introduction and growth of businesses specializing in high technology. Service industry employment is now the largest single component in the regional economy, accounting for approximately one-fourth of all jobs. Much of the development in the high technology sector has occurred in south Snohomish County, Bellevue, and Redmond.

The expansion of port-related international commerce in recent decades appears to be a long-term rather than a short-term change. It reflects the rapid


PUGET SOUND WATER QUALITY AUTHORITY
BELLINGHAM
EVERETT
SEATTLE
TACOMA
OLYMPIA
BREMERTON
PORT TOWNSEND
PORT ANGELES
VICTORIA
LEGEND
Built Up Area (Urban/Suburban)
Forest
Rural Non-Farm
Cropland
Range
Grass, Brush, and Barrens
REFERENCE:
Puget Sound and Adjacent Waters, 1971
Figure 3-3
LAND USE IN THE
PUGET SOUND WATER QUALITY
PLANNING AREA

industrialization of countries on the Pacific Rim and their importance as trading partners with the United States.

As new businesses have developed, natural resource industries have become less significant portions of the employment pool. Acreage devoted to agriculture throughout the region has been in a steady decline. Forest industries have not declined significantly, though they now represent a smaller proportion of the region's employment.

THE FUTURE

The next several decades promise to be a period of relatively modest growth for the Puget Sound region. In absolute numbers, however, this will imply greater overall population density and development. Forecasts suggest that the population will grow from 2.9 million in 1985 to between 3.7 and 3.9 million in the year 2000, an addition of 800,000 to 1,000,000 residents in 15 years. This represents an average annual growth rate of between 1.6 and 2.0 percent per year. Employment is projected to expand from 1.2 million in 1985 to 1.8 million in the year 2000.

If future development follows recent trends, a number of effects can be expected:

CITIES AND SUBURBS

With increasing urbanization, there will be an increase in impervious surface area throughout the Sound and related effects on water flows and quality, including higher peak runoff, heavier loads of silt, and stream erosion. In addition, water pollution, including toxic chemical contamination, has generally increased with increases in land use density. This reflects not only increased automobile use but pollution associated with commercial and industrial activity. Increasing urbanization will also mean greater production of solid waste and sewage sludge that will require disposal.

A continuation of past land use trends will strain the ability of government to provide many basic services, including those related to water quality. Studies by King County, Snohomish County, and the Puget Sound Council of Governments indicate that expected future revenues will be inadequate to maintain levels of service for such functions as surface water management and handling and disposal of solid waste. The shift of population away from central cities into less densely populated areas has a particularly important effect on local governments.

RURAL IMPACTS

The continuation of low-density residential development will most likely imply increasing problems from on-site sewage treatment (septic) systems. Since development has for the most part already used the lands with the fewest natural limitations, future development will have to be more carefully managed if ever greater problems are to be avoided. In all likelihood, more and more areas will be considered "near saturation" in terms of the ability of soils to accommodate septic systems.

Small noncommercial farms will likewise probably be developed on lands where careful farm practices are particularly needed. In the absence of more

widespread use of best management practices (e.g., pasture management and erosion control), small streams are likely to carry increasing loads of pollutants to the Sound.

INCREASED AUTOMOBILE USE

If the present pattern of suburbanization continues, automobile travel will likely increase. Greater automobile use in combination with increased impervious surface area suggests a greater potential for certain kinds of pollutants to reach the Sound, including nitrous oxides, PAHs from exhausts, and a variety of trace metals. In recent years, technological changes and limitations on the use of leaded gasoline have reduced the airborne lead entering the Sound. It is difficult to predict whether similar limitations will affect other pollutant sources.

HOUSEHOLD HAZARDOUS WASTE

With increases in population and single family residences, more household hazardous waste can be expected from use of such products as paints, cleaners, antifreeze, and fertilizers and pesticides used in landscape maintenance. This could lead to a heightened risk of water quality degradation.

MUNICIPAL SEWAGE TREATMENT

Regional population growth will create the need for a rapid expansion of water and sewer services. Recent four-county studies of the Seattle area indicate a need to provide roughly 30 percent more water and sewer services capacity in the next 21 years to accommodate population growth. Non-sewered areas are also expected to increase in population density but at levels below which sewering is economically feasible.

With an increase in population, a proportional increase can be expected in municipal sewage effluent. However, actual pollutant loading will be dependent on treatment technology and management practices.

INDUSTRIAL DISCHARGES

Pollution from new industries is very difficult to predict. Technological change has played an important role in creating and controlling pollution, as have land use policy and government regulations regarding discharge. Preliminary results of a NOAA study indicate that a number of industries have reduced their discharge of toxic chemicals, either as a result of technology changes or because of restrictions imposed by government. Notable examples are the reduction in discharges of copper, arsenic, and lead from heavy industries. PCBs have been reduced as a result of a ban on their manufacture, and a decline in PAHs has been associated with the switch from the use of coal in home heating.

With a shift toward a more service- and trade-oriented economy, the total amount of pollutants of all varieties is likely to increase but at a slower rate than would be expected if significant increases occurred in heavy industry, agriculture, and other resource (e.g., forest products, mining) industries.

FUTURE USE OF MARINE WATERS

Washington Sea Grant predicts that the number of recreational boats will increase by approximately 45,000 by the year 2000. This forecast is based upon expectations of both more people and greater disposable income per

capita. Increase in boating activity will in turn increase the potential for sewage discharges to the Sound.

Increased marine traffic, port calls, and volumes of petroleum and toxic materials are all likely to occur with increases in population. The extent of future pollution will be affected significantly by improvements in vessel design and spill control, cargo handling, and spill response.

The Navy has proposed a new home port facility for construction in Everett. This would mean added naval traffic in the Sound. The proposal would necessitate expansion of existing support facilities on Indian Island, Whidbey Island, and Bremerton, with consequent shoreline impacts.

Chapter 4:
Laws and Programs

INTRODUCTION

Before one can meaningfully discuss alternative approaches to enhancing water quality protection for Puget Sound, it is necessary to understand our current efforts to provide protection. Those efforts are most formally embodied in laws and governmental programs which affect water quality. The Legislature recognized that understanding water quality laws and programs was important in designing a strategy for protection, and required that this plan include an identification and analysis of those laws and programs. (See RCW 90.70.060.)

Understanding the legal and institutional context for Puget Sound water quality protection requires: (1) identifying laws and programs that are "on the books" and any pollution sources that are not addressed by those programs; and (2) evaluating the effectiveness of those laws and programs that do exist.

A variety of programs conducted by various levels of government affect water quality. In addition to regulatory laws, there are nonbinding policies or guidelines, technical assistance programs, policies and practices for publicly owned land, monitoring and research programs, financial grants and loans, and public education programs. All levels of government--federal, tribal, state, and local--are involved in administering these programs. Local government includes not merely cities and counties but also special purpose districts and governments such as sewer districts, conservation districts, and Metro. In short, a bewildering number of laws and programs implemented by an array of governmental units has evolved at least partially in response to the diversity of pollution sources. Table 4-1 summarizes just the *major* programs regulating water quality in the Puget Sound region.

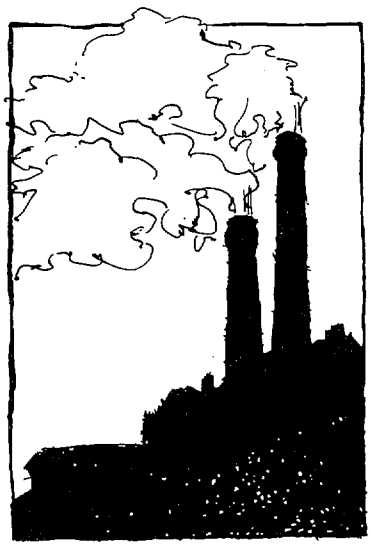
SOURCES OF POLLUTION

INDUSTRIAL DISCHARGES

Industrial and municipal discharges and other point sources are generally regulated by the federal Clean Water Act (CWA), 33 USC 1251. This act sets out a federal regulatory program to be administered by the Environmental Protection Agency (EPA) (with several other agencies having lesser roles) that may then be delegated to states that have developed equivalent or more stringent programs. Washington, which had an existing water pollution regulatory program when the CWA became law, was one of the first states to

TABLE 4-1: SUMMARY OF MAJOR LAWS AFFECTING WATER QUALITY IN PUGET SOUND

SOURCE:	REGULATION:		
Point -- Nonpoint	**Federal**	**State**	**Local**
(1) Industrial Discharge:	CWA (301(e))	NPDES permit system (Delegated to Ecology)	.....
(2) Municipal Discharge:	CWA (301(e); CWA (301(b)(1)(B))	NPDES permit system Secondary Treatment (Delegated to Ecology)	.....
(3) Industrial Pretreatment:	CWA (307) (Federal Pretreatment Program and Regulations)	Delegated to Ecology	(Delegation to some local treatment plants from Ecology)
(4) Combined Sewer Overflows:	CWA (301(e)	NPDES permit system RCW 90.48.480-90 (CSO plans due 1/1/88)	.....
(5) Contaminated Sediments & Dredging	CWA (404) ("Corps permit")	WAC 332-30-166 (DNR open water disposal permit); WAC 173-304 (Ecology disposal standards)	Shoreline Master Program
(6) Oil Spills	CWA; CERCLA (Federal Regional Contingency Plan)	RCW 90.48; RCW 70.105 (Ecology Contingency Plan)	.....
(7) Marinas and Recreational Boating:	CWA (312) (Coast Guard MSD I or III devices)	.....	SMA - Marina Construction [Some local governments prohibit live-aboards]
(8) Forest Practices:	[Best management practices in Forest Service contracts]	RCW 76.09 (Wa. Forest Practices Act plus Forest Practice Board regulations)	[Limited role via Shoreline Mgmt Act]
(9) Stormwater Runoff:	[CWA (301)]	[NPDES permit required for stormwater runoff by 1989]	Some surface water utilities (e.g., Bellevue)
(10) Household Hazardous Waste:	.....	RCW 70.105 (Hazardous Waste Management Act)	Local hazardous waste plan
(11) On-Site Sewage Disposal (Septic) Systems:	.....	RCW 43.20; WAC 248-96 (minimum standards for new construction)	Local health boards set septic regulations
(12) Agricultural Practices:	NPDES permit required for large farms	[Dairy Waste Management Plan-non-regulatory]	[Local zoning]



receive this delegation. Under this delegation the Washington Department of Ecology (Ecology) regulates and administers its own program with oversight from EPA to assure compliance with federal program requirements.

The Clean Water Act set as a national water quality goal the total elimination of pollution discharges by 1985, with an interim goal of making all the nation's waters "fishable and swimmable" by 1983. While both of these goals have proved idealistic, the theme of a steady reduction of pollutants continues throughout the act and its implementation. For point sources this reduction is to be accomplished through the National Pollutant Discharge Elimination System (NPDES). Under this system each industrial and municipal dischargers which discharges directly into surface waters must obtain a permit which contains numerical effluent limits for their discharge. Indirect dischargers (those discharging into sewage systems or underground waters) are not required to obtain NPDES permits. Instead they are required to obtain a state discharge permit pursuant to Washington's Water Pollution Control Act, RCW 90.48. Regulation of groundwater is generally regulated under the Ground Waters Protection Act, RCW 90.44. In addition, commercial and industrial dischargers are required by Washington's Pollution Disclosure Act, RCW 90.52, to report annually to Ecology a list of materials used in processing and the amount of wastes discharged into the water, air, or any sewer system.

Discharge limits contained in NPDES permits are determined by the application of two sets of standards: water quality standards and technology-based standards. Under the Clean Water Act all of the nation's waters were to be evaluated and assigned classes based on their intended uses (such as drinking water, shellfish harvesting, or swimming). In Washington these classes are: AA (Extraordinary), A (Excellent), B (Good), and C (Fair). Numerical *water quality standards* were then set for limiting contaminant levels as necessary to preserve or achieve the designated uses for each class. Washington law prohibits the degradation of a body of water below its designated use. The Washington Department of Ecology is required to reevaluate its water quality standards and classes every three years and submit the new results to EPA. Ecology is currently preparing such an evaluation for submission in September 1987.

While water quality standards focus on the intended quality of the receiving waters, another set of standards, *technology-based standards*, focus on the economic and technological ability of the discharger to reduce its effluent. EPA has been setting numerical technology-based standards on an industry-by-industry basis. At this time EPA has set numerical technology-based effluent guidelines for 52 industrial categories and for municipal sewage treatment plants.

As part of the pollution elimination theme of the Clean Water Act, the level of treatment technology required is periodically tightened. The CWA sets forth technology levels with deadlines both for EPA to establish numerical values and for industry to comply with these limits. EPA has had considerable difficulty meeting these requirements and has not set the newest limits for most industries.

Every industry for which technology-based standards have been set must meet these limits. If water quality standards and technology-based standards differ, the most restrictive standard must be met. For industries for which technology-based standards have not been established, the permit writer (an Ecology or EPA staff person) sets effluent limits using Best Engineering Judgment (also called Best Professional Judgment) and the water quality standards.

The permits also include a wide range of requirements for record keeping, waste handling and housekeeping, and reporting. Permit holders must monitor their discharges and send the results to the Department of Ecology in the form of Discharge Monitoring Reports (DMRs), which are generally submitted monthly. All permit conditions and requirements are legally binding, and violation of any of these opens the permit holder to civil or criminal liability. Penalties are equally applicable to both municipal and industrial dischargers.

The NPDES permit system is a well-conceived and potentially effective regulatory structure for controlling point sources of pollution. In its application in Puget Sound, however, weaknesses are found in all phases of this regulatory program. There is no systematic program to detect unpermitted discharges. Discharge permits typically include limits on only a few contaminants, generally the conventional pollutants rather than the toxic pollutants. EPA effluent standards do not cover all industries, requiring Ecology staff to rely upon Best Professional Judgment in developing limits for many permits. State ambient water quality standards include specific standards for only six parameters--all conventional pollutants--despite the existence of EPA guidelines for other pollutants. Present standards do not include any criteria for sediment quality even though contaminated sediments are a major concern in Puget Sound. Renewed permits have sometimes included less stringent effluent limits than the expired permits. Twenty-four percent of major permits and 53 percent of minor permits are expired, in effect circumventing the review and upgrade that is intended by the five-year term of the permit (limits in expired permits remain applicable).

Enforcement of the NPDES permit requirements is also weak. Despite the development of Ecology's more stringent enforcement policy in February 1985, 41 percent of major dischargers statewide were in significant noncompliance at some time during the last six months of 1985. (EPA defines significant noncompliance to be instances of discharges that are 140 percent or more of discharge limits for conventional pollutants and 120 percent or more for toxicants.) Many of these noncomplying dischargers were not subject to administrative orders or civil penalties. Municipal and industrial dischargers are not treated consistently. Generally, only industrial dischargers have been issued penalties. Ecology generally schedules inspections in advance, raising questions about the validity of the inspections. There is very little independent verification by Ecology or EPA of self-monitoring reports.

Ecology has insufficient resources to effectively implement the NPDES permit system. The agency's 1985 workload analysis shows that it has resources to carry out only 24 percent of needed water quality enforcement activities. Ecology recently adopted a permit fee schedule to recover the initial administrative expenses of issuing state and federal waste discharge permits, but

these revenues go to the state's general fund, not necessarily to Ecology. Moreover, these administrative fees reflect only a small portion of the costs of the already underfunded water quality program.

MUNICIPAL DISCHARGES

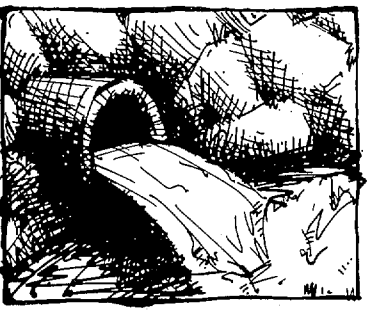
Approximately two-thirds of the population of Puget Sound dispose of wastewater into municipal sewer systems. The 1972 Clean Water Act required all municipal sewage plants to install secondary treatment by July 1, 1977. With this requirement, the act also established a federal grant and loan program to assist states in paying for these new facilities. The CWA allowed for grants of up to 75 percent of project costs. The 1977 amendments made available an additional ten percent for innovative or alternative technologies. To make use of available federal grants and assist localities in their treatment plant projects, state voters approved Referendum 17 in 1968 for $25 million, Referendum 26 in 1972 for $187 million, and Referendum 39 in 1980 for $308 million in plant construction bonds. However, the federal government in the 1970s indicated that federal funding for secondary treatment in coastal areas was not the highest priority. This occurred partially in response to the request of the coastal states, including Washington, that waiver provisions be added to the Clean Water Act. In 1980 Congress, in a budget-cutting move, reduced the federal share of grants to 55 percent.

Despite the large amounts of funding potentially available, the amount of funding still needed by local entities was very large, and many localities found it politically and financially difficult to raise the necessary funding. Many coastal municipalities sought to avoid the required secondary plant construction by applying for renewable five-year waivers under CWA 301(h) added in the 1977 amendments. Thirty-two Puget Sound municipalities sought 301(h) waivers. One waiver was granted. Then Ecology, following an Attorney General opinion, determined that state law did not permit the federal waiver and denied subsequent applications. For this and other reasons, 27 Puget Sound treatment plants do not yet have secondary treatment, although most are on compliance schedules. Funding and construction of the new plants, however, remain significant hurdles to be overcome.

Because of widespread failure to meet the deadlines for secondary treatment, Congress in 1981 amended the Clean Water Act to allow case-by-case extension for secondary installation until July 1, 1988. Some Puget Sound treatment plants will not be able to meet this deadline.

PRETREATMENT

Commercial and industrial discharges into sewer systems do not require an NPDES permit. These discharges are regulated by state discharge permits issued under RCW 90.48 and by a federal pretreatment program established under Section 307 of the Clean Water Act. The pretreatment program is different from most Clean Water Act programs: while the program and permit issuing powers can be delegated to the states (Washington received approval of its application on September 30, 1986), the delegation can go beyond the state level with major regulatory and enforcement functions passing to the operating municipalities.



Under the pretreatment program EPA has set effluent standards for industrial categories in much the same way as technology-based effluent guidelines are set under the NPDES program. These are called *categorical standards.* Listed industries must comply with the numerical effluent limits in these standards, but as in the NPDES program these limits are minimum standards. In the NPDES program more stringent limits may be required based on the water quality standards of the receiving water. In the pretreatment program more stringent limits are based on the effects of the effluent at the treatment plant. The Clean Water Act prohibits the discharge into sewer systems of pollutants that will "pass through" or "interfere" with the operation of the treatment plant. Limits based on these definitions are called *prohibitive standards.* Where there are no categorical standards, prohibitive standards serve as the basis for state discharge permit limits. Also, limits may be set in the municipal NPDES permit to address pollutants that may pass through, giving the plant operator a greater incentive to police these standards.

Because the treatment plant operators can best detect pass-through and interference problems and have a strong interest in controlling them, the pretreatment program can be delegated to the sewer jurisdiction. Delegation includes regulating industrial dischargers, setting discharge limits for industrial users, and initial enforcement responsibility. Sewer jurisdictions with plants that receive pass-through or interfering pollutants and that also process more than five million gallons per day must develop pretreatment plans and apply for delegation--unless the state has chosen to assume all local responsibilities. Jurisdictions with smaller plants may also be required by Ecology to apply for delegation. Jurisdictions with smaller plants not required to seek delegation may still apply for it if they so desire.

To receive delegation a municipality must demonstrate to Ecology that it has the necessary power and ordinances to pursue the program aims and that its plan adequately assures compliance. Aggressive pretreatment programs have been established by two of the major sewage treatment operators on the Sound, Metro and Tacoma.

Violations of pretreatment program requirements by industrial dischargers or by the managing municipality are punishable by the same civil and criminal penalties as under the NPDES program.

The effectiveness of the industrial pretreatment program is limited by several factors. First, the pretreatment emphasis has been more on preventing problems at the sewage treatment plant itself rather than on ultimate water quality. Second, EPA's categorical standards for pretreatment primarily regulate toxic metals, with few controls on organic toxicants. Third, these standards do not extend to many industries, and the standards that do exist are difficult to administer. Fourth, both Ecology and EPA are short of staff and funds to adequately administer and enforce the pretreatment program.

COMBINED SEWER OVERFLOWS

Section 201 of the Clean Water Act, 33 USC 1281, which authorized grants for best practicable waste treatment technology, is applicable to combined sewer overflows (CSOs). CSOs, however, received low priority in EPA grant programs. In December 1981 the Clean Water Act was amended to provide a special grant fund for the reduction and elimination of CSOs which discharge

into marine bays and estuaries. Despite the difficulty of obtaining federal grants, a number of local jurisdictions on the Sound--including Anacortes, Bellingham, Bremerton, Everett, Olympia, Port Angeles, and Metro--have engaged in significant construction programs to reduce the number of CSOs in their sewer systems.

Regulation of CSOs at the state level began in 1985 with the passage of an amendment to the Water Pollution Control Act. RCW 90.48.480-90 requires local governments to develop plans and compliance schedules for the greatest reasonable reduction of CSOs to be achieved at the earliest possible date. Plans and compliance schedules are to be completed and submitted to Ecology by January 1, 1988. "Greatest reasonable reduction," however, remains an undefined term. Ecology's December 1986 draft, if adopted, would define greatest reasonable reduction to mean one overflow event on average per year.

Before the 1985 amendment to state law, the Washington Departments of Fisheries and Game already had some regulatory authority over the siting of CSO discharges through the Hydraulic Permits Act. In addition, DSHS approves all sewage, water, and drainage plans. However, most CSOs were built before passage of these regulations.

Based on the best information available, there are nearly 200 known CSOs, owned by ten different municipalities, that discharge to Puget Sound. Few municipalities have studied their CSOs and the impact of them on water and sediment quality. Realization has been growing that stormwater runoff may be as much a problem for the water quality of Puget Sound as is sewage. Thus, simple separation of storm and sanitary sewers may no longer be the solution.

CONTAMINATED SEDIMENTS AND DREDGING

Disposal of any dredged material in Puget Sound is subject to regulation under the federal Clean Water Act, the Washington Water Pollution Control Act, and other local, state, and federal programs. The major federal regulation dredging and disposal of contaminated sediments is contained in Section 404 of the Clean Water Act, 33 USC 1344. The law requires a federal permit for the discharge of dredged or fill material into navigable waters. This permit ("the Corps permit") is administered by the Army Corps of Engineers. The Corps permit also incorporates the requirement of the Rivers and Harbors Act of 1899 to obtain a permit for "construction of structures or the excavation or filling or other alteration or modification of the bed or channel of the navigable waters of the U.S."

In conjunction with the Corps of Engineers, EPA has developed guidelines for the specification of disposal sites for dredged and fill material. No discharge of dredged material is permitted unless the guidelines are met. If the guidelines are met, the Corps of Engineers can approve disposal of dredged material at a specific site. The administrator of EPA has ultimate veto authority over a Corps of Engineers decision to permit disposal at a specific site.

The Corps circulates a public notice describing the proposed disposal. The public notice goes to state and federal resource agencies, the affected local governments, tribes, interested individuals, and organized environmental groups. The list of resource agencies includes EPA, U.S. Fish and Wildlife Service,

National Marine Fisheries Service, and the Washington Departments of Ecology, Natural Resources, Fisheries, and Game. These agencies review and comment on the proposed disposal, and some may use the Corps public notice to trigger their own permit or review programs. Generally, the Corps does not issue a permit if any required state or local approval is denied. This can include approval by DNR for the disposal site, by Ecology through a water quality certification, by Fisheries and Game through a hydraulics project approval, and by the affected local government through a shoreline development permit.

Disposal of dredged material in the water or on the shoreline itself is also regulated by local permits under shoreline master programs developed under the Shoreline Management Act (RCW 90.58). Upland disposal is regulated under the federal Resource Conservation and Recovery Act (RCRA; 42 USC 6901), delegated to Ecology by EPA, and under the Washington Solid Waste Management Recovery and Recycling Act (RCW 79.95). Planning for solid waste disposal under RCW 79.95 is delegated to local government health departments.

Recently, the Corps of Engineers, DNR, Ecology, and EPA have undertaken a major study designed to develop criteria for and select open water unconfined disposal sites in the Sound. This project, the Puget Sound Dredged Disposal Analysis (PSDDA), is directly applicable to the contaminated sediment problem. In particular, the analysis of alternatives to unconfined open water disposal will provide necessary technical information on methods for confined disposal of dredged material. The technical studies for the first phase of this two-phase study were completed in 1986, and a draft environmental impact statement for the first phase will be released in early 1987.

For open water disposal a functioning "Corps permit" process exists. The gap in the area of contaminated sediments and dredging is the lack of basic standards for deciding what levels of sediment contamination are acceptable. There is also a gap in the availability of upland sites for the disposal of material which cannot be disposed of in water.

OIL SPILLS[1]

As unauthorized discharges to public waters, oil spills in Puget Sound are violations of the federal Clean Water Act, Section 301(a) (33 USC 1311(a)), the Washington Water Pollution Control Act, RCW 90.48, and the Hazardous Waste Management Act, RCW 70.105. Pursuant to those laws and the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also known as the "Superfund" law), 42 USC 9601, the party causing the spill is responsible for cleaning it up and paying the costs of doing so; limited public funds are available for cleanup if the responsible party is unknown. The party is also required to compensate the public (i.e., the state of Washington) for damage to natural resources, such as fish and shellfish.

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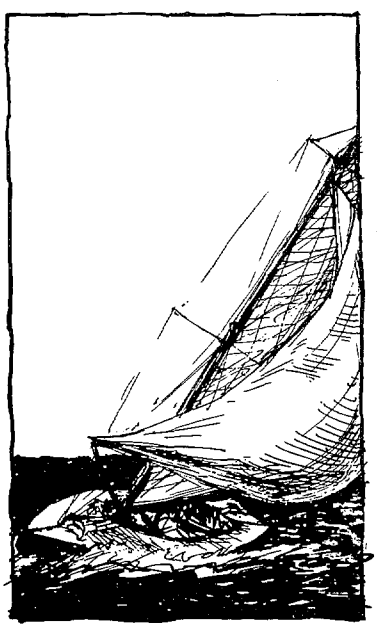
[1]The subject of oil spills in this plan is limited to an analysis of federal and state response to oil spills in marine waters, as distinguished from analysis of oil spill prevention or oil spills originating on land. The analysis is also limited in that it focuses on the response to a specific oil spill--the grounding of the *Arco Anchorage* in Port Angeles in December 1985. The following institutional discussion is accordingly limited.

Finally, the party is subject to the imposition of criminal or civil penalties (e.g., fines) as punishment for violation of the law.

The cleanup effort by the responsible party is conducted pursuant to "contingency plans" which are prepared by federal and state agencies. The national, regional, and state contingency plans are complementary programs that identify what is to be done by whom in the event of a spill. The U.S. Coast Guard is the lead agency responsible for oil spill response in Puget Sound, with state and local governments performing a secondary role. In practice, two areas of confusion are the use of volunteers and the role of local government in spill response.

MARINAS AND RECREATIONAL BOATING



Sewage discharges from boats and ships are regulated by Section 312 of the federal Clean Water Act, 33 USC 1322. All commercial and recreational boats in Puget Sound with an installed toilet must have an approved "Marine Sanitation Device" (MSD) on board. Federal regulations promulgated by EPA have established three types of MSDs: Type I and Type II MSDs are treatment devices and Type III devices are no-discharge devices (holding tanks). Boats under 65 feet in length can install either holding tanks (Type III devices) or a Type I device. Boats 65 feet and over must install either a Type II or Type III MSD.

The Coast Guard is responsible for enforcing these regulations. Enforcement of compliance by recreational boats, however, is on a spot check basis looking only to see if the MSD is installed. Enforcement of their actual use would be difficult and has generally not been attempted. In addition, neither the Clean Water Act nor federal regulation requires the installation of pumpout facilities at marinas. Discharge of raw sewage is therefore a common occurrence.

Marina siting is regulated by local government through the Shoreline Management Act (RCW 90.58) permit process. In addition, any developer planning to construct or expand a marina must secure a Corps of Engineers permit and a state hydraulics permit issued by the Departments of Fisheries and Game. Only new marinas are required to have pumpout facilities. Either the Corps permit or the hydraulics permit may be denied in order to protect the shellfish resource. Some local government jurisdictions have attempted to exercise control over pollution from existing marinas by prohibiting liveaboards. Siting a marina in the proximity of a commercial shellfish area, however, often leads to prohibition of commercial shellfish harvest by DSHS because of the potential for contamination.

The issue of marinas and recreational boating is one where a regulatory structure has been put in place but does not work. To encourage the use of pumpout stations they must be both convenient and relatively inexpensive. At present they are neither. Neither the Coast Guard nor EPA has attempted a boater education program aimed at getting boaters to use MSDs or pumpout facilities where they exist. In fact, EPA has announced that pollution from boats is not of national significance, thereby perpetuating the belief of boaters that their discharges are not creating problems. Discharges from recreational boats do cause localized problems in Puget Sound, but there are no existing

regulations that attempt to curtail overnight moorage or other boating uses in sensitive areas.

FOREST PRACTICES

Forest practices which are conducted in national forests are managed by the U.S. Forest Service under the National Forest Management Act, 16 USC 1601-1614. Timber harvesters and other contractors are required to abide by the Forest Service's "best management practices" as a condition of the contract between the operator and agency. The promulgation of best management practices is the product of nonpoint water quality planning which is prescribed by Section 208 of the federal Clean Water Act, 33 USC 1251.

Forest practices which are conducted on state or privately owned land are regulated primarily by Washington's Forest Practices Act, RCW 76.09. This law and Washington's Water Pollution Control Act (RCW 90.48) constitute an integrated regulatory scheme which expressly identifies water quality protection as one of the goals to be achieved by forest practice regulations. (See RCW 76.09.010, RCW 76.09.100, and RCW 90.48.420.)

General forest practice regulations (WAC Title 222) and forest practice water quality regulations (WAC 173-202) establish performance standards for activities which may degrade water quality, such as logging and road construction. Pursuant to RCW 76.09.050 timber operators must submit notification or an application to DNR before engaging in a forest practice and are required to comply with forest practice regulations. The state forest practice laws are administered primarily by the Department of Natural Resources (DNR). The state Departments of Ecology, Fisheries, and Game, as well as local governments, may perform monitoring, review, and advisory functions to DNR with respect to various forest practices and permit decisions.

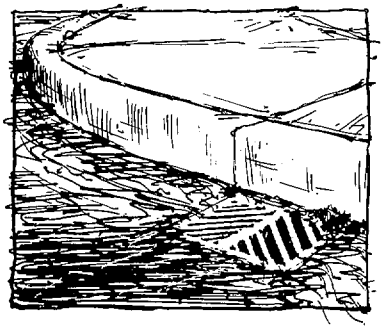
Forest practices have the potential for being affected by fishing rights of Puget Sound Indian tribes. The tribes claim a right to prevent degradation of fish habitat, such as salmon spawning streams, but the extent to which this right will be applied to forest practices remains to be determined by litigation or agreement between the tribes and federal and state governments.

A general lack of information makes it difficult to evaluate the success of these forest practice programs in minimizing water quality degradation. One deficiency in implementation is the absence of adequate funding (at least with respect to DNR and Ecology) for full program implementation, particularly in the enforcement area. There is also agreement that when forest practice regulations are not followed, adverse water quality impacts can occur. Uneven county involvement in forest practice permit review and the potential for impact from cumulative effects are two other possible limitations of these programs in practice.

In December 1986 participants in the Timber/Fish/Wildlife Project reached an agreement affecting commercial forest land management throughout the state. Participants include representatives from the timber industry, environmental groups, Indian tribes, and state agencies. The agreement, which will be presented to the Forest Practices Board, hopes to lead to increased protection for fish and wildlife habitat, water quality, and tribal cultural and archeologi-

cal sites while assuring a healthy timber industry. Continued, cooperative planning is at the center of the agreement. Among the key elements addressed by the T/F/W agreement are increased protection of fish, wildlife, and water quality along streamsides, improved operating flexibility for forest land managers based on site-specific concerns, increased field enforcement of the Forest Practices Act, and a program to protect resources from the risks associated with abandoned logging roads.

URBAN RUNOFF



Although urban runoff has traditionally been considered a nonpoint source, as a result of a lawsuit brought by the National Resources Defense Council against EPA in 1976, urban runoff is now coming to be considered a point source. Pursuant to the results of the lawsuit, revised EPA regulations require dischargers of urban runoff to apply for an NPDES permit by December 31, 1987.

In 1983 Ecology published its "Washington State Urban Stormwater Management Plan" which constitutes the urban stormwater management water quality plan under Section 208 of the federal Clean Water Act, 33 USC 1288. The plan placed an emphasis on preventing rather than curing the effects of stormwater runoff. It also proposed issuing general NPDES permits to large urbanized areas rather than to specific cities or individual outfalls. Implementation and specific planning of stormwater runoff remain with local government, however.

Bellevue, Poulsbo, Kent, and King County all used their authority under state law to establish stormwater utilities and charge rates for stormwater services. Other local governments, such as Snohomish County, however, have encountered significant public resistance to the establishment of yet another utility.

Local governments have other legal tools available to address the prevention of stormwater pollution. A common method for controlling increased urban runoff is a drainage ordinance requiring the submission of a drainage plan with all building permit applications. The purpose of the drainage plan is to assure that the stormwater runoff from the development is equivalent to its pre-development drainage characteristics. Local governments can also control stormwater runoff by reviewing subdivision and platting applications and requiring natural drainage areas.

Once channeled into a sewage or storm drain system, or to a stream network, urban runoff becomes a significant point source of pollution. It is likely, however, that the same issues of weak permit standards and weak enforcement that were discussed above in the sections on industrial and municipal discharges will also apply to stormwater. The Clean Water Act amendments recently vetoed by President Reagan would have required cities with populations over 250,000 to obtain an NPDES permit for stormwater runoff. It is unclear whether treatment of the runoff effluent will be required. Treatment technology for stormwater is still in its infancy, and municipalities fear that the expense of such requirements may rival secondary sewage treatment.

HOUSEHOLD HAZARDOUS WASTES

The handling and disposal of hazardous household substances is regulated primarily by the Hazardous Waste Management Act, RCW 70.105. Under that act local governments (cities and counties) are required to prepare a "local hazardous waste plan" for approval by Ecology. But local plan preparation is not required unless funding for that purpose is appropriated by the Legislature (RCW 70.105.270). Funding has never been appropriated.

If a local plan is developed, it must include a system of managing household hazardous substances. The plan must include an assessment of the quantities, types, generators, and fates of these substances. The plan must also include a public involvement and education component.

Disposal of household hazardous wastes is exempted from various regulatory programs which otherwise address the environmental effects of hazardous or toxic wastes. For example, exemptions are provided in the Federal Insecticide, Fungicide, and Rodenticide Act, the Resource Conservation and Recovery Act, and the Washington State Hazardous Waste Regulations.

Certain domestic practices, such as disposing of used motor oil into a storm drain or stream, would violate other laws, such as the state or federal clean water acts. In practice, however, enforcement against these activities is not practical.

ON-SITE SEWAGE SYSTEMS

Which laws, programs, and administrative agencies affect a particular on-site sewage (or "septic") system depends on the size of the system. Large "package" treatment on-site systems, generating more than 14,500 gallons per day, are required to obtain permits from and comply with regulations of the state Department of Ecology. (See RCW 90.48.110 and WAC 173-240.) Systems generating less than 14,500 gallons per day but more than 3,500 gallons per day require permits from and compliance with regulations of the state Board of Health (WAC 248-96). New on-site sewage systems producing less than 3,500 gallons per day must obtain permits from local government health agencies and comply with local health regulations. These regulations can be no less stringent than the minimum regulations for such systems adopted by the state Board of Health. The state Board of Health and local regulatory authority is exercised pursuant to RCW 43.20. Laws regarding disposal of septic tank sludge are discussed above.

Generally, the principal threat to water quality is perceived to be operation of the numerous small, individual systems, typically serving single-family residences. State minimum standards for these systems are designed principally to prevent contamination of surface water, groundwater, and wells. The regulations (WAC 248-96) prescribe design and installation standards for septic systems, addressing criteria such as minimum lot size, the depth of drainfield installation, soil type, and the distance of the drainfield from water supply, surface water, or public sewer system. Regulatory review occurs at the time of installation of a new system and, for those lots which are located in subdivisions, at the time of subdivision approval.

However, most failing systems which degrade marine water quality were installed prior to the adoption of these state regulations in 1974 and are

therefore generally exempt from their application. Furthermore, the historic regulatory response to pollution suspected from failing systems has been to decertify shellfish beds or close swimming beaches rather than to require repair or abandonment of failed systems.

Another institutional deficiency is a lack of adequate funds for state and local health agencies. As a result, numerous regulatory functions, such as education and enforcement, are performed poorly or not at all.

In addition, existing regulations for small systems do not insure that septic systems are adequately maintained. Homeowners may pave over drainfields or fail to pump out septic tanks. The result is failure of the septic system and potential water pollution.

Finally, effective implementation of standards may also be compromised by the substantial discretion exercised by local health department staff and public officials.

AGRICULTURAL PRACTICES

While local zoning (including shoreline master programs) may affect the location of new commercial farms, zoning generally does not regulate agricultural practices. NPDES permits for waste discharges are theoretically required for a few major dairies, but dairies have been effectively exempt from the NPDES permit process in practice.

Although regulation of agricultural practices is minimal, several programs exist which can affect agricultural practices in relation to water quality. A number of federal, state, and local agencies provide technical assistance to dairy operators and farmers and assist implementation of "best management practices" for their agricultural operations. These practices include structural actions, such as construction of a manure lagoon, or procedures, such as storing toxicants away from surface waters.

The impetus for development of best management practices was Section 208 of the federal Clean Water Act, 33 USC 1251, which required, among other things, water quality planning for nonpoint pollution sources. The state adopted a Dairy Waste Management Plan in 1979 as part of its Section 208 planning process. Local conservation districts, the Cooperative Extension Service, and the federal Soil Conservation Service are principal agencies which provide technical assistance and promote the use of best management practices.

Compliance with best management practices and participation in programs is voluntary, and the reach of these programs is limited (as it is with regulatory programs) by inadequate funding. One immediate consequence is a general lack of information regarding the nature and scope of water quality problems resulting from agricultural practices in Puget Sound.

Pesticide use is regulated by the Washington Pesticide Control Act, RCW 15.58, the Washington Pesticide Application Act, RCW 17.21, and the federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 USC 136. These laws prohibit or restrict the use and application of certain pesticides, mainly by requiring

that they be used consistent with the manufacturer's label instructions, but they do not necessarily prevent adverse water quality impacts.

Two other laws act to control water quality degradation caused by agricultural practices. The federal Food Security Act (1985 Farm Bill) is a significant federal enactment that bars federal assistance to farmers who substantially alter or drain wetlands. Washington law (RCW 36.70, RCW 35.63) requires county comprehensive plans to provide guidelines for reduction of pollutants affecting Puget Sound which come from stormwater runoff and drainage, including those which originates in agricultural areas.

RESOURCE PROTECTION

In addition to laws and programs that pertain to the control of sources of water pollution (see discussion above), there are also laws and programs associated with two other goals of the Puget Sound Water Quality Act--protection of wetlands and habitats and protection of shellfish beds (see RCW 90.70.070(11)).

WETLANDS AND HABITATS

Wetlands are a valuable resource for a number of reasons, and discussion of wetland laws and programs depends upon which particular value or function is being considered. The institutional discussion of wetland laws and programs presented here is confined to the wildlife habitat and water quality functions of wetlands.

Approximately a dozen federal and state laws relate directly or indirectly to regulation or management of wetlands and habitats. Section 404 of the federal Clean Water Act, 33 USC 1344, and the state Shoreline Management Act are perhaps the two laws which afford the greatest protection to wetlands adjacent to the Sound and its river tributaries. Section 404 regulates filling of wetlands through a permit program administered by the U.S. Army Corps of Engineers. The program discourages filling of sensitive wetlands. The Shoreline Management Act, which is implemented by cities and counties, authorizes prohibitions on wetland development or uses which are inconsistent with the habitat and water quality functions of wetlands. Each of these laws is discussed in more detail elsewhere in this chapter.

Several other laws affect wetlands and habitats. The federal Coastal Zone Management Act requires that federal permits and decisions be consistent with state coastal zone management programs to the maximum extent practicable. Because the Shoreline Management Act is Washington's coastal zone program, the act has added significance as a vehicle for protecting wetlands from actions which are subject to federal decision-making.

Section 10 of the Rivers and Harbors Act of 1899, 33 USC 403, provides protection to wetlands and beach habitats because it requires a permit from the Corps of Engineers for construction, dredging, and filling below the mean high water line. Fish habitats are the object of preservation under the state hydraulics project approval (HPA) law, RCW 75.20. That law authorizes the state Department of Fisheries or Game to deny or condition permits for projects if fish habitat would be jeopardized. Habitats of endangered species such as the bald eagle and peregrine falcon can be protected under the federal

Endangered Species Act, 16 USC 1531. The Fish and Wildlife Coordination Act, 16 USC 661, the Coastal Management Act, 16 USC 1451, and federal and state environmental policy acts (see discussion below) also pertain to wetland and habitat protection.

Three additional sources of protection for wetlands and habitats are local ordinances, tribal fishing rights, and state ownership of aquatic lands. Local zoning, grading, and drainage ordinances, such as those adopted in Island and King counties, may be effective in protecting wetlands and habitats. Puget Sound Indian tribes claim a right to prevent degradation of fish habitat, as mentioned previously. The state of Washington owns aquatic lands, which include some wetlands and habitats. These lands are managed by the state Department of Natural Resources and can be managed to enhance protection of wetlands and habitats.

Protection and enhancement of habitats can be accomplished by more informal and creative means, such as through increased cooperation among agencies, Indian tribes, private interests, and the public. For example, the Deer Creek Group, consisting of 13 federal, state, tribal, business, and environmental groups, was formed in response to a marked loss in fisheries and deteriorating water quality in Deer Creek, a tributary of the Stillaguamish River. Through cooperation and negotiation these groups developed a consensus on needed actions and planning. The Soil Conservation Service's Coordinated Resource Management Plan (CRMP) served as a model for the Deer Creek process. Increasing use of such mechanisms can do much to decrease the adversarial nature of some environmental problems and can provide substantial cost savings to all parties.

Several general observations can be made about how well these numerous laws and interests protect wetlands and habitats in practice. First, most development activities which are conducted directly upon marine wetlands are subject to laws or programs which require consideration of wetland protection. However, because of the limited geographic jurisdiction of many of these laws, areas adjacent to wetlands which affect them may not be subject to regulation to prevent adverse impacts. Most of the laws also exempt small water bodies and small wetlands from regulation. Second, for a number of these laws the decision to protect wetlands is discretionary, meaning that the need for protection is to be balanced against other needs. Thus protection may not be mandatory and may not occur. Third, most of these laws contain various exemptions, typically for minor projects or activities. The cumulative effect of these exemptions is difficult to assess, but may be detrimental to habitat and wetland protection goals. Fourth, there are numerous instances in which wetlands are filled without permits. When such instances are discovered, developers often are only asked to apply retroactively for a permit without restoration being required. Finally, and as is the case with other issues, the availability of funding at any given time has a major impact on the effectiveness of program implementation.

SHELLFISH

The Department of Social and Health Services regulates the shellfish resource from a human health perspective. The Department of Fisheries manages the shellfish resource for future harvests pursuant to RCW 75.16.100. The Depart-

ment of Natural Resources becomes involved if the anchoring of a mussel or oyster raft or use of a tideland requires a lease. In 1985 the Department of Agriculture was required by statute to provide support services for shellfish marketing. Neither the Department of Ecology nor local governments (with the exception of tribal governments' own aquaculture programs) directly regulate shellfish certification or harvest, although their respective efforts to regulate water quality and land use have a direct effect on the health of the shellfish resource. In 1985 the Legislature authorized counties to establish shellfish protection districts for the purpose of controlling nonpoint pollution and land use which threaten commercial or recreational shellfish (RCW 90.72).

DSHS regulates shellfish under the National Shellfish Sanitation Program. Dating from 1925, the program is a cooperative and voluntary effort among the shellfish-producing states, the industry, and the Public Health Service of the Food and Drug Administration. Under this program the FDA responsibilities include: (a) annual review of each state's program for the sanitary control of commercial shellfish; (b) publication of a monthly list of all valid interstate shellfish shipper certificates; and (c) research and technical assistance for the states. Under the newly devised classification system of the program, DSHS will certify commercial shellfish beds (recreational shellfish areas are unregulated) under the following classifications: (a) *approved,* where monitoring is done on a yearly basis; (b) *conditionally approved,* where monitoring is done monthly in areas where the amount of pollution may vary due to a seasonal population or other factors; (c) *restricted,* where only "relaying" may occur, monitored yearly ("relaying" refers to a method of purifying shellfish contaminated by fecal coliform bacteria by removing the organisms to an area of high water quality so that over a period of two weeks the shellfish pump enough water through their systems as they feed to purge themselves of the bacteria); and (d) *prohibited,* where harvest is prohibited due to lack of information or if monitoring data show that contaminants may reach the area in excessive concentrations.

Closures of commercial growing areas have been in effect in many of the more productive areas throughout the Sound since the 1950s, either through prohibition of areas once certified for commercial production or classification of areas as unsuitable due to the presence of bacterial contamination.

There is little information about the extent of toxic pollutants in the shellfish. There is also little information on the destruction of shellfish habitat from dredging or the smothering of geoduck beds from sedimentation. Current Ecology and local shellfish protection programs focus on only commercial growing areas, although thousands of Puget Sound residents harvest clams and other shellfish for recreation. There is also very little information or regulation regarding the approximately 30 shellfish species that are not harvested for human consumption but form an integral part of the Puget Sound ecosystem.

ENVIRONMENTAL PROTECTION

Three laws exist which, while not specifically designed to control a source of water pollution, are intended to enhance environmental protection generally. These laws, the National and State Environmental Policy Acts and the Washington Shoreline Management Act, are important sources of authority for

controlling water quality and protecting habitats. Also, because restricting pollutant discharges to water may shift disposal of pollutants to the air or land, laws that address air and land pollution should be noted. These laws are discussed below.

NEPA AND SEPA

Two laws provide authority to identify and control water quality impacts resulting from nearly all human activity which is subject to governmental regulation. This pervasive authority is provided by the National Environmental Policy Act (42 USC 4321) and State Environmental Policy Act (RCW 43.21C), known respectively as NEPA and SEPA. These laws are distinctive in that they "overlay" other governmental laws and programs, and do not apply to an activity unless that activity is otherwise subject to a permit approval or governmental decision. NEPA governs actions subject to federal regulation; SEPA governs actions subject to state or local regulation.

The principal purpose of these laws is to identify and mitigate adverse impacts to the environment which may be caused by a proposed project or activity. Impacts are identified through preparation of an environmental impact statement (EIS) or other environmental documents. An EIS must be prepared for actions which may significantly affect the quality of the environment, or the decision approving the action will be unlawful.

NEPA and SEPA require consideration of water quality and other specific environmental elements, but specific water quality requirements are not contained in either law. Nonetheless, the laws contain ample authority to protect water quality with respect to a far-reaching range of decisions and actions. State water quality goals, such as those contained in the Puget Sound Water Quality Act, RCW 90.70, and this plan, may be readily implemented by state and local governments pursuant to SEPA. Proposed developments or actions which fail to meet water quality or habitat protection policies established pursuant to SEPA may be denied or conditioned in order to achieve those policies.

SHORELINE MANAGEMENT ACT

The Washington Shoreline Management Act (SMA), RCW 90.58, is a major regulatory program which may affect many decisions relating to Puget Sound water quality in general and wetland protection in particular. The focus of the SMA is upon the use of land; it is comprehensive planning and zoning for shorelines.

The SMA operates in two principal ways. First, it requires cities and counties to adopt policies and regulations for land use in shoreline areas. The policies and regulations are contained in local "shoreline master programs," and development and use activity must conform to master program requirements.

Second, the act requires persons to obtain permits for numerous land and water uses, including construction projects valued in excess of $2,500. Permits are issued only for projects which are consistent with the master program. Land uses must be consistent with master program policies regardless of whether a permit is required.

Examples of activities which require SMA approval are the construction of a marina, sewage treatment plant, or outfall; landfilling or dredging; and bridge and road construction. Although many local master programs promote protection of wetlands, habitats, and water quality, the law allows decision-makers to balance the value of such protection against other values, such as recreational needs or economic development. Therefore, water quality and wetland protection are not necessarily the controlling criteria for decision-making under the SMA.

The act is also less effective than it might be in protecting water quality and habitats because of its limited geographic jurisdiction. Lakes smaller than 20 acres and streams with flows less than 20 cubic feet per second are excluded. The act applies only to water areas and 200 feet upland of those areas, and to wetlands associated with those water areas. Many activities lying outside those boundaries can adversely affect wetlands and water quality. Additionally, land uses which existed prior to enactment of the SMA are generally "grandfathered" (i.e., exempt from) application of master program requirements, although most expansions or changes in use would be regulated.

The state Department of Ecology oversees the implementation of the SMA by cities and counties. Civil and criminal penalties and remedies exist to enforce the act.

OTHER LAWS

Reducing pollution discharges to water may transfer disposal to the air or land. For example, limiting the discharge of toxicants to water may lead to an increase in air or land pollution as toxic materials are burned or disposed of in a landfill. Several major laws address environmental protection for the air and land and are discussed below.

Air Pollution

EPA, Ecology, and local air pollution agencies (in the Puget Sound region, the Puget Sound Air Pollution Control Agency, the Northwest Air Pollution Authority, and the Olympic Air Pollution Control Authority) regulate air pollution pursuant to the federal Clean Air Act, 42 USC 7401, and the state Clean Air Act, RCW 70.94. Ecology has full responsibility for implementation where there are no local pollution control agencies (e.g., San Juan County); otherwise it performs an oversight role.

Direct regulation of toxic air pollutants has been minimal, although toxicants have been controlled incidentally through particulate and other air pollution controls. Ecology is now in the process of developing new source review guidelines for air toxics. In 1987 the department, in conjunction with local air pollution control authorities, will be evaluating toxic emissions inventories (completed for the first time in 1985) to determine problem areas and pollutants. While air pollution permits may be reviewed when plants are modified, there is no regular schedule for reviewing air emission permits after a facility is first constructed.

Solid and Hazardous Waste Disposal

Solid waste management and planning are the responsibility of local governments with state oversight. The key laws pertaining to solid waste are the state Solid Waste Management Act, RCW 70.95, and the federal Resource

Conservation and Recovery Act (RCRA), generally 42 USC 6901 (for which Ecology has been delegated implementation authority). Minimum state standards for solid waste handling are incorporated in WAC 173-304.

Most of the state's solid waste is disposed of at landfills, and the capacity of many landfills is being rapidly exhausted. According to Ecology's 1985 annual report, the majority of landfills are currently not inspected and many are operating without a permit. Twenty-eight percent of the 191 known landfills in Ecology's Northwest Region had documented problems, including 35 with groundwater problems and nine with surface water problems.[2] New and expanded landfills are required to have leachate controls.

Hazardous wastes, as defined by the State Hazardous Waste Management Act, RCW 70.105, and WAC 173-303, must be managed at a permitted hazardous waste facility, except for small quantities (generally less than 220 pounds). (Most of the latter are believed to end up in landfills or the sanitary sewer.) Washington state has only a limited number of permitted hazardous waste treatment and storage facilities and no hazardous waste disposal facilities. The nearest disposal facility is in Arlington, Oregon.

Despite the controls pertaining to hazardous waste, there is some environmental risk associated with the handling and disposal of hazardous waste, and illegal disposal occurs.

Municipal Sludge and Septage Management

Sludge from municipal treatment plants and septage from septic tanks are considered solid waste under the state solid and hazardous waste laws. Although sludge is eligible for designation as a hazardous waste if sufficiently contaminated, none tested to date in Washington has warranted this designation.

The discharge permit for municipal sewage treatment facilities requires that sludge be utilized or disposed of in a manner or at facilities approved by the local health department. Ecology issued guidelines pertaining to sludge handling and use, establishing limits for some toxicants depending on how the sludge is to be used.

EPA policy guidelines issued in February 1986 indicate that, where possible, beneficial methods of sludge disposal (such as use as fertilizer where appropriate) should be encouraged. In 1986 the Washington Legislature authorized Ecology to prohibit the disposal of sewage sludge and septage in landfills after 1988 (see RCW 70.95). Local solid waste management plans must address sludge and septage management.

Local health agencies are responsible for assuring adequate handling of

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[2]Groundwater contamination can affect drinking supplies. All 12 Puget Sound counties have groundwater as well as surface water drinking supplies, and contamination of groundwater by toxicants is a potential problem that is beginning to be examined.

septage. They administer permit and regulatory programs for septic tank pumpers and utilization and disposal facilities.

Other Laws Affecting Water Quality

Among other laws affecting water quality in Puget Sound not mentioned previously is the Water Resources Act, RCW 90.54, under which the state seeks to allocate water uses to achieve the maximum benefit. A part of the Water Resources Act seeks to protect the high quality of the state's waters and requires that any wastes drained into the state's waters be provided with all known, available, and reasonable methods of treatment, RCW 90.54.020(3)(b). The Open Space Act, RCW 84.34, seeks to protect open space in the state by offering tax incentives to keep the land in agricultural, timber, or other undeveloped uses that provide the retention of open space. Authority for the acquisition of land or development rights is specifically provided under RCW 84.34.200-240. Washington's Surface Mining Act, RCW 78.44, has as its purpose the greatest degree of protection and restoration for all lands and water involved in surface mining throughout the state. Under this act DNR must approve all reclamation plans for any surface mining operation.

PUGET SOUND ESTUARY PROGRAM

In an effort to bring a more coordinated approach to activities related to Puget Sound, EPA and Ecology took the lead in establishing the Puget Sound Estuary Program in 1984-85. Most of the state and federal agencies having an interest in the Sound are participants in this endeavor, which involves several important programs aimed at addressing the Sound's water quality problems. While much of the PSEP's value is simply the exchange of information and coordination of programs, EPA and Ecology have also been involved in several important studies under the auspices of the PSEP. Important strides have been made in the areas of developing standard methods of analysis, targeting priority pollutants, and developing sediment criteria.

One of the major accomplishments of this program is the development of the urban bay strategy, an action program designed to identify and address presently known toxic and bacterial contamination problems and sources in designated priority sites in the Sound. Actions to date have focused on Commencement Bay, Elliott Bay, Eagle Harbor, and Lake Union. More recently, some initial work has begun on Everett Harbor. The future level of effort in urban bays will depend upon the availability of funding. It is anticipated that the estuary program will be integrated into the overall effort to implement this plan.

LOCAL GOVERNMENTS

Local governments have a pivotal role in the control of pollution reaching the Sound. Local governments can control pollution sources through land use planning and regulation and through enforcement of health regulations. Land use planning is not usually undertaken with control of water pollution as the primary objective. Yet, more than many other factors, the type (e.g., agricultural, residential, commercial, industrial) and density of land use determine the character and amount of pollution that results. However, certain local government ordinances, such as a wetland protection ordinance, may be specifically directed at the issues of water pollution and loss of habitat. Health codes, such as those governing the construction and maintenance of

septic tanks, also affect the character and amount of pollution that eventually reaches the Sound.

The many programs already initiated by local governments in the Puget Sound basin to control pollution and preserve wetlands show a commitment on the part of local governments to solve problems and to promote citizen involvement in water quality issues. Some examples include:

- Snohomish County's "Adopt-A-Stream" program
- Thurston County's geologically sensitive areas ordinance and study of the Hendersen-Eld watersheds
- Mason County's project in Skookum Inlet and a joint project between Mason and Thurston Counties in Totten Inlet
- Jefferson County's new project in cooperation with the local conservation district on Quilcene Bay
- Cooperative watershed planning among Pierce and Kitsap Counties in the Burley-Minter watersheds
- Clallam and Jefferson Counties' initiatives to develop local government response to oil spills and management of oil-related activities in local harbors
- Skagit County's landfill planning
- Programs by Island County and King County to preserve wetlands which are outside the jurisdiction of the Shoreline Management Act
- Whatcom County's Lake Whatcom Watershed Advisory Committee's charge to recommend a watershed management plan
- Bellevue's surface water utility
- Seattle's Lake Union Action Plan
- Bellingham's efforts to eliminate four of the city's five combined sewer overflows
- Tacoma's and Metro's pretreatment programs
- The Hood Canal Coordinating Council's efforts to control nonpoint problems in the counties surrounding Hood Canal.

EDUCATIONAL AND PRIVATE PROGRAMS

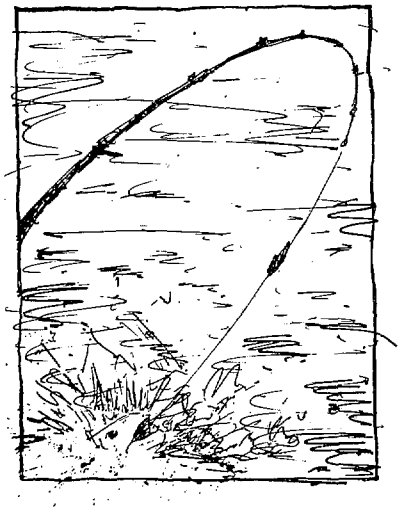
EDUCATIONAL PROGRAMS

Education about water quality and habitats is available from diverse sources. However, existing educational programs are often specialized and do not provide comprehensive exposure to Puget Sound water quality issues. Programs are also often of limited duration, frequently as a result of inadequate funding. While vast amounts of information exist about habitats and water quality, dissemination of this information to potential users or the general public may not occur because education is often not a priority of those possessing the information.

Schools may include water quality information in conjunction with regular classes or as special programs. Information for the general public is provided at nature centers, aquariums, wildlife centers, fish hatcheries, sewage treatment plants, and similar facilities. The news media carry stories about water quality issues.

Private organizations and public agencies often provide information regarding particular aspects of water quality. Notable among these efforts are the activities of salmon enhancement and watershed protection groups; agency, school, and citizen programs related to household hazardous wastes and pesticides; conservation district programs to help farmers implement practices which protect water quality; wetland programs at Padilla Bay and Nisqually Delta; Washington Sea Grant publications, seminars, and technical support on a wide range of marine issues; a variety of grade school curricula; and seminars offered by industry, government, and business on pollution control and stormwater runoff.

PRIVATE PROGRAMS



There are numerous private nonprofit organizations, trade associations, businesses, and other private sector groups which are important parts of the broader community endeavor on behalf of Puget Sound. In an era of budget reduction for environmental programs, the efforts of the private sector aimed at improving Puget Sound water quality become even more important.

Those efforts include the Boeing Company's extensive efforts to educate employees on the proper management of hazardous wastes on the job and in their homes. An example of collaboration among industries is the Clean Sound Cooperative, an organization which provides response to oil spills in the Sound and is supported by many of the refiners and transporters of petroleum products. Response to oil spills has also been marked by a tremendous outpouring of volunteer effort to assist in bird rescue. As much of this activity has been ad hoc and not organized by those in charge of spill response, the Washington Oiled Bird Rescue Association and other groups have been formed to provide a framework.

Some of the most important private sector activity involves direct involvement in restoration, enhancement, or cleanup of habitat in streams or on beaches. Chapters of the Northwest Steelhead and Salmon Council of Trout Unlimited spend numerous hours working with farmers to encourage best management practices and in physical restoration of stream habitat. Two of the groups with the most extensive programs encouraging volunteer activity for stream and beach restoration are managed by public agencies: the Seattle Aquarium Adopt-A-Beach and the Snohomish County Adopt-A-Stream programs.

Several nonprofit organizations are focused on specific parts of the Sound and engage in advocacy as well as education and restoration. Examples include the Nisqually Delta Association, Carkeek Watershed Community Action Project, Friends of Eagle Harbor, Friends of the San Juans, Friends of the Snohomish Delta, Hood Canal Environmental Council, and Tahomans for a Healthy Environment. Complementing these locally focused groups are the regional, statewide, and national organizations which use similar approaches for the Sound as a whole. These include the many chapters of the Audubon Society, Friends of the Earth, Greenpeace, Mountaineers, Puget Sound Alliance, Sierra Club, and the Washington Environmental Council.

Some of the private sector activity on behalf of the Sound is concentrated on the actual preservation of important ecological systems through purchase or deed restrictions. Organizations of that type active in the Sound are The

Nature Conservancy, Trust for Public Lands, and the San Juan Preservation Trust.

Many of these private sector activities are intimately related to government action. It is a partnership that is adversarial at times but essential for the health of the Sound.

RESEARCH PROGRAMS

Today, universities, government agencies, and private laboratories are involved in Puget Sound-related research. Of these, the most extensive and diverse programs are at the University of Washington and the various facilities of the National Oceanic and Atmospheric Administration (NOAA).

The Environmental Protection Agency (EPA) contracts for research with other agencies and has an active marine research program at Newport, Oregon. There are also many ongoing smaller research programs at other universities, state agencies, and private laboratories.

While research is not a major part of the work of state agencies, several find that research is necessary for regulatory decisions and resource enhancement. Some of these programs go beyond monitoring or intensive studies and can be considered to be research. Examples include the South Sound Circulation Study and the development of decision analysis software for nonpoint pollution, both funded by the Department of Ecology. The Department of Fisheries has projects for salmon stock identification and for development of the geoduck hatchery program.

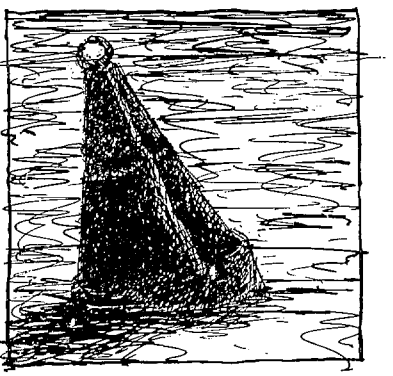
Private nonprofit laboratories such as Battelle Northwest Marine Research Center at Sequim do contract research related to Puget Sound. Cascadia Research Consortium in Olympia is another such group with an emphasis on Puget Sound marine mammals.

The Sea Grant program at the University of Washington, which has provided a focal point for research in the Sound, EPA, and NOAA are the major funding sources for Puget Sound research. Additional federal funds come from the U.S. Army Corps of Engineers and the National Cancer Institute. State funding of research related to Puget Sound is limited to internal funding of agency projects and a small number of contracts and grants for very specific projects. Private funding also appears to be very limited.

Researchers at all of these facilities are concerned about the severe lack of funding from national granting agencies for site-specific research in Puget Sound. For example, although the Wildlife Toxicology Institute at Western Washington University has obtained substantial funding to study the pharmacology of various pesticides in wildlife, generally it has been unable to obtain funding to study the effects of pesticides on wildlife in Puget Sound.

MONITORING PROGRAMS

Existing Puget Sound monitoring programs have been reviewed by NOAA (1985) and in the PSWQA issue paper, Comprehensive Monitoring of Puget Sound. These studies identified many agencies who gather data on a variety of aspects of Puget Sound including information on biological resources, water quality,



and sediments. Some of the major monitoring programs include water column and river monitoring by the Department of Ecology, special water quality studies by the Department of Ecology, shellfish monitoring by the Department of Social and Health Services, fisheries monitoring by the Department of Fisheries, river and stream monitoring by the USGS, and monitoring of a variety of physical, chemical, and biological characteristics by NOAA. There are few long-term or comprehensive programs for monitoring habitats or sediments, although the Army Corps of Engineers annually photographs Puget Sound habitat types and NOAA annually monitors sediment contamination at 11 sites in the Sound. Federal, state, and local agencies gather substantial data on Puget Sound as part of specific project-related intensive surveys, short-term or localized monitoring, and compliance monitoring. These programs are generally implemented independent of one another. There is no program which integrates and coordinates ambient monitoring, discharge monitoring, intensive surveys, and other programs to assess the quality of Puget Sound water, sediment, habitat, and biological resources.

In September 1986 the Authority formed a Puget Sound Monitoring Management Committee chaired by the Authority and consisting of representatives from state, federal, tribal, local, and Canadian agencies, industry, shellfish growers, the scientific community, and citizen organizations. The management committee will be responsible for recommending a comprehensive ambient monitoring program that responds to the needs of participating agencies in supporting their resource management responsibilities.

Paralleling these efforts has been the Puget Sound Atlas Project, sponsored by the Authority, EPA, and the Corps of Engineers. The atlas consists of resource and water quality maps gathered from a variety of sources on 40 topics, including sediment chemistry, tidal currents, land use information, benthic and shellfish conditions, and aquatic and wetland habitats. The information has been entered into a computer data base which it is hoped will soon be available to agencies and others for various planning and analytical purposes. The data base, once it is available, also should also provide an important foundation for any future monitoring data base.

GENERAL CONCLUSIONS

Having reviewed laws and programs affecting Puget Sound water quality in relation to specific sources of pollution and specific resource protection, the following conclusions emerge. (Keep in mind that there are usually exceptions to any generalization.)

First, laws, programs, and agencies already exist to control many of the principal pollution sources and to protect wetlands and shellfish areas. If existing laws and programs are effectively implemented, only a few new laws or programs might be needed to complete a comprehensive management program for protection of Puget Sound's water quality and resources.

Second, the existing institutional framework reflects a primary role for federal and state involvement in regulating point sources of pollution, whereas local governments play (or could play) the lead role regarding many nonpoint sources.

Third, although water quality protection is a required result of certain governmental decisions, particularly those involving point source control, that protection is discretionary for many other, typically nonpoint, activities. In other words, although legal authority currently exists to protect water quality, wetlands, and shellfish, there is not, with the exception of certain actions, a requirement that the authority *be exercised* to provide that protection. Thus, water quality has typically not been the focus of many decisions with adverse effects.

Fourth, although ostensibly several laws or programs are duplicative (i.e., "overlap"), such as the federal and state clean water acts and the federal and state spill contingency plans, there are no significant program duplications in the water quality area. This is because formal delegations of authority and intergovernmental agreements provide delineation of responsibilities such that the programs operate in a cooperative manner. Although a number of laws and programs may address the same general subject matter, scrutiny shows that they typically address related, but different, aspects of a problem. Despite the lack of duplication, citizens and companies may readily believe that overlapping (and occasionally contradictory) programs exist when viewing air, water, and land environmental programs as a whole.

Fifth, the Puget Sound Water Quality Authority is responsible for coordinating and integrating current and potential laws and programs in an effort to protect Puget Sound water quality, wetlands, and shellfish. Several other federal, state, and local agencies perform major, critical functions which pertain to those protection goals.

Chapter 5: Action Plan

Introduction

This chapter contains the Puget Sound Water Quality Authority's action plan for cleaning up and preventing pollution of Puget Sound. The purpose of this plan is to restore and protect the biological health and diversity of Puget Sound. The strategy for achieving this purpose is to protect and enhance three resources: water and sediment quality; fish and shellfish; and wetlands. Protection of water and sediment quality and fisheries yields biological health. Protection of wetlands preserves biological productivity and diversity.

The following goal provides the basis for the plan: It shall be the long-term goal of the state to prevent increases in the introduction of pollutants to the Sound and its watersheds, and to reduce and ultimately eliminate harm from the entry of pollutants to the waters, sediments, and shorelines of Puget Sound. In seeking this goal, agencies shall take into consideration the net environmental effect of their decisions in order to minimize the transfer of pollutants from one environmental medium to another.

This emphasis on prevention recognizes the simple truth that it will cost more to clean up pollution later than to prevent it now.

Each of the source control programs in the plan contains specific goals and actions to prevent additional pollution. The plan also recognizes that certain sources of pollution present a greater threat than others, and that responsibility for preventing pollution should reflect those differences.

An adequate scientific basis now exists to take decisive preventive actions, despite the fact that definitive scientific conclusions do not exist (and may never exist) regarding certain issues. The plan uses the substantial knowledge we now have about the Sound to direct efforts to controlling the sources of pollution. "Source control" provides a working principle for addressing known, as well as potential, problems.

In recognizing that considerable scientific uncertainty does exist about the effects of pollution in Puget Sound, the plan also supports continuing scientific research and monitoring of the health of the Sound. A comprehensive monitoring program is necessary to guide our actions over the long term, including the Authority's biennial revisions to the plan.

The plan is based on a premise of shared responsibility among all of us in the Puget Sound region and recognizes that water pollution crosses jurisdictional lines. It establishes a framework based on a partnership between state and local agencies, each having a defined set of responsibilities in different areas. The plan also recognizes and includes actions by tribes, the private sector, and citizens, and it relies on the federal government to play an important role as well.

Because the responsibility for protecting Puget Sound involves action by individuals, businesses, and all levels of government, education is a key feature of the plan. The plan contains both education requirements in specific programs and an overall education program.

An important emphasis of the plan is effective implementation of existing governmental programs, particularly the provision of adequate staff and funding for those programs. The plan prescribes expansion of existing programs and, in some circumstances, the establishment of new programs to address designated problems. It uses existing agencies rather than calling for the creation of new ones.

This plan is comprehensive: it addresses the major sources of water and sediment quality degradation and wetland loss; it generally applies to all of the Puget Sound basin; and it employs a range of solutions--regulatory, educational, and policy. At the same time, it permits or requires programs targeted to particular geographic locations.

Special emphasis is given to the control of toxicants discharged into Puget Sound by strengthening existing regulation of industrial and municipal discharges, by instituting effective pretreatment programs, and by controlling combined sewer overflows and stormwater.

The plan provides increased control of pathogens discharged into Puget Sound by reducing municipal combined sewer overflows and by controlling stormwater. Control of pathogen pollution from septic systems, farm animals, and recreational boating is addressed in the nonpoint program, with special attention given to commercial and recreational shellfish areas.

The generation and spread of contaminated sediments is controlled through programs for stormwater, dredging and disposal, and regulation of point sources and certain nonpoint sources of pollution.

The protection of marine biological diversity is accomplished by identification and protection of significant wetland habitats. Wetlands are protected through public acquisition augmented by enhancement of local regulatory programs.

Inherent in the plan is a strong sense of priorities. Decisions on priorities are reflected by the inclusion of some issues and programs in the plan and not others. A number of proposals considered by the Authority in the planning process were determined to be of lower priority and were dropped from the plan. The table called Priorities for Action, later in this chapter, delineates priorities.

The final section in this chapter discusses costs and financing. Estimates for public sector and some private sector costs of the programs are included. Possible funding sources are also discussed.

Although this action plan went into effect upon adoption by the Authority on December 17, 1986, its implementation is in large part dependent upon funding and, in a few instances, on passage of new legislation. At the conclusion of the legislative session in 1987, the Authority will review the plan to determine what, if any, changes may be needed to reflect the decisions of the legislature. The Authority's enabling statute describes the process for revising the plan. (A copy of this statute is included in Appendix C.)

Most of the target dates shown for the elements of the action plan depend on adequate and timely funding. For the Department of Ecology, which is a major implementing agency for this plan, an additional assumption has been made regarding the rate at which the department will be able to hire qualified staff. If this assumption proves too ambitious, Ecology's ability to meet target dates might be affected.

The programs which follow this introduction are organized in a consistent format. Each program is prefaced with a brief problem definition. This is followed by the program goal, the strategy for achieving this goal, a summary description and list of major features, followed by the elements comprising the program. For each program, the major actions which the Authority intends to review are listed and any new legislation required by the program is specified. A table at the end of each program summarizes the program's estimated cost.

NONPOINT SOURCE POLLUTION

PROBLEM DEFINITION

Nonpoint source pollution is typically defined as pollution that is not discharged through pipes. Nonpoint source pollution includes pathogens (as indicated by fecal coliform bacteria), sediments, and toxicants. Pollutants can be discharged directly into the water from boats or other water-based sources and indirectly from the land where they are picked up by rainwater and carried into streams and rivers and thence to Puget Sound. Because a bay can receive the drainage from a large land area ("watershed") as well as discharges from the water, the potential contributors to nonpoint pollution can be numerous and difficult to identify.

Bacterial contamination from nonpoint source pollution has been responsible for five out of seven recent closures of commercial shellfish beds in Puget Sound. Increasing rural development of noncommercial farms and residences using on-site sewage disposal (septic) systems as well as existing large commercial farms appear to be the major causes. In newly urbanizing areas stormwater can add additional bacterial and toxic contamination.

Generally, each nonpoint source (on-site septic systems, agricultural practices, boats, and forest practices) has its own control program run by a different government agency. Weaknesses in the control of nonpoint pollution arise from weaknesses in the separate source control programs and in the lack of an overall coordinated process to control all sources in a bay or watershed. Basin and areawide plans developed earlier under the federal Clean Water Act have generally not been implemented because they have not been funded and because no law required their implementation.

ON-SITE SEPTIC SYSTEMS

Failing on-site septic systems can discharge pathogens and household chemicals to streams, groundwater, and eventually Puget Sound. Failures occur because many soils in the Puget Sound region are poorly suited for conventional systems, because water tables are high, or because the systems are improperly designed, installed, or maintained. Many older systems have failed because they were designed to serve as temporary units for summer cottages or until an area was sewered. Today, approximately one-third of the residents in the Puget Sound basin are served by on-site systems.

New on-site septic systems must comply with local health regulations which can be no less stringent than the minimum regulations promulgated by the state Board of Health. Most systems that are failing today (three to five percent) were installed prior to the adoption of these state regulations in 1974 and are therefore generally exempt from their provisions. Moreover, implementation of current standards is subject to substantial discretion exercised by local permitting officials.

State and local health agencies lack adequate funds for education and enforcement. When enforcement actions are taken, prosecution rarely follows. Existing regulations do not require system maintenance or inspections for proper functioning at time of property transfers.

AGRICULTURAL PRACTICES

Potential pollutants from agricultural practices are sediments, nutrients, organic materials, pesticides, and pathogens. Pathogens arise from poor animal-keeping and pasture-management practices. Sediments, which carry pathogens and can damage salmonid habitat, can be generated by livestock trampling and eroding stream banks and by poor row crop practices.

State programs for control of nonpoint pollution from agricultural practices rely on voluntary implementation of best management practices (BMPs) with enforcement of water quality standards as a last resort. Local conservation districts, the Cooperative Extension Service, and the federal Soil Conservation Service all provide technical assistance to farmers and promote the use of BMPs. The Department of Ecology provides grant funding for agricultural construction projects. Partial funding of BMPs by federal cost-share programs has been important to the success of these voluntary programs on commercial farms. Federal cost-share funds are declining, and no state cost-share program exists.

The effectiveness of these programs is limited by inadequate funding and the general exclusion of noncommercial farms.

FOREST PRACTICES

Most of the rivers and streams that flow into Puget Sound have their origin in forest lands; sediment loading from timber harvesting and road construction can damage fish habitat in these streams which in turn can damage migratory species that are harvested in Puget Sound. Logging roads built prior to the current Forest Practices Act and since abandoned are of particular concern.

Forest practices are regulated by Washington's Forest Practices Act, RCW 76.09. Timber operators are required to submit applications and comply with regulations administered by the state Department of Natural Resources. Other state agencies perform limited monitoring, review, and advisory functions. A serious deficiency in the forest practice program is inadequate funding for enforcement and monitoring.

MARINAS AND RECREATIONAL BOATING

Potential contaminants from marinas and recreational boating include pathogens, petroleum products, and toxicants in antifouling paint. Sewage discharge from boats is a potential problem during the boating season wherever large numbers of boats congregate, but especially in smaller, poorly flushed bays, near shellfish beds and public swimming areas, and at marinas occupied by "liveaboard" boats.

In Puget Sound the Coast Guard is not actively enforcing federal regulations requiring marine sanitation devices (MSDs). Even with a vigorous enforcement program, widespread violations of discharge standards could still occur because enforcement cannot ensure the use of an MSD. Despite this flaw in the enforcement program, no boater education programs have been attempted in Puget Sound. In addition, major boating areas such as the San Juan Islands and Hood Canal lack sufficient pumpout facilities for holding tanks.

Most local shoreline master programs lack specific design standards for marinas which address protection of shellfish beds, pumpout facilities, runoff from boatyards, and fueling facilities.

PROGRAM GOAL

To reduce and ultimately eliminate harm from nonpoint sources of pollution to Puget Sound, including pathogens, toxic contaminants, and sediment.

STRATEGY

The strategy for achieving this goal is (1) to target state and local resources on priority watersheds through a cooperative local watershed planning process, (2) to supplement the watershed plans with countywide education and preventive programs, and (3) to develop state programs or regulations for those sources that are most effectively controlled at the state level.

SUMMARY DESCRIPTION

The nonpoint program takes a three-pronged approach to the control of nonpoint sources of pollution. First is a cooperative local watershed program for priority watersheds identified in two rounds: Round 1 or early action watersheds are identified by Ecology from ongoing projects and from nominations; Round 2 watersheds are identified and ranked in order of importance by multi-agency committees convened by each county. Watershed action plans cover on-site septic systems, animal keeping/pasture management, stormwater, and any other significant nonpoint pollution concerns in that watershed. The plans are prepared and carried out by local watershed management committees consisting of all affected jurisdictions, tribes, special purpose districts, and others. Planning must be done according to guidelines prepared by PSWQA which permit substantial flexibility in planning approaches. Ecology must approve the action plans.

Second, to supplement the watershed action plans, the nonpoint program requires counties to prepare and/or coordinate countywide education programs for on-site septic systems and animal keeping/pasture management. It also requires all local governments to evaluate ways in which water quality considerations are incorporated into land use decisions, the effectiveness of their regulations for new on-site systems, and the need for on-site system maintenance programs within their jurisdictions. At the state level, DSHS is asked to audit all local on-site septic system programs, to evaluate the need for revised regulations for on-site systems in sensitive areas, to be consulted in drafting legislation requiring on-site system certification at the time of property transfers, and to develop a program for certification of on-site system professionals. Ecology is asked to conduct a study and design a program for cost-sharing both for animal keeping/pasture management and for on-site programs and to carry out the Dairy Waste Management Plan with a focus on priority watersheds.

Third, the nonpoint program includes state programs for marinas and boats and forest practices. The marinas and boats program includes revised guidelines for shoreline master programs regarding the siting of marinas, the establishment of a boaters task force (using the existing Boating Safety Advisory Task Force as a base) to develop an accelerated education program and prepare legislation requiring pumpouts at marinas, and eventual state enforcement of

federal regulations requiring marine sanitation devices on boats. For forest practices, the program endorses the Timber/Fish/Wildlife Project. The Authority will support the statutory and regulatory actions proposed by the T/F/W Project and will review and comment on major milestones and documents of the project as they relate to Puget Sound.

MAJOR FEATURES

---Ecology selects the first round of early action watersheds which include the six existing shellfish watershed projects and additional watersheds selected from nominations.

---Subsequent priority watershed designations are based on rankings prepared by committees in each county.

---Watershed action plans address animal keeping and pasture management, on-site septic systems, stormwater, and any other significant nonpoint sources.

---Counties, cities, and other entities sharing watersheds coordinate plan development and implementation through watershed management committees.

---Ecology provides state oversight for local watershed action plans. Ecology designates a lead agency where a watershed management committee cannot agree on one and may either prepare plans for watershed committees that "default" on their responsibility or order the jurisdictions to comply.

---A state program, including an accelerated education program and phased enforcement, is developed for nonpoint source pollution from recreational boating.

---The Timber/Fish/Wildlife Project for forest practices is endorsed.

PROGRAM ELEMENTS

NP-1. SELECTION OF PRIORITY WATERSHEDS

Selection of priority watersheds shall be in two steps: Round 1 or early action watersheds to be selected by Ecology from nominations and Round 2 consisting of a ranking of all watersheds in each county to be compiled by countywide committees.

Round 1. Early Action Watersheds

Funding shall be continued and in some cases increased for the six existing Ecology Shellfish Protection Strategy Watersheds. Additional early action watersheds shall be selected as follows:

Ecology shall request nominations for priority watersheds from local governments, tribes, special purpose districts, environmental and public interest groups, agricultural groups, state agencies, and organizations such as the Hood Canal Coordinating Council. Ecology shall rank the nominations in order of priority and shall hold public hearings on the proposed ranking. The conservation districts, working through the Soil Conservation Service, will provide local governments with assistance in the nomination process by providing information and coordination through its River Basin Study. The conservation district

process of preparing nominations will be taken into account in making the final selections. The total number of early action watersheds to be selected by Ecology shall depend on funds available.

Target Date: Final selection by June 30, 1987.

Round 2. Long-Term Watershed Selection Process

Using guidelines developed by PSWQA (NP-2), each county shall convene a committee of representatives from cities, special purpose districts, tribes, and other appropriate entities in the county for the purpose of identifying and ranking all watersheds for future nonpoint watershed action plans. The county is assumed to be the committee lead, but the committee may select a lead other than the county where circumstances warrant. The watershed selection process shall include public participation. Both the general public and affected individuals shall be involved either through a separate citizen advisory committee and/or inclusion of citizen groups, farming organizations, and others on the selection committee.

Each county committee shall submit to Ecology its identification and ranking of all watersheds within the county. The submittal shall include maps showing watershed boundaries, identification of probable nonpoint sources, identification of all local jurisdictions and special purpose districts with territory within the boundary of each watershed, and identification of all affected tribes.

Target Date: Submittal to Ecology by January 1, 1989.

Criteria

Ecology and county committees shall use the following criteria for selection of priority watersheds in Round 1 and Round 2:

a. The watershed has a beneficial use such as recreational or commercial shellfish beds, fish habitat, or drinking water, that is impaired or threatened by pollution from nonpoint sources.
b. The watershed has a likelihood of intensified land or water use, including a likelihood of being logged, in the next ten years.
c. Environmental factors, such as soil, slope, and precipitation on land and/or limited flushing in the Sound increase the probability of future water quality degradation.
d. The watershed produces more contaminants or causes greater harm to a beneficial use than other watersheds.
e. Nonpoint source control programs in the watershed are likely to succeed in protecting water quality in Puget Sound as evidenced by programs already underway, existing institutional arrangements for interjurisdictional cooperation such as the Hood Canal Coordinating Council, or other factors.

Hood Canal

The Hood Canal Coordinating Council is an example of a watershed managed by interlocal agreements between three counties and two tribes. It was created after several years of discussion by an advisory committee formed in response to a directive by former Governor Spellman. An action plan, published in the summer of 1986, outlines procedures for dealing with nonpoint pollution

problems in Hood Canal. The Council is currently implementing the septic system and farm animal provisions of the plan, as well as education activities and monitoring of shellfish beds; forest practices and boating activities will be part of the 1987 agenda. The Authority has provided administrative assistance to the Council and will continue such support. The Council should report to PSWQA and Ecology by December 31 each year on the progress of its work on nonpoint pollution control. Ecology will consider continued funding of this program under its grants programs.

NP-2. GUIDELINES FOR WATERSHED ACTION PLANS

PSWQA shall prepare guidelines for use by watershed management committees in developing watershed action plans and by county committees in identifying and ranking watersheds (NP-1). Ecology, DSHS, and the state Department of Agriculture shall each assign to PSWQA one staff member who is an expert on nonpoint source pollution control to form a team to develop the guidelines. PSWQA shall also consult with the U.S. Environmental Protection Agency, the Departments of Fisheries and Game, the Washington Conservation Commission, the U.S. Soil Conservation Service, conservation districts, tribes, counties and cities, farming organizations, educators, and other affected parties during the preparation of the guidelines.

The goal of watershed action plans shall be to meet water quality and shellfish standards in priority watersheds. The objectives of watershed action plans shall include reopening closed/correctable shellfish beds, preventing further closures, protecting fish habitat, and achieving other objectives appropriate to each watershed. Watershed action plans shall address nonpoint pollution from animal keeping/pasture management, on-site septic systems, stormwater, and any other significant nonpoint source but need not include programs for all of the sources if the watershed is found not to have problems from one or more of these sources. The six early action watershed plans already underway in fiscal year 1986 shall not be required to meet every detail of the guidelines but must be consistent with the intent of the PSWQA plan.

The guidelines shall include a procedure for Ecology to determine schedules for each watershed plan based on the complexity and size of the watershed and other local conditions.

The guidelines shall permit watershed management committees to select regulatory and/or educational approaches for each source and shall make recommendations on the development of *effective* programs using either or both approaches. The guidelines shall specify that if regulatory programs are chosen, adequate enforcement must be provided and if educational programs are chosen, agencies and/or individuals with expertise in education must be involved in program development and implementation.

Animal Keeping/Pasture Management

The guidelines shall specify how local action plans address animal keeping and pasture management. The guidelines shall recommend but not require the use of conservation district/SCS farm management plans as the preferred approach to controlling pollution from both commercial and noncommercial farms, and shall adopt the conservation districts' farm management manual as the recommended standard. The guidelines shall permit watershed management commit-

tees to address animal keeping/pasture management through other regulatory or educational approaches, but the guidelines shall specify that any farm which has implemented an approved farm management plan through either the Dairy Waste Management Plan or the conservation district/SCS program shall be exempt from further animal keeping/pasture management regulations unless water quality violations occur. (See also NP-13, Dairy Waste Management Plan.) The selection of an educational approach to controlling pollution sources shall not be construed to overrule or prevent the enforcement of existing regulations and laws by local, state, or federal agencies nor shall it be construed to exempt local governments from other requirements of this plan.

On-site Septic Systems

The guidelines shall provide examples of several acceptable approaches to controlling nonpoint pollution from on-site systems, including regulation, education, and on-site system maintenance programs, but shall not specify a required approach.

Stormwater

The guidelines shall recommend a basic approach but leave latitude to the watershed management committees. The guidelines shall suggest different approaches for different land use patterns and shall be consistent with stormwater elements described in the Stormwater and CSOs program. The inclusion of stormwater in a priority watershed does not exempt local governments from carrying out the additional stormwater requirements of SW-1 and SW-2.

Forest Practices

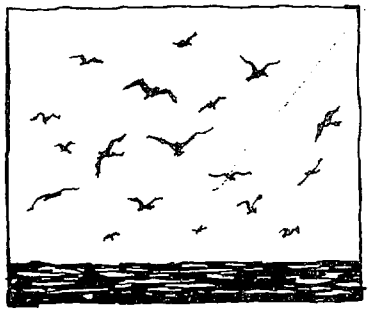
In endorsing the Timber/Fish/Wildlife Project in FP-1 and recognizing that state law preempts local action on forest practices, the Authority intends that watershed action plans which include forest practices be closely coordinated with the T/F/W Project, especially in the areas of pre-planning and basin planning, enforcement, data management, orphaned roads, and extended review.

Target Date: Preliminary guidelines to be published by June 30, 1987. Final guidelines to be published by December 31, 1987.

NP-3. WATERSHED MANAGEMENT COMMITTEES

When funding becomes available for each priority watershed, Ecology shall notify the county with jurisdiction within the watershed and the county shall be responsible for convening a watershed management committee. If two or more counties share a watershed, the counties may agree on a temporary lead to convene the committee or may jointly convene the committee. The committee shall consist of all affected local governments, special purpose districts, tribes, interested state agencies, and others. If nonpoint pollution from boats and/or forest practices has been identified as a problem source in the watershed, staff of the State Parks and Recreation Commission and/or Department of Natural Resources forest practices personnel shall participate in the committee.

The county is presumed to be the lead for each watershed management committee. However, the committee may designate a city, a local health agency, a conservation district, or other agency if circumstances warrant.



Watershed management committees may split technical and administrative lead functions. If the committee cannot agree on a lead within four months of notification of the availability of funding for a priority watershed, Ecology shall designate the lead based upon type of pollution problems, size of the geographic area in different jurisdictions, willingness and capability of an agency to take lead status, and each jurisdiction's legal authority to carry out a program.

Planning and implementing agencies[1] for each source to be controlled in the watershed shall be selected by the watershed management committee. Criteria for selection shall include territory governed, legal authority, and expertise. It is not the intent of the designation process to impose new jurisdictional arrangements on watershed committees, but to allow use of existing institutional structures while giving maximum flexibility to watershed management committees to achieve effective development and implementation of the action plan. If a watershed management committee cannot agree on implementing agencies, Ecology shall designate them and may require interlocal agreements.

The lead agency selected by the watershed committee shall be responsible for convening meetings, coordinating among local jurisdictions and other agencies, working with planning and implementing agencies in preparation of the plan, compiling and publishing the plan, and submitting the plan to Ecology for approval.

The watershed action planning process shall include public participation. Both the general public and affected individuals shall be involved either through a separate citizen advisory committee and/or inclusion of citizen groups, farming organizations, and others on the management committee.

To ensure full participation of tribes in watershed planning, tribes shall evaluate their desired level of participation in watershed management committees following each round of the watershed selection process and shall submit coordinated grant applications to Ecology.

NP-4. PLAN ADOPTION AND IMPLEMENTATION

Each watershed action plan submitted to Ecology for approval shall include goals and objectives; identification of types of nonpoint sources; a description of the general planning approach for the watershed and for each type of source; identification of planning and implementing agencies and their author-

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[1]For the purpose of this program, a planning agency is the agency that prepares reports and makes recommendations, and an implementing agency is the agency that carries out the day-to-day activities of the plan once it is adopted by a county and/or city council. An agency could be both a planning agency and an implementing agency, for example, a health department could both propose regulations for on-site systems and enforce them after they have been adopted by the county council or commission. In watersheds with two or more counties or cities there could be several implementing agencies for the same source, for example, two different health departments carrying out on-site programs prepared by a single planning agency and adopted by the two different county councils or commissions.

ities; program plans and/or ordinances including enforcement and/or education programs; and an implementation schedule. Ecology shall have 90 days to approve/disapprove the plan. If a plan is disapproved, the watershed management committee shall revise the plan as necessary and the lead shall negotiate with Ecology for final approval. Ecology may approve portions of a plan before approving the entire plan and require those portions to be implemented during the revision process for the remainder of the plan.

Each implementing agency identified in the plan approved by Ecology shall be responsible for carrying out its portion of the watershed action plan using the approaches described in the plan. The lead shall be responsible for coordinating among implementing agencies and for preparing reports to PSWQA and Ecology.

Watershed action plans may be revised by watershed management committees following submission of revisions to and approval by Ecology.

NP-5. PROGRAM FUNDING AND INCENTIVES

5.1. Nonpoint Watershed Planning Grants

The Department of Ecology shall administer a program for disbursing grant funds to watershed management committees for preparing and implementing watershed action plans. Disbursal of grant funds to agencies may be funneled through the lead administrative agency or paid directly to implementing agencies according to procedures established in the state water quality account (cigarette tax).

5.2. Funding for Conservation Districts

Ongoing funding shall be provided to enable Puget Sound conservation districts to participate in planning and implementing priority watershed action plans and to maintain basic administrative functions.

5.3. Continued Funding for Washington Conservation Corps

The continued existence of the Washington Conservation Corps shall be supported, and funding shall be provided to allow it to continue to provide assistance in constructing nonpoint pollution control projects.

5.4. Tax Assessment of Stream Corridors with Restricted Use

In instances where property owners have fenced along streams as part of a watershed action plan, the Dairy Waste Management Plan, or an approved farm management plan through the SCS/conservation district program, counties should consider granting open space tax status pursuant to the Open Space Act (Chapter 84.34 RCW) to lands with restricted use resulting from fencing.

NP-6. TECHNICAL ASSISTANCE FOR WATERSHED PLANS

Ecology, with coordination assistance from PSWQA, shall form teams consisting of staff from Ecology, the Department of Social and Health Services, the Department of Game, the Department of Fisheries, the Department of Natural Resources, the Washington Department of Agriculture, the Washington Conservation Commission, and other appropriate state agencies and tribes to provide technical assistance to each watershed management committee through-

out the planning and implementation phases of watershed action plans. The teams shall provide watershed committees with clear direction as to which individuals/agencies to call upon for specific types of assistance.

NP-7. EVALUATION, FEEDBACK, DEFAULT

7.1. Audits

Ecology shall provide ongoing oversight of watershed action plans. In addition, Ecology, in cooperation with PSWQA, shall audit each watershed action plan every two years to ensure consistent and adequate implementation.

7.2. Monitoring

Ecology (or Ecology and DSHS for watersheds in which shellfish or drinking water is an issue) shall monitor water quality in each priority watershed after substantial progress has been made in implementation of the action plan. The purpose of the monitoring shall be to provide information for measuring the success of action plans in achieving water quality goals. Watershed monitoring shall be coordinated with the overall monitoring program (M-2).

7.3. Default Watersheds

If local governments decline to prepare and implement nonpoint watershed action plans, Ecology shall either prepare and implement watershed action plans itself or use its regulatory authority under Chapter 90.48 RCW, the Puget Sound Water Quality Management Plan, or other authority to direct local governments to prepare and implement nonpoint watershed plans.

7.4. Program Evaluation

The effectiveness of the nonpoint program, including the effectiveness of the watershed plans, shall be evaluated by PSWQA as part of the 1989 and 1991 revisions to the Puget Sound plan. Procedures and guidelines shall be revised, including the addition of more prescriptive standards, as necessary.

COUNTYWIDE PROGRAMS

NP-8. EDUCATION PROGRAMS

Each Puget Sound county shall be required to conduct educational programs on all sources of nonpoint pollution, including but not limited to on-site septic systems, animal keeping/pasture management, and stormwater throughout all portions of the county in the Puget Sound planning area. The first year's education program for animal keeping and pasture management shall focus on identifying methods for reaching both commercial and noncommercial farmers. Educational programs shall be submitted to Ecology for approval. Counties are responsible for the submittal to Ecology but may arrange with health agencies, conservation districts, tribes, nonprofit groups, or others for preparation and distribution of educational materials or for other special education programs.

NP-9. PREVENTION

Using guidelines prepared by PSWQA, each local government in the Puget Sound planning area shall evaluate the items below for that portion of its jurisdiction within the Puget Sound planning area and shall submit a written report to PSWQA for consideration in the 1989 plan revision.

a. How water quality considerations are incorporated into land use decisions.

b. The effectiveness of its regulations for new on-site systems, including the soil types and other conditions under which they are permitted. Effectiveness in this case refers to protection of public health and water quality.

c. The need for on-site system maintenance programs to protect both public health and water quality.

d. The effectiveness of local enforcement programs for zoning, shoreline, and health regulations affecting nonpoint pollution. (To be coordinated with Legal and Personnel Support element LP-4.)

Target Date: Complete evaluations by June 1, 1988.

STATE ELEMENTS TO SUPPLEMENT LOCAL PLANNING

NP-10. EVALUATION OF ON-SITE REGULATIONS AND PROGRAMS

DSHS shall study the effectiveness of current statewide standards for on-site systems, with special attention paid to sensitive areas. Effectiveness in this case refers to protection of public health and water quality in the Puget Sound basin. The study shall include audits of the local on-site programs in all 12 Puget Sound counties and an evaluation of the following specific issues:

a. Minimum vertical separation (distance between bottom of drainfield and impermeable layer).
b. Required soils evaluation during the high water-table season.
c. Definition of and proximity to surface water.
d. Required inspection ports on new on-site systems.
e. Required inspection during construction.
f. Required use of alternative technologies (proven enhanced treatment systems) under appropriate soil and other conditions.
g. Procedures for identifying and enforcing correction of failures, especially where conventional or alternative technology will not result in proper subsurface soil disposal and including resolution with Ecology of the issue of surface discharging systems.
h. Land area requirements.
i. Comprehensive operation and maintenance requirements, including private sector roles.
j. Applicability of rules to systems installed prior to promulgation of the 1974 state Board of Health on-site sewage disposal regulations.
k. Design criteria for increased treatment efficiencies of conventional systems.
l. Expanded monitoring of local on-site programs and of alternative systems.
m. Identification of sensitive areas where more stringent regulations, especially relating to the above issues, should apply.
n. Other issues deemed appropriate by DSHS.

If the study concludes that revised regulations are needed, either Soundwide or

in sensitive areas, DSHS shall present proposed regulations to the state Board of Health for consideration.

Target Date: July 1, 1988.

NP-11. PROPERTY TRANSFERS

PSWQA, after consultation with DSHS, shall propose legislation requiring sellers to submit the following information to buyers at the time of sale of residential or commercial property: (a) whether the building has an on-site system or a sewer hook-up; (b) location of the septic tank and, if available, information on location of the drainfield; (c) certification of inspection and/or pumpout of the septic system within the last three years; (d) certification that the septic system is operational; and (e) when available, a DSHS maintenance manual for on-site systems. In the development of the legislation PSWQA shall consider the role of lending institutions in ensuring that the information has been provided before any loan is made.

Target Date: 1987 Legislature.

NP-12. CERTIFICATION OF ON-SITE PROFESSIONALS

DSHS shall develop a program including any required legislation or amendments to WAC 249-96 and RCW 18.43.070 for state certification of designers (including professional engineers), installers, and environmental health specialists involved in the design and installation of on-site septic systems. DSHS shall require all on-site systems to be installed, designed, given permit approval, and inspected by certified professionals.

Target Date: June 30, 1989.

NP-13. DAIRY WASTE MANAGEMENT PLAN

The existing Dairy Waste Management Plan shall be funded to focus on priority watersheds, and Ecology shall be encouraged to continue its use for commercial dairies regardless of size. Any farm which has fully implemented a farm management plan through either the Dairy Waste Management Plan or the conservation district/SCS system shall be exempt from further regulations on animal keeping/pasture management under a priority watershed action plan unless water quality violations occur.

NP-14. COST-SHARING PROGRAM

Ecology, with assistance from the Washington Conservation Commission, shall conduct a study and design a program, legislation, or constitutional amendment to establish a cost-sharing program for animal keeping, pasture management, on-site systems, or other situations where BMPs are required by priority watershed action plans.

Target Date: Complete study by June 1989. Program in place by June 1990.

MARINAS AND RECREATIONAL BOATING

[NOTE: The marinas and recreational boating program shall focus on recreational boating because of its widespread occurrence throughout Puget Sound. However, small (less than 65 feet in length) uninspected commercial

vessels using areas where nonpoint pollution from boats has been identified as a problem shall be subject to educational and enforcement programs.]

MB-1. SHORELINE MASTER PROGRAM AMENDMENTS FOR MARINAS

Ecology shall revise WAC 173-16 guidelines to include specific standards for siting and design of marinas. The guidelines shall include a specific prohibition against siting marinas near shellfish beds and specific regulations requiring best management practices to control runoff from boatyards.

Target Date: Revised guidelines by July 1989.

Local jurisdictions shall amend their shoreline master programs to be consistent with the revised WAC 173-16.

Target Date: Programs amended by July 1990.

MB-2. MODEL ORDINANCES FOR SEWER HOOKUPS FOR LIVEABOARDS

Ecology shall draft a model ordinance requiring slipside pumpouts ("sewer hookups") or other means of sewage disposal for liveaboards at public and private marinas. Local governments shall be encouraged but not required to adopt and enforce ordinances requiring slipside pumpouts or other sewage disposal methods. The ordinance shall be accompanied by a report providing information for local governments on designing and installing slipside pumpouts at marinas and methods of ensuring their use by liveaboard boaters.[2] Following publication of the model ordinance and report Ecology shall evaluate progress under the nonmandatory program and recommend additional action as necessary.

Target Date: January 1, 1988.

MB-3. BOATERS TASK FORCE

The State Parks and Recreation Commission shall form a task force consisting of the existing Boating Safety Advisory Committee (which includes boaters and local governments) plus representatives from PSWQA, DSHS, WDF, DNR, Ecology, Interagency Committee for Outdoor Recreation, tribes, shellfish growers, marina owners, the marine sanitation industry, and owners of small commercial vessels to accomplish the following tasks:

a. Design an accelerated education program to be implemented by State Parks and Recreation with the following purposes:

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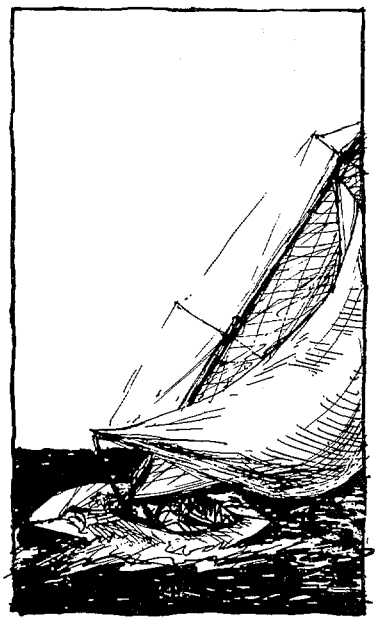
[2]The discharge of untreated sewage from liveaboard boats at a marina is currently illegal under the general provisions of the Clean Water Act. The provision of a model ordinance is intended to assist local governments in dealing with illegal discharges from liveaboard boats. The discretionary nature of the ordinances does not mean discharge of sewage is legal where such ordinances have not been adopted.



i. Encourage the use of marine sanitation devices (MSDs) in shallow water bays and other sensitive areas.[3]
ii. Discourage anchoring near shellfish beds.
iii. Encourage environmentally safe habits in the use of antifouling paint, cleaning agents, and petroleum products.

In designing the education program the task force shall include an ongoing evaluation of the effectiveness of the program, including its effectiveness with regard to boats anchoring near commercial shellfish beds. This evaluation shall be used by DSHS in its determination of the need for anchorage prohibitions (MB-8).

Target Date: Task force convened by July 1, 1987. Education program underway by January 1988 (for 1988 boat shows).

b. Prepare legislation requiring sufficient pumpout facilities at existing and new moorage facilities (marinas, yacht clubs [including outstations], and parks with moorage). The legislation shall not require pumpouts at all moorage facilities but shall specify circumstances where pumpouts shall be required and shall establish an enforcement program. Legislation shall also specify (or require a rulemaking process to specify) operating characteristics of pumpouts including water depth, pumping pressure, maneuvering room, fees, and operating hours.

Target Date: Legislation submitted to 1988 Legislature.

MB-4. CONSTRUCTION OF PUMPOUTS AT PRIORITY STATE PARKS

The State Parks and Recreation Commission shall install pumpout stations at selected state parks with priority given to parks located in poorly flushed bays with shellfish resources and without other nearby pumpout facilities. State Parks shall consult with PSWQA, DSHS, Ecology, WDF, DNR, and the Boaters Task Force of MB-3 for assistance in identifying those parks with the highest need for pumpouts.

Target Date: Installation of at least one pumpout by the summer of 1988 and up to four additional pumpouts by the summer of 1991.

MB-5. ENFORCEMENT OF MSD REGULATIONS

The Boating Safety Division of State Parks and Recreation shall obtain a Memorandum of Understanding with the U.S. Coast Guard to permit state inspection of recreational vessels and other uninspected vessels under 65 feet in length for marine sanitation devices (MSDs). State Parks shall develop an inspection program coordinated with the accelerated education program (MB-3) and focused on shallow water bays and other sensitive areas. Development of the inspection program shall be timed to allow at least two years of an education program before beginning an enforcement program. The enforcement program shall include enforcement of "no anchorage" areas and "no discharge"

[3]Sensitive areas are defined as restricted water bodies where discharge of untreated sewage from boats is especially detrimental because of limited flushing, shallow water, commercial and recreational shellfish, swimming areas, or other characteristics.

areas if instituted under MB-7 and MB-8 below. Parks and Recreation shall consult with the Boaters Task Force (MB-3) for assistance in designing an effective enforcement program to complement the education program.

Inspectors shall keep records of all boats inspected and the types of MSDs found and shall submit a report on the inspections to Ecology for use in the study of "no discharge" areas (MB-7).

Target Date: Begin inspection program July 1990.

MB-6. INTENSIVE SURVEYS OF BOATING AREAS

The Department of Ecology, with assistance from DSHS, shall conduct at least two intensive surveys of boating areas per year during the boating season to determine the extent of contamination by boats and to provide information for use in the boater education programs. The surveys shall include water and shellfish samples and boat counts.

Target Date: First survey in summer of 1988 (FY 1988).

MB-7. STUDY OF "NO DISCHARGE" AREAS

Two years after the implementation of MSD enforcement (MB-5) Ecology shall evaluate the need for "no discharge"[4] areas and if a need is found, apply to the EPA for their designation. Need shall be based upon the inability to achieve water and shellfish quality standards in boating areas if Type I and II MSDs are permitted. In making a determination as to whether a boating area needs a "no discharge" designation, Ecology shall consider the flushing and other natural characteristics of the area, the presence of shellfish and swimming areas, the results of the intensive surveys of boating areas (MB-6), the number of boats using an area, and the percent of boats with Type I and II devices found by the inspection program (MB-5).

Target Date: Study complete and any applications to EPA made by December 1992.

MB-8. "NO ANCHORAGE" AREAS

DSHS shall provide ongoing evaluation of the results of the intensive surveys of boating areas and the success of the education program in protecting commercial shellfish beds from closures due to anchored boats. If DSHS finds that the education program has been unsuccessful in protecting commercial shellfish beds from such closures, DSHS shall draft legislation prohibiting anchorage near commercial shellfish beds. "No anchorage" areas shall be enforced by State Parks and Recreation as part of its MSD enforcement program (MB-5). The education program shall warn boaters of the potential for anchorage prohibitions if the education program is unsuccessful in achieving water quality and shellfish standards in boating areas.

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[4]"No discharge" areas are areas where the use of Type I and Type II MSDs (treatment devices as opposed to Type III holding tanks) is prohibited. Vessels with Type I and Type II devices are permitted in "no discharge" areas but may not discharge. The process of designation requires application by the governor or the Department of Ecology to the U.S. Environmental Protection Agency and a showing that sufficient pumpout facilities for all vessels exist.

Target Date: If necessary, legislation shall be submitted to the 1992 Legislature.

FOREST PRACTICES

FP-1. TIMBER/FISH/ WILDLIFE PROJECT

The Authority endorses the Timber/Fish/Wildlife Project and supports in concept the process and proposed regulatory and programmatic changes outlined in the December 13, 1986, "First Draft T/F/W Agreement in Principle." In particular, the Authority supports the T/F/W approach of significantly increasing enforcement and monitoring of forest practices, preplanning and basin planning, interdisciplinary identification (ID) teams, data management, a comprehensive program for identifying and correcting problems with orphaned roads, riparian management zone regulations, extended forest practice application review period (extended from 15 to 30 days), reorganization and staff increases at DNR, and continuing program evaluation. The Authority will support the statutory and regulatory actions, including any federal and state funding proposals, necessary to implement the T/F/W Agreement.

The Authority will review and comment on major milestones and documents of the T/F/W Project as they relate to Puget Sound, both providing the Forest Practices Board with comments on regulatory and policy initiatives of the T/F/W Project and participating in the annual T/F/W evaluation process.

MAJOR PUBLIC ACTIONS FOR AUTHORITY REVIEW[5]

1. The results of the study by DSHS evaluating the need for revisions to WAC 248-96 for on-site septic systems and any subsequent proposed revisions (NP-10).

2. Ecology guidelines on shoreline master program requirements for marina siting and design (MB-1).

LEGISLATION REQUIRED

1987 Session

1. Legislation requiring sellers and lending institutions to provide septic system information and certification to purchasers prior to transfer and financing of property (NP-11).

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[5]Although PSWQA will not be reviewing as major public actions the actual selection of priority watersheds or the individual action plans adopted for each priority watershed, the selection process and the plans will be reviewed by PSWQA through its general oversight role, as part of the audit of the program described in NP-7, and through the reports required of state agencies and local jurisdictions described in Chapter 6.

Subsequent Sessions

1. Legislation amending RCW 18.43.070 to allow inclusion of professional engineers among the professionals to be covered by the state certification program for designers and installers of on-site systems (NP-12).

2. Legislation would be required to expand Boating Safety enforcement powers to allow inspections of marine sanitation devices on vessels (MB-5).

3. If "no discharge" areas are designated, legislation would be required to prohibit use of Type I and Type II MSDs in those areas (MB-7).

4. Legislation (to be drafted by the Boaters Task Force) requiring pumpout facilities at marinas (MB-3).

5. Legislation prohibiting anchorage near commercial shellfish beds (MB-8).

6. Legislation or constitutional amendment to establish a cost-sharing program for BMPs in priority watersheds (NP-14).

ESTIMATED COST

Estimated costs for this program are $7.0 million in fiscal year 1988, increasing to $9.4 million in fiscal year 1990, decreasing to $8.5 million in fiscal year 1991, and increasing to $9.4 million in fiscal year 1992. Cost estimates for each element for fiscal years 1987 through 1992 are shown on the tables. Costs are associated with both administering the watershed action plans and carrying out augmented state programs for forest practices, marinas and boats, commercial dairy farms, and on-site septic systems. Most elements would likely be financed from either the state water quality account (cigarette tax) or local government general funds.

Some of the costs for controlling nonpoint pollution would be borne by the private sector. At the local level, in watershed action plans (NP-2), there will be costs for implementing agricultural and stormwater BMPs and for on-site septic system pumpouts or possible replacement.

Agricultural BMP costs may be minimal, for example, sealing leaks in animal confinement areas; moderate, for example, stream fencing (approximately $1.00/foot plus watering costs); or high, for example, if manure lagoons have to be built. The cost of constructing lagoons may be $50,000 or more per farm. However, farmers implementing BMPs may be eligible for cost-sharing with government agencies.

The costs of stormwater BMPs vary widely depending upon the nature of the source and the type of BMP or good housekeeping measure needed. Two examples of stormwater BMPs are building berms and paving drum storage areas at industrial sites and constructing detention basins at residential and commercial developments. Examples of costs for stormwater BMPs are given in the Stormwater and CSOs program.

On-site septic systems can be pumped out for about $120, but if they need to be repaired or replaced, the costs would be much higher. For example, a new drainfield would cost $1,000 to $2,000 while costs for alternative systems range from $3,000 to $10,000.

There will also be private sector costs for state-level programs. Costs related to the Dairy Waste Management Plan (NP-13) will be for implementing BMPs to minimize pollution from animal keeping/pasture management, as mentioned above for the watershed action plans, and may be subject to cost-sharing. Providing required information about on-site systems at property transfers (NP-11) is expected to cost about $75 per transfer.

In the marinas and boats program, costs for installation of pumpout facilities for marinas as a result of legislation to be drafted by the boaters task force (MB-3) have been estimated at $8,500 to $25,000 at each marina. Up to an additional $40,000 would be needed if installing a pumpout facility requires construction of a new dock, and about $9,500 would be needed if a new septic tank for pumpout wastes is necessary. Although some boaters may have to spend money installing marine sanitation devices because of the state enforcement program (MB-5) ($200 to $1,000 depending on type of MSD and installation costs), the requirement for MSDs already exists in federal regulations. Similar costs would be borne by boaters with Type I or II MSDs who might wish to use their toilets legally in "no discharge" areas (MB-7) and therefore might choose to replace their MSDs with holding tanks (replacement would not be required by law). New boatyards may also incur additional costs for runoff controls resulting from the revised shoreline master program guidelines (MB-1).

For forest practices, there is a potential for private sector costs from actions taken through the T/F/W Project.

ESTIMATED COSTS: NONPOINT SOURCE POLLUTION	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Program Element						
NP-1: SELECTION OF PRIORITY WATERSHEDS	0	177,000	211,400	0	0	0
NP-2: GUIDELINES FOR WATERSHED ACTION PLANS	0	114,300	0	0	0	0
NP-3: WATERSHED MANAGEMENT COMMITTEES[1]	0	1,248,300	671,000	1,732,300	791,900	1,946,700
NP-4: PLAN ADOPTION AND IMPLEMENTATION[1]	0	1,679,200	1,093,100	2,847,300	2,186,200	3,175,700
NP-5: PROGRAM FUNDING AND INCENTIVES[2]	0	595,200	559,200	559,200	631,200	631,200
NP-6: TECHNICAL ASSISTANCE FOR WATERSHED PLANS	0	282,800	380,800	444,500	442,100	427,500
NP-7: EVALUATION, FEEDBACK, DEFAULT	0	22,800	224,800	265,800	264,500	250,300
NP-8: EDUCATION PROGRAMS	0	1,003,500	950,000	950,000	950,000	349,900
NP-9: PREVENTION[3]	0	13,800	1,025,000	0	0	0
NP-10: EVALUATION OF ON-SITE REGULATIONS AND PROGRAMS	0	115,100	0	0	0	0
NP-11: PROPERTY TRANSFERS[4]	0	28,800	63,900	63,900	63,900	63,900
NP-12: CERTIFICATION OF ON-SITE PROFESSIONALS	0	28,800	28,800	28,800	28,800	28,800
NP-13: DAIRY WASTE MANAGEMENT PLAN[5]	0	1,192,400	1,757,800	1,856,600	1,854,400	1,853,700
NP-14: COST-SHARING PROGRAM[6]	0	0	83,800	40,700	40,400	40,300
MB-1: SHORELINE MASTER PROGRAM AMENDMENTS FOR MARINAS[7]	0	0	34,400	220,100	219,800	0
MB-2: MODEL ORDINANCES FOR SEWER HOOKUPS FOR LIVEABOARDS[8]	0	18,100	6,900	6,700	6,700	6,700
MB-3: BOATERS TASK FORCE AND EDUCATION PROGRAM[9]	0	251,500	234,400	75,200	75,200	75,200
MB-4: CONSTRUCTION OF PUMPOUTS AT PRIORITY STATE PARKS[10]	0	181,000	368,000	199,000	205,000	30,000
MB-5: ENFORCEMENT OF MSD REGULATIONS	0	0	0	0	689,600	349,600
MB-6: INTENSIVE SURVEYS OF BOATING AREAS	0	40,600	79,900	79,400	79,100	79,100
MB-7: STUDY OF "NO DISCHARGE" AREAS[11]	0	0	0	0	0	83,500
MB-8: "NO ANCHORAGE" AREAS[11]	0	0	0	5,800	14,400	14,400
TOTAL ANNUAL ESTIMATED COSTS:	$0[12]	6,993,200	$7,773,200	$9,375,300	$8,543,200	$9,406,500

NOTE: Approximately $200,000 in Referendum 39 funds are available as matching grants for nonpoint actions in FY '87.

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[1]Assumes 6 watersheds in FY 1987, 6 in 1988, and 12 more in 1990 and 1992. Costs for state agencies are included in NP-6.
[2]Funding for conservation districts and Washington Conservation Corps which would hire 9 people in 1988 and 6 in 1989.
[3]Assumes 12 health departments/districts will perform evaluations and 12 counties and 50 cities will evaluate land use.
[4]Septic information at time of property transfer is expected to cost $75.00 per property.
[5]Assumes 1 Conservation Corps crew per 2 watersheds (3 people in 1988 and 6 in 1989). Assumes 28 dairy waste projects at $250,000 each.
[6]Costs for study and program development only. Does not include funds for actual cost-sharing.
[7]Assumes all 12 counties and 15 Puget Sound cities will have to revise their shoreline master programs.
[8]This does not include the costs to local governments of adopting voluntary ordinances or costs to marina and boat owners of installing sewer hookups.
[9]Recommendations of the Boaters Task Force may result in significant private and public costs for marina pumpouts, estimated to cost up to $7 million total.
[10]Assumes each park pumpout system costs $175,000. Capital costs include docks, pumpout equipment, electrical and water connections, and (in some cases) on-site septic systems. O & M costs include repair and maintenance of pumpout systems and sewage hauling at parks where septic tanks are not feasible.
[11]Costs do not include necessary enforcement which is estimated in Element MB-5.
[12]Expenditures in fiscal year 1987 will be funded by existing state budgets.

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ESTIMATED COSTS: NONPOINT SOURCE POLLUTION
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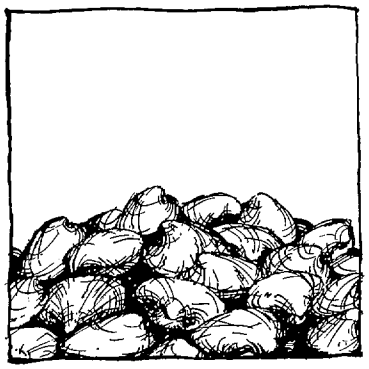
By Agency	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
STATE GOVERNMENT						
ATTORNEY GENERAL	0	0	8,100	0	0	0
CONSERVATION COMMISSION	0	79,800	102,500	81,900	81,900	81,900
DEPT OF AGRICULTURE	0	19,200	17,900	11,000	11,000	11,000
DNR	0	16,500	16,500	11,000	11,000	11,000
DSHS	0	328,900	138,500	124,700	133,300	133,300
ECOLOGY	0	345,600	783,700	944,000	937,200	985,000
ECOLOGY PASS-THROUGH GRANTS	0	750,000	1,125,000	1,125,000	1,125,000	1,125,000
FISHERIES	0	16,500	16,500	11,000	11,000	11,000
GAME	0	11,000	11,000	11,000	11,000	11,000
PSWQA	0	96,100	33,000	27,500	27,500	0
PSWQA PASS-THROUGH GRANTS	0	600,000	600,000	600,000	600,000	0
STATE PARKS	0	385,100	555,300	274,200	969,800	454,800
WASHINGTON CONSERVATION CORPS	0	148,000	132,000	132,000	204,000	204,000
OTHER						
LOCAL GOVERNMENTS	0	3,303,300	3,583,600	5,047,600	3,608,500	5,566,500
CONSERVATION DISTRICTS	0	893,200	649,600	974,400	812,000	812,000
TOTAL ANNUAL ESTIMATED COSTS:	0	6,993,200	7,773,200	9,375,300	8,543,200	9,406,500

SHELLFISH PROTECTION

PROBLEM DEFINITION

IMPORTANCE OF THE SHELLFISH RESOURCE



Puget Sound is one of the most productive shellfish growing areas in the country. In 1985 the value to the grower of the annual commercial harvest in Puget Sound exceeded $6 million, and the Department of Ecology has noted that existing commercial shellfish operations represent only a fraction of the potential production of Puget Sound. Economic losses attributable to prohibited or conditionally approved shellfish beds are estimated by Ecology to be approximately $3 million annually.

The Department of Fisheries estimates that about 450,000 recreational clamming trips are made to Puget Sound each year, yielding over 3.1 million pounds of clams for an approximate retail value of $6.2 million. Fisheries also reports that in 1984 approximately 136,000 pounds of oysters were harvested in Hood Canal for noncommercial consumption, a potential retail value of approximately $1,088,000.

The value of the shellfish resource, however, extends far beyond strictly economic benefits. There are few other places where the tie between people and their natural surroundings is as close as on Puget Sound. An important part of this tie is the use of the Sound's shellfish resource--for years people have depended on shellfish for food or have enjoyed shellfish harvesting, and the resource has an intangible value to people. For numbers of people, including many who do not themselves harvest shellfish, these and other living resources of the Sound represent historical and cultural values integral to the quality of life of the region.

CAUSES OF CONTAMINATION

Some commercial shellfish beds in Puget Sound were closed to harvest as early as the 1950s. These early closures were mainly in urbanized areas due to the beds' proximity to sewage treatment plants and other urban sources of fecal coliform bacteria. A significant change in this pattern has occurred since 1981 with most closures occurring in rural, not urban, bays. Animal keeping practices, failing on-site septic systems, stormwater, sewage treatment plants, marinas, and boats are all sources of fecal coliform and have been implicated in recent closures of commercial shellfish beds.

The extent of bacterial contamination of recreational shellfish beds is not well known. Preliminary results of an ongoing DSHS-EPA study of 25 recreational shellfish areas have revealed bacterial contamination exceeding state water quality standards in at least six of the 25 sites.

There is limited information on toxic contamination of commercial and recreational shellfish in Puget Sound. The DSHS-EPA study is currently testing for some toxicants but is scheduled to end in 1987. There is no program in place for continuing and expanding this toxicant testing.

EXISTING PROGRAMS

Two federal agencies, five state departments, and numerous local health jurisdictions and planning departments are responsible for managing and protecting the shellfish resource of Puget Sound. DSHS tests and approves or restricts commercial growing areas for shellfish harvest. Ecology's Shellfish Protection Program provides grants to local governments to conduct programs to control pollution of commercial shellfish beds within their jurisdiction. DNR, Fisheries, and Agriculture as well as EPA and FDA also play important roles and coordinate their activities with DSHS, Ecology, and, to a lesser extent, with local governments. Tribes have a long-standing concern with the shellfish resource. With the exception of minimal local Paralytic Shellfish Poisoning ("red tide") programs and the current DSHS-EPA study, however, little attention is paid to the recreational shellfish resource. Virtually all programs to protect shellfish focus exclusively on commercial shellfish.

There are a number of deficiencies in existing shellfish programs. Despite the existing shellfish programs which address the problem of contamination of commercial shellfish beds, at least seven commercial beds have been closed or restricted in the last six years, and more are threatened with closure. Further efforts are needed to prevent additional commercial closures. In addition, there is no program in place to determine whether a significant enough health risk exists to warrant development of toxicant standards for shellfish that would be more inclusive and restrictive than existing FDA action levels.[6] Inattention to the recreational shellfish resource at both the state and local level presents the possibility that a health risk to consumers of recreational shellfish already exists from both toxic and bacterial contamination. Finally, people in the Puget Sound basin are generally unaware of the problem of shellfish bed closures and the threat to their health from consuming recreationally harvested shellfish that have not been tested by the state for contamination.

PROGRAM GOAL

To protect shellfish consumers from pathogens and other contaminants, including toxicants; to maintain and enhance the abundance of shellfish; to control sources of pollution in order to reopen by 1990 at least three closed/correctable commercial shellfish beds closed since 1981 due to contamination;[7] and to control sources of pollution to prevent additional closures of commercial and recreational shellfish beds.

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[6] FDA has established action levels for poisonous or harmful substances to control levels of contaminants in human food and animal feed, including seafood. Action levels have been set for certain heavy metals, pesticides, petroleum products, polychlorinated biphenyls (PCBs), and naturally occurring marine toxins. The levels represent limits at or above which FDA will take legal action to remove adulterated products, including shellfish, from the market.

[7] Closed/correctable beds are those growing areas where Ecology has determined that improvements are possible; the term is applied to areas that are not intensively developed, do not have major or numerous sewage discharges, and where application of Ecology's shellfish strategy could lead to the reopening of beds.

STRATEGY

The strategy for achieving this goal is to (1) adopt shellfish policies that will ensure that pollution source control programs protect shellfish; (2) respond to existing and potential shellfish contamination with an aggressive restoration and protection program; (3) test for toxicants in targeted commercial and recreational shellfish beds; (4) begin restoration and protection projects in recreational shellfish areas and extend shellfish monitoring and certification programs to recreational shellfish areas; (5) increase public involvement and education in shellfish protection; and (6) identify funding sources for shellfish protection programs.

SUMMARY DESCRIPTION

The shellfish program provides for investigating closed and threatened areas and correcting pollution sources through other programs, especially the nonpoint program; testing for toxicants at selected sites; developing a program to test and certify recreational shellfish beds and begin restoration and protection projects for recreational areas; conducting annual inventories of shellfish contamination problems Soundwide; identifying funding sources; and expanding public involvement and education in shellfish protection.

MAJOR FEATURES

---An aggressive program is implemented under the nonpoint program's local watershed action plans to recertify closed shellfish beds and prevent closures in threatened areas.

---A recreational shellfish program is implemented, including testing in selected areas for bacterial contaminants and some toxics as well as initiation of protection and restoration projects.

---The extent of shellfish contamination is mapped and published annually.

---Public education and involvement in shellfish protection are emphasized.

PROGRAM ELEMENTS

SF-1. SHELLFISH PROTECTION AND RESTORATION POLICY

In developing the programs for Nonpoint Source Pollution (including local watershed action plans), Stormwater and Combined Sewer Overflows, and Municipal and Industrial Discharges, state and local agencies shall ensure that the programs meet these objectives:

a. Protection of shellfish beds from contamination and decertification;
b. Recertification of commercial beds, especially closed/correctable areas; and
c. Reduction of contamination of recreational shellfish beds.

Target Date: Upon plan adoption.

SF-2. RESTORATION AND PROTECTION OF COMMERCIAL SHELLFISH BEDS

Ecology, in cooperation with PSWQA, DSHS, and local governments, shall continue and expand its existing Shellfish Protection Program, to be implemented under the nonpoint priority watershed program (NP-6). The objective of this shellfish program is to reopen closed/correctable commercial shellfish beds and protect open/high threat commercial beds. The program provides that:

a. Current Ecology/local government shellfish projects shall be treated as early action watersheds under the revised nonpoint program, and future Ecology shellfish grants to local governments for shellfish protection shall be integrated with the nonpoint program.

b. DSHS shall expand and coordinate its investigations program with Ecology and local governments and shall begin retesting of sites failing certification and sites being addressed by local shellfish protection projects. This information shall be transmitted as soon as available to Ecology and the appropriate local governments and agencies.

c. The Authority shall review during the plan revision process the success of state and local agencies in controlling identified and potential sources of shellfish contamination.

Target Date: Ongoing.

SF-3. TESTING SELECTED SHELLFISH BEDS FOR TOXICANTS

DSHS shall establish an ongoing program to test for toxicants at commercial and recreational areas beginning where recent studies have found toxicants to occur. The results of the tests shall be used to establish baseline and trend information on toxicants in shellfish around the Sound. Beds where toxicants exceed existing FDA action levels, or other accepted standards as developed, shall be closed and routinely reevaluated. FDA is requested to reconsider, in consultation with EPA and NOAA, the need to establish standards and require testing for toxicants not covered by existing FDA action levels.

Target Date: July 1, 1988.

SF-4. RECREATIONAL SHELLFISH PROGRAM

Ecology, DSHS, Fisheries, DNR, State Parks, tribes, and local health departments (with DSHS and Ecology as co-leads) shall jointly develop a program to protect recreational shellfish from pollution, including: responsibilities of agencies; a schedule that identifies which recreational beds will be tested within a given time frame; water quality and tissue sampling of shellfish in targeted recreational areas; closures and posting of areas that do not meet commercial standards, including advisory closures of private noncommercial areas; and initiation of restoration and protection projects in contaminated or threatened areas.

Under the authority of RCW 43.20 DSHS shall propose regulations governing the recreational harvest of shellfish for consideration by the state board of health.

Target Dates: Submit scope of work to PSWQA by July 1, 1987. Begin implementation of survey and testing of recreational areas by October 1, 1987. Adopt regulations by July 1, 1988. Start restoration projects by July 1, 1988.

SF-5. ANNUAL INVENTORY

DSHS shall annually publish and distribute to local health departments, Ecology, and other state resource agencies and local watershed management committees (see NP-3) an inventory of all sites in the Puget Sound basin where recreational and commercial shellfish beds have been found to be contaminated, indicating the types of contamination tested for and the types found.

Target Date: First inventory distributed by July 1, 1987.

SF-6. FUNDING SOURCES ASSESSMENT

Ecology, working through its Shellfish Protection Advisory Committee and in consultation with the Department of Fisheries and DNR, shall assess ongoing funding mechanisms for shellfish protection programs. Ecology shall consult with DNR about the use of Aquatic Land Enhancement Account funds for the shellfish program.

Target Date: Assessment submitted to PSWQA by January 1, 1989.

SF-7. PUBLIC INVOLVEMENT AND EDUCATION

Ecology, working through its Shellfish Protection Advisory Committee and in consultation with DSHS, tribes, the Department of Fisheries, and local health agencies, shall identify improved mechanisms for disseminating information among agencies and to the public on shellfish issues, including citizen involvement in shellfish protection projects and the prevention of shellfish contamination. Information about shellfish and shellfish protection shall be included, as appropriate, in other educational programs developed under the PSWQA plan. DSHS and local health departments shall implement a program of posting, press releases, and other techniques to inform the public of commercial and recreational shellfish contamination and closures and to prevent harvesting of contaminated shellfish. Education shall be a required element of all local programs under SF-2 and SF-4.

Target Date: Program to begin by July 1, 1987.

MAJOR PUBLIC ACTIONS FOR AUTHORITY REVIEW

1. Restoration/protection program for commercial shellfish beds (SF-2, NP-6).
2. DSHS program for testing of toxicants in selected areas (SF-3).
3. Recreational shellfish program and regulations (SF-4).

LEGISLATION REQUIRED

None

ESTIMATED COST

The shellfish program is estimated to cost approximately $0.6 million in FY 1988 and $1.9 million per year thereafter. The greatest costs are for a

recreational shellfish program at approximately $1.3 million per year. Costs for continuation and expansion of Ecology's Shellfish Protection Program under SF-2 are estimated in element NP-6 of the nonpoint program.

Private sector costs resulting from shellfish restoration and protection projects would primarily involve repairs for failed on-site septic systems or implementation of farm animal waste control programs. These costs are discussed in the nonpoint program.

ESTIMATED COSTS: SHELLFISH PROTECTION	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Element						
SF-1: SHELLFISH PROTECTION AND RESTORATION POLICY	0	0	0	0	0	0
SF-2: RESTORATION AND PROTECTION OF COMMERCIAL BEDS[1]	0	274,100	274,100	274,000	274,000	274,000
SF-3: TESTING SELECTED SHELLFISH BEDS FOR TOXICANTS	0	25,700	25,700	25,700	25,700	25,700
SF-4: RECREATIONAL SHELLFISH PROGRAM	0	134,900	1,317,400	1,316,300	1,315,700	1,310,100
SF-5: ANNUAL INVENTORY	0	27,800	27,800	27,800	27,800	27,800
SF-6: FUNDING SOURCES ASSESSMENT	0	0	65,400	0	0	0
SF-7: PUBLIC INVOLVEMENT AND EDUCATION	0	155,500	220,800	251,200	250,900	250,800
TOTAL ANNUAL ESTIMATED COSTS:	$0[2]	$618,000	$1,931,200	$1,895,000	$1,894,100	$1,888,400

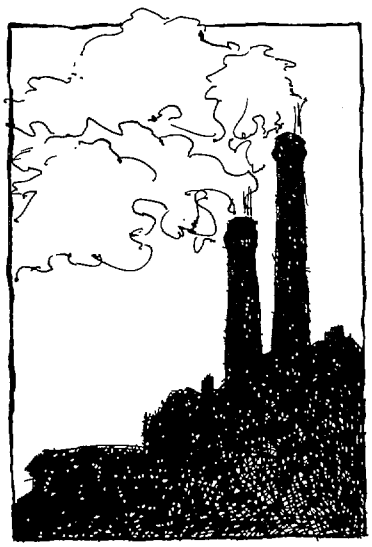
ESTIMATED COSTS: SHELLFISH PROTECTION	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Agency						
STATE GOVERNMENT						
DNR	0	5,500	23,600	5,500	5,500	5,500
DSHS	0	447,200	783,200	796,800	796,800	796,800
ECOLOGY	0	48,900	120,900	102,000	101,100	100,900
ECOLOGY PASS-THROUGH GRANTS	0	0	510,000	510,000	510,000	510,000
FISHERIES	0	5,500	29,300	16,500	16,500	16,500
PARKS	0	5,500	5,500	5,500	5,500	5,500
PSWQA	0	5,500	5,500	5,500	5,500	0
WASHINGTON CONSERVATION CORPS	0	0	108,400	108,400	108,400	108,400
OTHER						
LOCAL GOVERNMENTS	0	99,900	344,800	344,800	344,800	344,800
TOTAL ANNUAL ESTIMATED COSTS:	0	618,000	1,931,200	1,895,000	1,894,100	1,888,400

[1]Additional costs are contained in NP-1 through -7 and NP-13.
[2]Expenditures in FY 1987 are included in existing agency budgets.

MUNICIPAL AND INDUSTRIAL DISCHARGES

PROBLEM DEFINITION

ENVIRONMENTAL PROBLEMS



Industries and municipal sewage treatment plants release about 650 million gallons of effluent (wastewater) to Puget Sound every day. Municipal and industrial discharges of wastewater are often referred to as "point sources" of pollution because they are discharged into the water at a specified point such as a pipe or ditch.

Extensive and continuing efforts to control conventional pollutants[8] from point sources with wastewater discharge permits have proved increasingly successful, and water quality problems related to these pollutants are now relatively rare in Puget Sound[9]. Where such problems do occur, they are generally localized and transient.

Toxic pollutants are of greater concern in Puget Sound. Of greatest concern are toxicants that are persistent (remaining in existence indefinitely) and those that are irreversibly accumulated and concentrated in sediments and living tissues and passed through the food chain.

Many toxicants discharged by point sources bind to particles and settle out to become part of the sediment. The concentration of toxicants found in recent sediments from Puget Sound's urban bays is up to 100 times the levels in the cleanest rural bays. Toxicant concentrations in sediments from the central basin and rural bays are much lower but are still elevated over preindustrial levels. High concentrations of toxic contaminants have been associated with high incidences of diseased fish and other adverse biological effects in Puget Sound's urban bays. Toxic substances may also pose health risks to consumers of Puget Sound seafood.

While many industries and municipal treatment plants that discharge directly to the Sound and its tributaries discharge significant quantities of toxicants, current effluent monitoring is insufficient to estimate accurately their contribution relative to other sources of toxicants such as stormwater, CSOs, and nonpoint sources.

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[8]The federal Clean Water Act divided pollutants into categories with varying requirements for control of each. *Conventional* pollutants are oxygen-depleting substances, suspended solids, fecal coliform bacteria, pH, and oil and grease. *Toxic* pollutants include 13 heavy metals, 111 organic compounds (such as pesticides and polychlorinated biphenyls, or PCBs), asbestos, and cyanide. All other pollutants are classified as *nonconventional* pollutants.

[9]An exception to this exists in the case of shellfish beds within approximately one mile of municipal discharges. Because of the risk of contamination with pathogens, current rules automatically require closure of such shellfish beds.

In cases where municipal treatment systems receive industrial discharges, these "indirect discharges" generally contribute a high proportion of the toxicants discharged by the treatment plant. These toxicants can interfere with the operation of the sewage treatment plant, expose plant workers or equipment to damaging substances, or pass through the treatment plant to contaminate the water, air, or sludge.

While toxic pollution of sediments has become a dominant concern, recent reports show that the sea surface "microlayer" may also be contaminated with toxicants in sufficient concentrations to kill or cripple larvae and fish eggs that are found in the microlayer. The water itself also sometimes shows concentrations of toxicants that exceed EPA's criteria for the protection of marine life from adverse chronic effects.

While the rate of contamination of sediments by some highly regulated toxicants (e.g., lead, DDT, PCBs) is decreasing, most other toxicants can be expected to continue to accumulate at levels sufficient to cause biological harm unless additional controls are implemented. As population and industrial activity increase, toxic contamination may become more severe. Because of the persistence of many of these toxic substances, this contamination is not easily reversed.

INSTITUTIONAL PROBLEMS

The federal Clean Water Act and Washington state law have established a strong institutional framework for controlling municipal and industrial discharges. Direct dischargers must obtain a National Pollutant Discharge Elimination System (NPDES) permit from the Department of Ecology (for nonfederal facilities) or EPA (for federal facilities). Ecology also administers state waste discharge permits, which regulate discharges to sewers (and related pretreatment requirements) and to groundwater. Ecology has been delegated authority to administer the pretreatment program, which regulates certain industrial and commercial discharges to sewers.

Under the point source control system, (1) a permit is required for any point source discharge, (2) the permit establishes specific limits on the quantity and concentration of contaminants allowed to be discharged (or on the overall toxicity of the effluent), together with other requirements (for monitoring, spill prevention, and others), (3) dischargers must monitor their effluent and report compliance with the conditions of the permit, and (4) the administering agency periodically inspects the facility and takes enforcement action as necessary. Effluent limits in permits must include minimum technology-based limits (generally based on criteria of "Best Available Technology" from federal law or "all known, available, and reasonable treatment" from state law) plus more stringent limits where necessary to meet state water quality standards.

A number of weaknesses have been identified in the current implementation of the point source control system that allow toxic contamination to continue. These weaknesses include:

- Permits have generally imposed very few limits on toxicants or particulates (either by limits on overall toxicity or on specific toxicants).

- o EPA effluent guidelines do not cover all industries, waste streams within industries, or contaminants within waste streams.
- o Permit writers often lack sufficient information, guidelines, and standards to write toxicant limits in permits, and must rely on best professional judgment in developing permit conditions.
- o Current, informal guidelines for dilution zones do not take into consideration persistent toxicants and reconcentration of toxicants in sediments.
- o The scope of discharger self-monitoring is limited and does not detect problems in sediment.
- o Past enforcement has been weak and inconsistent.
- o Felony provisions do not exist in state law for serious, willful violations.
- o Inspections are infrequent and are generally preannounced.
- o There is no system to detect unpermitted discharges, except to a limited extent in urban bays.
- o Self-monitoring is rarely independently verified.
- o Laboratory data are sometimes inaccurate and are therefore unreliable.
- o Municipal operator training is limited in scope, e.g., operators generally receive no training related to pretreatment.
- o Public participation in permits and related decisions has been limited.
- o Ecology lacks adequate resources to effectively carry out its functions under the NPDES and pretreatment programs.

PROGRAM GOAL

To achieve comprehensive improvement in the control of toxic pollutants discharged into Puget Sound by industrial and municipal dischargers, reducing and eventually eliminating harm from toxic contaminants entering or accumulating in the Sound.

STRATEGY

The strategy for achieving this goal is (1) to require that all waste discharge permits include appropriate limitations on toxicants and other pollutants of concern; and (2) to devote substantially increased resources to the inspection and enforcement of waste discharge permits for industrial and municipal discharges throughout the Puget Sound basin as well as the discovery and control of unpermitted discharges.

SUMMARY DESCRIPTION

This program calls for extensive improvement in the effectiveness of the state's point source control program (including the pretreatment program) and emphasizes control of toxicants from both industrial and municipal discharges.

The program requires waste discharge permits to include limits on overall toxicity and/or specific toxicants of concern in addition to limits on conventional pollutants that are currently in most permits. Ecology will include specific conditions in permits aimed at controlling the introduction of toxicants into the Sound in both a dissolved and a particulate form. In addition, comprehensive monitoring requirements are added to permits to ensure compliance with permit conditions and to detect contamination not controlled by effluent limits and other permit requirements.

This program devotes substantially increased resources to the inspection and enforcement roles of the Department of Ecology. Ecology is further directed to

carry out a search for wastewater discharges that do not have permits. Felony provisions for willful violations are to be requested in proposed legislation. Finally, in order to assure that those individuals with a direct impact on Puget Sound are fully aware of their responsibilities, enhanced education is required of operators of both industrial and municipal treatment plants, and employee education assistance is to be provided to employers whose employees make decisions affecting the Sound.

MAJOR FEATURES

---Ecology adopts sediment criteria, EPA water quality criteria for toxicants, and criteria for defining dilution zones.

---Permits are modified Soundwide to incorporate appropriate toxicant limits and comprehensive monitoring requirements.

---Inspections and enforcement are substantially increased.

---Expanded permit fees are assessed to recover the full cost of issuing and administering permits;[10] a study will determine the feasibility of assessing variable charges based on toxicity of the effluent.

---Enhanced education programs are undertaken.

---Public notice of significant permit actions is enhanced.

PROGRAM ELEMENTS

STANDARDS

P-1. ADOPT EPA WATER QUALITY CRITERIA

To assure better control of toxicants, Ecology shall adopt numerical water quality criteria equivalent to those published in EPA's *Quality Criteria for Water.* These criteria may be adopted by reference; if so, a summary of the criteria (including the numerical values) shall be appended to copies of the state water quality standards distributed by Ecology.

Target Date: September 30, 1987 (as part of Ecology's current review and revision of the state water quality standards).

P-2. CRITERIA FOR CLASSIFYING SEDIMENTS HAVING ADVERSE EFFECTS

Ecology shall develop and adopt by regulation criteria for identifying and designating sediments that have observable acute or chronic adverse effects on biological resources or pose a significant health risk to humans. Sediments that exceed the criteria are defined as "sediments having adverse effects." The criteria may use physical, chemical, and biological tests and shall clearly identify pass/fail standards for the prescribed tests. Because methodologies to assess the human health risks of chemical contamination of sediments are not

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[10]Because receipt of enhanced permit fee revenues will not begin until fiscal year 1989, funding for program elements before that time would come from the state general fund.

well developed, the initial criteria may deal only with adverse effects on biological resources. The criteria shall be revised to incorporate information on human health risks as it becomes available.

The criteria shall be used to limit discharges through the NPDES program and to identify sites with sediment contamination. The criteria shall be used as a basis for regulation of solid matter including sediments and suspended solids (suspended particulates) in wastewater streams. Ongoing work by EPA and the Puget Sound Dredged Disposal Analysis (PSDDA) to develop sediment quality values may be used as the technical basis for these criteria.

These sediment criteria will not necessarily be directly applied to decisions on dredged material disposal or the cleanup of contaminated sediment sites. PSDDA is expected to recommend criteria for environmentally safe and publicly acceptable unconfined aquatic disposal of dredged material that allow some material with adverse effects to be disposed of in open water (see Sediments element S-2).[11] Ecology may determine that it is not cost-effective to cap, treat, or remove all sediments in urban bays that exceed the criteria developed under this element but may set higher (more contaminated) trigger levels that would result in remedial actions (see Sediments element S-7).

In developing these sediment criteria, Ecology shall form an advisory committee which shall include representatives of environmental and public interest groups, ports, industry, appropriate state and federal agencies, local governments, and tribes. The criteria shall be reviewed and updated as necessary, at least every three years.

Target Dates: Interim sediment criteria are to be proposed for adoption by June 30, 1988. Final adoption of the initial criteria shall be completed by December 31, 1988.

P-3. DILUTION ZONE CRITERIA

In order to provide adequate opportunity for public review and comment on the criteria governing dilution zones surrounding wastewater discharges (within which water quality standards do not apply), Ecology shall adopt administrative rules specifying criteria for establishment of dilution zones in wastewater discharge permits. As part of this effort, Ecology shall also consider the need to develop specific criteria for *sediment* dilution zones.

Target Date: Final adoption of rules by December 31, 1988.

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[11]The sediment standards developed by Ecology under this element are meant to establish levels of sediment contamination that would be acceptable throughout the Sound and to be a basis for preventing future contamination. Standards for unconfined open water disposal will probably be less stringent because PSDDA sites will be selected for minimal impact, the sites will be monitored, and the effects of any contaminated sediments will be mitigated by the cleaner material also being disposed of at the unconfined open water sites.

PERMITS

P-4. PERMIT FEES

The Authority shall submit proposed legislation to the 1987 Legislature amending RCW 90.48.460 and directing Ecology to assess permit fees on all permitted dischargers statewide (including industrial, municipal, and federal) to recover the cost of administering the NPDES and state waste discharge permit programs. Costs to be included in calculating fees shall include (1) initial permit issuance, (2) compliance review and evaluation, (3) inspections and related monitoring, (4) laboratory support, and (5) overhead expenses directly related to the preceding items. Fees would not be designed to recover expenses related to enforcement (including discovery of unpermitted discharges) or expenses that are funded by federal grants. Fees for pretreatment-related state discharge permits shall recover expenses related to administration of the pretreatment program. Ecology shall ensure that indirect dischargers are not assessed a double permit fee (i.e., once for their state discharge permit and again as a contribution to the treatment plant's permit fee).

Ecology shall adopt an initial schedule for this permit fee and shall submit to the Authority a study of the feasibility of establishing a variable charge based on the quantity, toxicity, persistence, and other characteristics of the effluent. A variable component of the permit fee would, to the maximum extent possible, create an incentive for dischargers to reduce the quantity and harmful characteristics of their effluent.

In establishing the fee schedule Ecology shall consider impacts of fees on small dischargers and provide appropriate relief if such impacts would be excessive. Ecology shall also give special consideration to the appropriate fee for permits issued to public entities for urban runoff.

The proposed fee legislation shall require Ecology to report annually to the Legislature and to the public on actions it has taken over the past year to improve the administrative efficiency of the NPDES and pretreatment permit systems. Ecology shall further be directed to develop evaluation criteria against which its success in improving administrative efficiency can be measured from year to year.

The proposed legislation shall dedicate the fee revenues to an account which would be available to Ecology for water quality programs, subject to legislative appropriation.

Target Date: Submit fee legislation to 1987 Legislature. Begin assessing expanded permit fees by July 1, 1988. Submit feasibility study of the variable charge by March 31, 1988.

P-5. PROCEDURES MANUAL AND INTERNAL TECHNICAL ASSISTANCE FOR PERMIT WRITERS

Ecology shall prepare and revise as necessary a procedures manual for permit writers. This manual shall include guidelines and procedures to ensure that all pertinent information is made available and used by permit writers in determining appropriate effluent limits, particulate contamination limits (see P-7), source control measures, and other conditions in NPDES and state permits. Such information may be derived from documents already available to the department (e.g., the applicant's most recent hazardous waste annual

reports) or additional information that would be requested from the applicant (e.g., information on the overall distribution of contaminants between the dissolved and suspended phases of the effluent).

The procedures manual shall require that all NPDES permits include appropriate conditions addressing all stormwater runoff from permitted facilities. The procedures manual shall incorporate other requirements of this plan related to permit writing, including enhanced information in public notices and fact sheets pertaining to draft permits. The procedures manual shall encourage Ecology staff to make the best possible use of industry expertise and resources in carrying out permit writing and appropriate related activities.

The procedures manual shall also include guidelines for permit writers to use in evaluating the potential for cross-media transfer of pollutants. These guidelines shall emphasize mechanisms available to permit writers to encourage waste reduction at the source rather than end-of-pipe treatment if such treatment results in cross-media transfer of pollution.

Ecology shall provide opportunity for the public to review and comment on the draft procedures manual.

Ecology shall establish an internal technical assistance team to assist permit writers in researching and writing appropriate conditions for NPDES and state permits.

Target Dates: Complete interim procedures manual by December 31, 1987. Complete final procedures manual by June 30, 1988. Establish internal technical assistance team by March 31, 1988.

P-6. TOXICANT EFFLUENT LIMITS IN PERMITS

The objective of toxicant effluent limits in permits is to control through the use of all known, available, and reasonable methods[12] the sources of toxicants in the waste discharge. In issuing or reissuing NPDES or state waste discharge permits, Ecology permit writers shall review the dischargers' operations and incorporate permit conditions which require all known, available, and reasonable methods to control toxicants in the dischargers' wastewater. Such conditions may include, but are not limited to, limits on the discharge of specific chemicals and/or limits on the overall toxicity of the effluent. The toxicity of the effluent shall be determined by techniques such as chronic or acute bioassays. Such conditions shall be required regardless of the quality of receiving water and regardless of the minimum water quality standards. In no event shall the discharge of toxicants be allowed that would violate any water quality standard, including toxicant standards, sediment criteria, and dilution zone criteria.

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[12]Ecology has considered the following criteria, among others, in determining "reasonable methods:" (1) status of planning needed to proceed with the proposed method, (2) environmental or siting constraints, and (3) economic factors. The Pollution Control Hearings Board has upheld Ecology's use of these criteria (see PCHB Nos. 84-178, 84-206, 84-211).

In the fact sheet accompanying each draft major permit, Ecology shall clearly explain how the draft permit fulfills the goal of reducing and eventually eliminating harm from toxic contaminants in Puget Sound, including a summary of the information used to determine which limits on specific toxicants and/or overall effluent toxicity should be included in the permit. The Authority requests EPA to provide a similar explanation for any draft major permit issued by EPA.

Target Date: March 31, 1988.

P-7. EFFLUENT LIMITS IN PERMITS--PARTICULATES

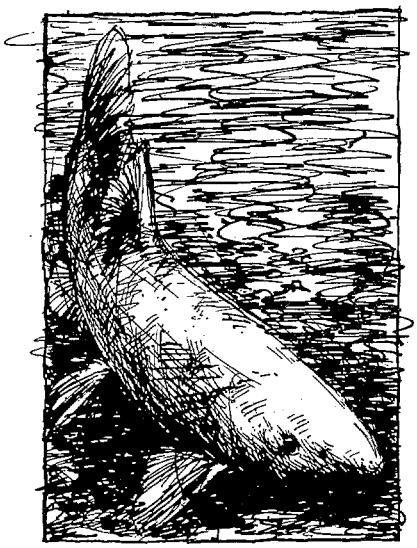
In issuing or reissuing NPDES permits, Ecology shall obtain and review information on particulate contamination in the applicant's effluent and shall include specific conditions on particulate contamination, appropriate to each case, sufficient to assure that the ambient sediment criteria will not be violated. Such conditions may include source control measures, best management practices, numeric limits on toxicity of the particulate fraction of the effluent, numeric limits on the concentration or mass of specific chemicals discharged, or other conditions deemed appropriate by Ecology. However, permittees shall not be required to comply with conditions for which there is no appropriate laboratory protocol, as determined by Ecology. Any draft of a major permit proposed without conditions on particulate contamination shall include, in the accompanying fact sheet, a written explanation of reasons why such limits are not applicable to the specific discharger. The Authority requests EPA to carry out this element with respect to every NPDES permit issued by EPA in the Puget Sound basin (see also element P-11).

Target Date: This element shall become effective no later than January 31, 1989--the date that ambient sediment quality criteria become effective (see element P-2).

P-8. MONITORING REQUIREMENTS IN PERMITS

In issuing, modifying, or reissuing NPDES permits, Ecology shall consider the need for each of the five types of monitoring listed below and shall include requirements in permits for all types of monitoring that are appropriate to each permittee. Monitoring requirements included in permits shall be tiered so that if initial sampling discloses no problems, a reduced monitoring schedule may then apply. Likewise, if initial sampling indicates the possibility of problems, a more frequent and/or more comprehensive monitoring schedule would apply.

Ecology shall develop (and revise as necessary) guidelines for the frequency and methodology of these tests and for reporting requirements and format. The guidelines shall include the tiered approach described above. The guidelines shall specify indicators, sampling techniques, and analytical methods that complement the ambient monitoring programs in Puget Sound. The guidelines shall also define triggers for determining when action is necessary to modify a permit. Ecology shall develop the guidelines in consultation with municipal and industrial dischargers, laboratories, EPA, the Authority, and others as appropriate.



The fact sheet accompanying each draft major permit shall include a brief discussion of how the draft permit has dealt with each of the five types of monitoring specified below and shall explain those situations where any of these types of monitoring have not been required in the draft permit. Although these monitoring requirements shall be primarily directed toward the detection of impacts from individual wastewater discharges, as a second priority, and to the extent practicable, Ecology shall develop monitoring requirements for permits that will facilitate the calculation of total contaminant mass loading to Puget Sound.

The five types of monitoring are as follows:

1. Monitor specified parameters in the *sediment* in the vicinity of every significant outfall;
2. Separately analyze samples of the *particulate* fraction of the effluent from each significant outfall;
3. Conduct periodic acute and chronic toxicity *bioassays* on a sample of the effluent from each outfall and on the sediment near each outfall;
4. Conduct periodic surveys of the population, species composition, and health of *biota* in the vicinity of each significant outfall;
5. Monitor water quality at the boundary of the *dilution zone.*

If, for a given test, Ecology finds that there is no analytical protocol reasonably available, or if there is no public or private laboratory capability to carry out the test, Ecology may suspend the testing requirement for that test until such time as such a protocol and/or laboratory capability becomes available. Ecology shall promote the development of protocols and laboratory capability in cases where these are not available for the types of monitoring tests listed above (see also laboratory elements L-1 and L-2).

Ecology, in cooperation with EPA, shall prepare a list of the highest priority permits (based on the probability of effluent containing a significant quantity of toxic pollutants of concern) to be reopened prior to expiration for inclusion of these monitoring requirements. Ecology shall submit this list to the Authority together with a schedule for completion of permit modifications to include these requirements.

Every major and minor permit issued or reissued by Ecology before the monitoring guidelines are implemented shall include a reopener provision allowing the modification of the permit to incorporate monitoring requirements in accordance with this element. Every permit issued or reissued by Ecology shall include a reopener clause allowing Ecology to modify, based on monitoring results or other causes consistent with state and federal regulations, the effluent limitations, monitoring requirements, or other conditions in the permit. The Authority requests EPA to include similar reopener provisions in every NPDES permit issued by EPA in the Puget Sound basin.

Ecology shall submit a report to the Authority on the advisability of providing an "option B" in which Ecology would arrange for an independent organization to conduct some or all of the monitoring activities (especially those involving sampling outside the effluent pipes--e.g., 1, 4, and 5 above) for some dischargers in lieu of the individual dischargers performing this monitoring

themselves, to be funded by a surcharge on the NPDES permit fee paid by these dischargers. The study shall estimate the amount of the fee surcharge that would be necessary to support this alternative and whether the overall cost to dischargers would be reduced. The study shall also address whether the quality of information derived under such an alternative would be improved. This study shall not be construed as authorizing any delay in the implementation of the monitoring requirements described in this element.

Target Dates: Include reopener language in all permits issued or reissued after March 31, 1987. Complete monitoring guidelines by December 31, 1987. Submit report on "option B" by December 31, 1987. Include monitoring requirements in permits issued or reissued after March 31, 1988. Submit list of high priority permits and schedule for completing modifications by March 31, 1988.

P-9. SPILL CONTROL PLANS REQUIRED

Every major permit issued or reissued shall include appropriate conditions requiring the development or updating, if necessary, of spill prevention control and countermeasure (SPCC) plans. As a minimum, such plans shall apply to both oil and hazardous substances. Ecology, in consultation with EPA, shall actively review and comment on the SPCC plans and shall require the permittee to implement the approved plan. Ecology shall take enforcement action, consistent with its enforcement guidelines, against any permittee found out of compliance with its SPCC plan.

Target Date: Begin implementation by March 31, 1988.

P-10. EXPLANATION OF RELAXED AND INCREASED LIMITS IN PERMITS

For any draft permit whose effluent limitations are in any way less stringent than those in the preceding permit, Ecology shall include a conspicuous notice and clear explanation of the reasons for such limits in the public notice of the draft permit. This requirement shall apply to all effluent limitations that are, or appear to be, a relaxation of limits in comparison to the previous permit. This requirement for notice and written explanation shall also apply to any draft permit proposing to allow a greater amount of effluent to be discharged due to increases in production. In every such explanation, Ecology shall report on measures available to and undertaken by the discharger to reduce the production of pollutants per unit of product. Ecology shall adopt rules implementing this program element.

Target Dates: Begin notice and explanation process by March 31, 1987. Final adoption of rules by June 30, 1989.

P-11. ENHANCED REQUIREMENTS FOR EPA-ISSUED PERMITS

The Authority requests that the Environmental Protection Agency include conditions in EPA-issued permits at least as stringent as those that are required under this plan in permits issued by Ecology. This request applies to all toxicant and particulate limits and to monitoring, spill control, frequency of inspection, and public notice requirements. The Authority also requests EPA to review existing EPA-issued permits and modify any permit as necessary to include such limits and requirements.

Ecology shall not certify the issuance or renewal of any NPDES permit for a federal facility under Section 401 of the Clean Water Act unless the permit includes numeric limits and other conditions required to comply with all applicable water quality and sediment standards and other elements of this plan. Before considering a 401 certification for a federal facility permit, Ecology shall seek to be familiar with the facility site, through joint site visits or inspections with EPA or other means.

Target Date: This element shall apply to Ecology 401 certifications issued after December 31, 1987.

P-12. REEVALUATE ALLOCATION OF PERMITS INTO MAJOR/MINOR CATEGORIES

The Authority requests that EPA give special consideration to early completion of its reevaluation of the major/minor permit classification for permits in the Puget Sound basin. Ecology shall communicate to EPA any discrepancies it is aware of in the classification of permits in the Puget Sound basin.

COMPLIANCE ASSURANCE

P-13. URBAN BAY ACTION TEAMS

The Authority recognizes the "Urban Bay Approach" as an essential part of a comprehensive strategy to control point source pollution and requests EPA to continue providing resources for the urban bay programs. Support for the Urban Bay Action Teams is included in the cost estimates for elements related to permit writing (P-6, -7, -8), inspections (P-14), searching for unpermitted discharges (P-20), and investigation of contaminated sediment sites (S-8).

P-14. INSPECTIONS

Ecology shall conduct a significant number of class I inspections on an unannounced basis. Similarly, a significant number of class II inspections shall include an unannounced sampling visit. Ecology shall assure that such conditions as may be necessary to provide a prearranged means for Ecology inspectors to obtain unannounced samples of effluent on a 24-hour basis are included in appropriate permits.

Ecology shall conduct inspections in accordance with the following minimum schedule:

	Number of inspections per year per permit	
Type of permit	Class I	Class II
Major	2	1
Significant minor	1	0.5
State and minor NPDES	1	0.1

Additional inspections (both announced and unannounced) shall be conducted based on the permittee's record of compliance.

Target Date: Begin phasing in enhanced inspection schedule by September 30, 1987. Complete phase-in by July 1, 1991.

P-15. STUDY OF INDEPENDENT VERIFICATION OF SELF-MONITORING

Ecology shall submit to the Authority the results of a study evaluating alternative methods of carrying out independent verification of self-monitoring reports submitted by dischargers, together with Ecology's proposed plan and estimated costs for implementing a verification program. Possible methods to be evaluated may include combining the independent verification function with the quality assurance/quality control procedures contemplated under the laboratory certification program (see laboratory element L-1 and element P-16) and also "option B" in element P-8.

Target Date: Submit study by September 30, 1988.

P-16. USE OF CERTIFIED LABS FOR SELF-MONITORING

Ecology shall adopt regulations requiring all permittees to use a certified laboratory for their wastewater analyses and requiring all certified laboratories to use specified protocols and comply with specified quality assurance/quality control procedures (see Laboratory Support program). Before implementing this requirement of permittees, Ecology shall ensure that the laboratory certification program is operational (see element L-1) and that a sufficient number of certified labs are available to carry out needed analyses. Labs owned and operated by individual industrial and/or municipal dischargers shall be eligible for certification. The Authority shall include authorization for Ecology to require use of certified labs in proposed legislation to be submitted to the 1987 Legislature under element L-1.

Target Dates: Adopt regulations by March 31, 1989. Permittees to begin using certified labs by July 1, 1989.

P-17. DATA MANAGEMENT

Ecology shall complete the initial implementation of its computerized Wastewater Discharge Information System for tracking self-monitoring reports of dischargers and other information related to major NPDES permits.

Ecology shall complete the initial loading of data related to state (pretreatment) and minor NPDES permits and begin incorporating routine self-monitoring data for these permits into the Wastewater Discharge Information System.

Target Dates: Complete initial implementation of the WDIS system (included in status quo budget) by March 31, 1987. Load state and minor permit data by June 30, 1989.

ENFORCEMENT

P-18. ADOPT ENFORCEMENT GUIDELINES AS REGULATIONS; REPORT ON ENFORCEMENT POLICY

It is the policy of the Authority that enforcement guidelines be adopted by Ecology as administrative regulations. In recognition of the desire to gain additional experience with enforcement guidelines before they are formally adopted as rules, Ecology and the Pollution Control Hearings Board shall each submit a report to the Authority assessing the effectiveness of Ecology's 1985 Enforcement Policy and Manual, its 1986 supplemental guidelines, and any further supplements that are issued before the date of the reports. Ecology shall also include in its report a list of all enforcement actions taken against violators during the preceding year. The Pollution Control Hearings Board

shall also include in its report an assessment of the advisability of the board having *de novo* review powers.

Target Date: Ecology and PCHB to submit enforcement reports by December 31, 1987.

P-19. CROSS-TRAINING FOR INSPECTORS

Ecology shall establish an ongoing, vigorous program of training for inspectors, including cross-training in other environmental regulatory programs, recognition of problems related to cross-media transfer of pollution, and opportunities to reduce or recycle waste at the source. This program shall assure that an appropriate percentage of inspectors' time is allocated to training activities.

Target Date: Establish the program by July 1, 1988.

P-20. SEARCH FOR UNPERMITTED DISCHARGES

Ecology shall carry out a coordinated program for detection of wastewater discharges not covered by permits. This shall apply to both direct and indirect wastewater discharges and to direct discharges of stormwater from industrial facilities. Ecology shall ensure that its enforcement guidelines incorporate appropriate automatic penalty provisions for instances when dischargers without permits are discovered.

Ecology shall submit a report to the Authority evaluating the environmental significance and methods of detection of hazardous waste discharges to sewers which are legal under the RCRA domestic sewage exemption, together with the department's recommendations on this issue.

Target Date: Implement search for unpermitted discharges by January 1, 1988. Submit report on exempted hazardous waste discharges to sewers by June 30, 1988.

P-21. FELONY PROVISIONS

The Authority shall submit proposed legislation to the 1987 Legislature to amend the state water pollution control act to provide for felony penalty provisions for willful violations.

PRETREATMENT

P-22. ADDITIONAL STAFF FOR PRETREATMENT PROGRAM

Ecology shall assign sufficient staff to fully carry out the pretreatment program, including permitting, compliance tracking, inspections, spill control, auditing of local programs, and enforcement as needed.

Target Dates: Begin phasing in additional staff by January 1, 1988. Reach full staffing by July 1, 1990.

INFORMATION/EDUCATION/ TECHNICAL ASSISTANCE

P-23. MUNICIPAL OPERATOR TRAINING

The Water and Wastewater Operators Certification Board shall revise the sewage treatment plant operator qualification standards in WAC 173-230-030 to require the completion of a course covering treatment and pretreatment laws and regulations, treatment technologies, maintenance and trouble shooting, and recognition of pretreatment-related problems. All new plant operators shall be required to meet this requirement. Operators who are currently certified shall be required to fulfill this requirement for recertification. A follow-up class will be required every three years for recertification in addition to current testing requirements.

Target Date: Board adopts revisions to the municipal operator qualification standards by September 30, 1988.

P-24. CERTIFY INDUSTRIAL TREATMENT PLANT OPERATORS

The Authority shall propose legislation to amend Chapter 70.95B RCW to extend the certification requirement to operators of industrial treatment facilities. This legislation would direct the Water and Wastewater Operators Certification Board to develop operator qualification standards for operators of industrial treatment facilities (for both direct and indirect dischargers). Ecology would adopt appropriate rules to implement an industrial treatment plant operator certification program. Such rules shall provide for recovery of at least 50 percent of the cost of administering the program through user fees (e.g., application, examination, or other fees). Qualification standards shall be designed to assure that operators are aware of applicable laws and regulations and that they have an understanding of the environmental impacts of various waste streams. Standards shall not be designed to determine competence to operate specific industrial treatment processes.

Target Dates: Board adopts qualification standards for industrial operators by December 31, 1988. Ecology adopts implementing rules by September 30, 1989.

P-25. EMPLOYEE EDUCATION ASSISTANCE

In connection with the current employee education programs required under the state Worker Right-to-Know law (Chapter 49.70 RCW), Ecology and the Department of Labor and Industries shall prepare and implement a coordinated plan for developing and distributing educational materials for employees to appropriate employers in the Puget Sound basin. This plan shall establish a schedule for distribution of such materials to these employers and shall establish a schedule for any necessary rulemaking by Ecology or Labor and Industries. Educational materials to be prepared shall provide information on the environmental consequences of waste disposal decisions typically made by employees of the firms and/or agencies included in the program.

Target Dates: Complete employee education plan by May 30, 1988. Begin distribution of educational materials by September 30, 1988.

PUBLIC INVOLVEMENT

P-26. PUBLIC OUTREACH

Ecology shall establish a public outreach position to actively contact and assist groups and individuals regarding the NPDES and state waste discharge permit program and related activities. For each permit or action under consideration, this person shall seek out those who may be interested or affected, inform them of the significance of the action, highlight key decision-making points, and provide technical assistance in working through the process.

Ecology shall also expand its permit mailing lists to achieve broad circulation, regularly provide program information in general publications (e.g., newsletters, brochures), provide informative and widespread public notice of draft permits, and establish criteria for deciding when a public hearing will be held on a permit. In establishing criteria, adopting guidelines, and developing rules, Ecology shall actively seek and provide opportunity for meaningful public involvement in accord with the public involvement policy (EPI-3) of this plan.

Target Date: Establish position by December 31, 1987.

MAJOR PUBLIC ACTIONS FOR AUTHORITY REVIEW

1. Adoption of amendments to water quality standards to include toxicant criteria and sediment criteria (P-1, P-2).
2. Adoption of rules for expanded permit fees (P-4).
3. Adoption of permit writers' procedures manual (P-5).
4. Adoption of monitoring guidelines (P-8).
5. Employee education program (P-25).

LEGISLATION REQUIRED

1987 Session

1. Expanded permit fees (P-4).
2. Felony provisions (P-21).

Subsequent Session

1. Certification of industrial treatment plant operators (P-24).

ESTIMATED COST

This program would cost approximately $1.7 million in addition to existing programs during fiscal year 1988; costs would increase to approximately $4.5 million by fiscal year 1992. Cost estimates for each element for fiscal years 1987 through 1992 are shown on the table below. The elements with the largest costs include inspections (P-14), incorporation of effluent limits and monitoring requirements into permits (P-6, -7, -8), full staffing for the pretreatment program (P-22), and searching for unpermitted discharges (P-20). Cost estimates for three elements (P-14, -20, -22) include additional costs for laboratory fees totaling $340,000 in fiscal year 1988 and increasing to $923,000 in fiscal year 1992.

The cost estimates shown do not include costs that may be incurred by dischargers in complying with the more stringent monitoring requirements, permit limits, and other elements of the plan.

Most dischargers would incur increased costs for the additional monitoring that would be required under element P-8. While the specific costs would depend on the content of the guidelines that Ecology is directed to prepare and on the particular characteristics of each effluent stream and the local receiving environment, the tiering approach would be expected to minimize additional monitoring costs for dischargers where no problems are discovered during first-tier monitoring. A rough estimate of the maximum cost of first-tier monitoring for the largest, most complex discharges is $20,000 to $30,000 per year. Monitoring costs would be much less for smaller, less complicated discharges. In cases where problems are discovered in first-tier monitoring, costs for further monitoring to confirm and characterize the source of the problem (and for additional pollution control of any problem pollutants discovered) could be substantial, but cannot be estimated with current information.

Some dischargers would have new or more stringent limits imposed on the discharge of specific toxicants (in the dissolved or particulate phase) or on the overall toxicity of the effluent. The cost of meeting more stringent limits would depend not only on the specific limits that are chosen by Ecology but also on the particular circumstances of the plant involved. Costs to meet effluent limits could vary widely, from virtually no cost to many millions of dollars for new treatment systems or process changes. For example, a toxicant in the effluent of a pulp mill was recently traced to contamination in one of the chemicals purchased by the mill. This toxicant can apparently be controlled at virtually no cost to the mill by purchasing the needed chemical from other, uncontaminated sources. On the other hand, some toxicants are either unavoidable by-products of or required in the discharger's process. Requiring "known, available, and reasonable" treatment to control these toxicants may necessitate substantial modification of the process or the installation of a new, end-of-pipe treatment system. Costs for toxicant control cannot be estimated until Ecology determines specific case-by-case limits and each discharger determines what modifications, if any, are necessary to meet the limits.

Other elements of the program may also affect costs to dischargers. Permit fees under this program could be as much as ten times the current fee, depending on the fee schedule to be adopted by Ecology. Laboratory costs would likely increase slightly due to the requirement to use certified labs. The greater cost per test might be offset by the need to do fewer tests because of greater accuracy. Industrial treatment plant operators would incur some cost in complying with certification requirements to be established and in paying a certification fee. Some dischargers would incur costs as a result of enforcement action taken when violations are detected through increased inspections and compliance review efforts by Ecology. Finally, dischargers would incur some increased costs to comply with spill and stormwater control requirements for plant sites. These costs would be extremely variable and would depend on the characteristics of the site and types of materials used or stored on the site.

Although state permit fees are proposed as the source of revenue for several elements, it should be emphasized that these expanded permit fees require legislative authorization and adoption of a new fee schedule before they go

into effect. The earliest that revenues from the expanded fees would be received would be fiscal year 1989, hence other funding would be necessary for all elements until the permit fees are received.

ESTIMATED COSTS: MUNICIPAL AND INDUSTRIAL DISCHARGES	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Program Element						
P-1: ADOPT EPA WATER QUALITY CRITERIA	0	18,100	0	0	16,700	0
P-2: CRITERIA FOR CLASSIFYING SEDIMENTS	0	145,200	41,300	13,500	67,000	13,400
P-3: DILUTION ZONE CRITERIA	0	14,500	34,400	6,800	6,700	6,700
P-4: PERMIT FEE[1]	0	108,700	34,400	33,800	33,500	33,400
P-5: PROCEDURES MANUAL AND INTERNAL TECHNICAL ASSISTANCE	0	108,700	172,200	236,600	234,500	240,400
P-6, -7, -8: TOXICANT AND PARTICULATE EFFLUENT LIMITS AND MONITORING IN PERMITS[2]	0	434,600	792,200	1,243,700	1,634,500	1,616,200
P-9: SPILL CONTROL PLANS REQUIRED[3]	0	0	0	0	0	0
P-10: EXPLANATION OF RELAXED AND INCREASED LIMITS IN PERMITS	0	7,200	20,700	6,700	6,700	6,700
P-11: ENHANCED REQUIREMENTS FOR EPA-ISSUED PERMITS	0	62,100	71,600	71,000	70,800	70,700
P-12: REEVALUATE MAJOR/MINOR PERMIT CATEGORIES	0	7,200	0	0	0	0
P-13: URBAN BAY ACTION TEAMS[4]	0	0	0	0	0	0
P-14: INSPECTIONS	0	404,900	625,000	1,081,900	1,305,800	1,397,800
P-15: STUDY OF INDEPENDENT VERIFICATION OF SELF-MONITORING	0	0	34,400	0	0	0
P-16: USE OF CERTIFIED LABS FOR SELF-MONITORING	0	0	20,700	13,500	13,400	13,300
P-17: DATA MANAGEMENT	0	0	62,600	51,600	76,700	76,400
P-18: ADOPT ENFORCEMENT GUIDELINES AS REGULATIONS/ REPORT ON ENFORCEMENT POLICY	0	45,500	55,100	0	0	0
P-19: CROSS TRAINING FOR INSPECTORS	0	28,100	118,300	155,200	192,500	230,300
P-20: SEARCH FOR UNPERMITTED DISCHARGES	0	46,200	177,800	175,200	174,000	173,600
P-21: FELONY PROVISIONS[5]	0	0	0	0	0	0
P-22: ADDITIONAL STAFF FOR PRETREATMENT PROGRAM	0	122,400	266,700	350,400	414,800	413,900
P-23: MUNICIPAL OPERATOR TRAINING	0	0	79,800	99,000	99,000	99,000
P-24: CERTIFY INDUSTRIAL TREATMENT PLANT OPERATORS	0	6,500	110,200	94,600	67,000	66,800
P-25: EMPLOYEE EDUCATION ASSISTANCE	0	109,100	17,200	20,300	20,100	20,000
P-26: PUBLIC OUTREACH	0	36,200	68,900	67,600	67,000	66,800
TOTAL ANNUAL ESTIMATED COSTS:	$0	$1,705,200	$2,803,500	$3,721,400	$4,500,700	$4,545,400

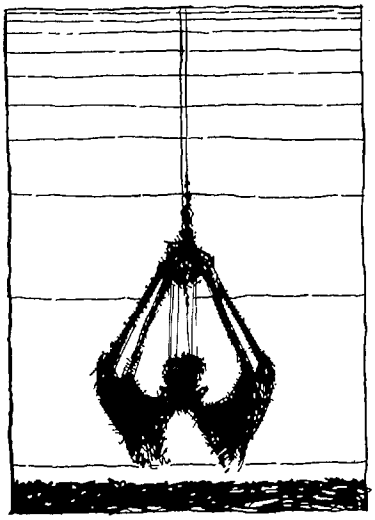
[1]Costs for development and administration of an expanded permit fee program.
[2]Estimates do not include costs to dischargers to comply with new standards and monitoring requirements. Such costs may be substantial for some dischargers, but cannot be estimated with current information.
[3]Costs included in P-6, -7, -8.
[4]Costs included in P-6, -7, -8, -14, -20, and S-8 (sediment program).
[5]PSWQA will use existing staff to draft proposed legislation.

ESTIMATED COSTS: MUNICIPAL AND INDUSTRIAL DISCHARGES	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Agency						
FEDERAL GOVERNMENT						
EPA	0	44,000	44,000	44,000	44,000	44,000
STATE GOVERNMENT						
ECOLOGY	0	1,627,200	2,693,500	3,578,400	4,357,700	4,402,400
LABOR & INDUSTRIES	0	11,000	0	0	0	0
PCHB	0	16,500	0	0	0	0
PSWQA	0	6,500	0	0	0	0
OTHER						
LOCAL GOVERNMENTS	0	0	66,000	99,000	99,000	99,000
TOTAL ANNUAL ESTIMATED COSTS:	0	1,705,200	2,803,500	3,721,400	4,500,700	4,545,400

CONTAMINATED SEDIMENTS AND DREDGING

PROBLEM DEFINITION

ENVIRONMENTAL PROBLEMS



The accumulation of toxicants in sediments and resulting damage to natural populations is increasingly recognized nationally and internationally as the most serious threat to the marine ecosystem. Toxic contaminants bind to particles and are retained as sediments in the Puget Sound basin. Toxic compounds are found in a wide range of concentrations in the surface sediments (those deposited in the last two years) at many locations in the Puget Sound area. Contamination levels of surface sediments in the deep central Puget Sound basin are significantly higher than estimated preindustrial levels. In urban areas the present levels of contamination are much higher, up to 100 times the levels in the cleanest rural bays.

As reported in the EPA Pollutant of Concern Matrix (EPA, 1986),[13] 40 chemicals have been found in at least one site in the Puget Sound basin at levels that cause biological harm. Sixteen chemicals are harming marine life in more than ten percent of samples.

Amphipod bioassay samples collected over the past five years from many locations in Puget Sound including Bellingham Bay, Commencement Bay, Port Gardner Bay, Elliott Bay, and Eagle Harbor were very toxic. Some toxicity was observed in samples from many other locations. These samples were generally collected from the top two centimeters of sediment--the material that had accumulated within the last one to five years--indicating recent or ongoing sources of contamination.

The benthic populations at many locations are also considered damaged (significantly altered in composition or seriously reduced in total abundance) by sediment pollution.

These toxicants reach the water from many sources, but the principal ones are unpermitted discharges, stormwater runoff, and permitted point source discharges (industrial and municipal outfalls). In addition, dredging and disposal can disturb and redistribute these materials.

INSTITUTIONAL PROBLEMS

Sediment contamination is generally regulated by programs aimed at protecting water quality. But since toxicants can concentrate in sediments, serious sediment contamination can occur even when the water column is not seriously

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[13]The matrix contains information on 52 toxic substances that are of concern in Puget Sound. The matrix reports observed sediment concentrations of 41 pollutants of concern along with apparent effect threshold (AET) values. These AET values, as described in the PSWQA Contaminated Sediments and Dredging Issue Paper, are estimates of the sediment concentration at which adverse biological effects will *always* occur. If sediments at a station exceed the AET values, one can be reasonably certain that biological harm is actually occurring at that site.

contaminated. The existing programs lack clearly stated goals or policies for the prevention of sediment contamination.

The regulation of discharges, the management of dredging and disposal, and the identification and ranking of contaminated sediment sites for cleanup are all hampered by the absence of any adopted sediment standards. In addition, regulation of sources of toxicants has generally not addressed the contaminated sediment particles suspended in effluents.

Dredging is necessary to create and maintain docks and navigation channels. Dredging and disposal are highly regulated through state and federal permit systems. Some dredged material is disposed of at open water sites. Seriously contaminated material is required by these programs to be disposed of at confined disposal sites. The Puget Sound Dredged Disposal Analysis (PSDDA), a cooperative effort by the Corps of Engineers, EPA, DNR, and Ecology, will recommend new standards and sites for unconfined open water disposal. PSDDA will also recommend improved permitting and management of monitoring and disposal sites. But PSDDA is not designed to develop or adopt standards for disposal of sediments that are too contaminated to be disposed of in unconfined open water sites. In addition, although there is some agency interest in establishing multi-user disposal sites for the more contaminated sediments, many unknowns must be resolved about the feasibility of such sites before any are proposed.

Existing identified sites with serious sediment contamination are being addressed in several locations through the EPA-Ecology urban bay program and Superfund investigations. But no complete inventory of contaminated sites exists, and it is unlikely that the existing level of funding for the urban bay program will allow the known sites of contamination to be addressed very soon. The decision criteria for identifying contamination, addressing sources, and deciding whether to propose cleanup actions tend to be reinvented for each site.

PROGRAM GOAL

To reduce and ultimately eliminate adverse effects on biological resources and humans from sediment contamination throughout the Sound by reducing or eliminating discharges of toxic contaminants and by capping, treating, or removing contaminated sediments.

STRATEGY

The strategy for achieving this goal is (1) to classify sediments that cause observable adverse biological effects; (2) to implement Soundwide controls on sources of contaminants causing sediments to fail the classification criteria; (3) to provide rules and sites for disposal of dredged materials; and (4) to expand the urban bay program to provide for additional source control and consideration of remedial actions for existing areas of high sediment contamination levels.[14]

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[14]The first two elements of this strategy, classification of contaminated sediments and source controls, are included in the Municipal and Industrial Discharges program and the Stormwater and CSOs program.

SUMMARY DESCRIPTION

This program, in combination with elements of the Municipal and Industrial Discharges and Stormwater and CSOs programs, sets up a comprehensive sediment quality program that includes sediment quality goals and criteria, contaminant source controls, dredging and disposal goals, dredged material disposal standards, a feasibility study of multi-user disposal sites for sediments, and an expanded urban bay program including guidelines to identify and respond to sites with high levels of sediment contamination and additional resources for those activities.

MAJOR FEATURES

---PSWQA adopts policies to guide agency actions affecting sediments.

---PSWQA participates in and takes action on the recommendations of the Puget Sound Dredged Disposal Analysis (PSDDA) for disposal of dredged material at unconfined open water disposal sites.

---DNR operates open water disposal sites and undertakes monitoring. Ecology provides for baseline studies of open water disposal sites.

---Ecology adopts rules for disposal of dredged material not suitable for unconfined open water disposal.

---Following Authority review and action, state and local agencies may be required to conform their programs as needed to the adopted PSDDA recommendations and to the rules for confined disposal of dredged material.

---Ecology studies the feasibility of establishing multi-user confined disposal sites.

---Ecology and EPA, in cooperation with local governments, inventory sites with sediment contamination problems and investigate the sites on an accelerated schedule, using uniform procedures.

PROGRAM ELEMENTS

POLICIES

S-1. SEDIMENT PROGRAM POLICIES

The following policies shall be followed by all state and local agencies in actions affecting sediment quality, including rulemaking, setting priorities for funding and actions, and developing permit programs:

a. All government actions will lead toward eliminating the presence of sediments in the Puget Sound basin that cause observable adverse effects to biological resources or pose a serious health risk to humans.

b. Programs for management of dredging and disposal of sediments should

result in a net reduction in the exposure of organisms to adverse effects.[15]

c. Remedial programs (which may include capping in place) shall be undertaken when feasible to reduce, with the intent of eliminating, the exposure of aquatic organisms to sediments having adverse effects.

UNCONFINED OPEN WATER DISPOSAL

S-2. PROGRAM FOR UNCONFINED OPEN WATER DISPOSAL

The Authority shall review each draft report and environmental impact statement (EIS) of the Puget Sound Dredged Disposal Analysis (PSDDA) and provide timely comments to the Corps of Engineers (lead PSDDA agency). In addition, Authority staff shall review preliminary drafts of PSDDA draft EISs and advise the Authority of any significant changes needed. Comments will then be forwarded to PSDDA. Every effort will be made to resolve PSWQA concerns with PSDDA recommendations so that the recommendations in the final reports by PSDDA can be adopted by the Authority. The Authority shall review, modify if necessary, and adopt the recommendations of Phase 1 and Phase 2 of PSDDA within three months of the publication of the final reports and EISs.

In commenting on the draft EIS and adopting final unconfined open water disposal recommendations, the Authority will specify how state agencies and local governments should conform their programs to the recommendations. After adoption by PSWQA, the recommendations shall become part of the Puget Sound Water Quality Management Plan and shall be used by state agencies and local governments in reviewing and acting on proposals for unconfined open water disposal. If required, all state and local agencies shall promptly modify their regulations and programs as necessary (including shoreline master programs) to conform to the adopted recommendations. Revisions to regulations and programs shall be completed within one year of adoption by PSWQA. Agencies which cannot act within one year shall notify the Authority immediately to request an extension to this time limit.

Target Dates: Adopt Phase 1 by September 1987. Adopt Phase 2 by September 1988.

S-3. UNCONFINED OPEN WATER DISPOSAL SITES

The Authority supports two anticipated recommendations of the Puget Sound Dredged Disposal Analysis (PSDDA) for early action by the Legislature. The first is that DNR continue to manage unconfined open water disposal sites, including an active program to monitor both compliance with permit re-

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[15]The intent of this policy is that dredging and disposal contribute to the cleanup of the Sound by allowing unconfined open water sites to have only low levels of contamination and to dispose of more contaminated sediments in a manner that prevents continued exposure of organisms to adverse effects. For proposals where dredging will expose contaminated sediments, project-specific mitigation measures may be required.

strictions by site users and the long-term effects of use of the site on the environment. To accomplish this, DNR may request additional fee authority and shall charge fees for site use to recover the cost of site management and administration, compliance, and monitoring. The second anticipated PSDDA recommendation is that Ecology undertake (directly or through interagency agreement with DNR) baseline studies of proposed open water sites. Ecology is expected to request funding for such studies.[16]

Target Dates: Begin baseline study by July 1987. Complete baseline study by July 1989. Begin monitoring October 1987.

CONFINED DISPOSAL

S-4. SEDIMENT DISPOSAL STANDARDS

The PSDDA recommendations will set the standards for disposal of dredged material in unconfined open water sites. Ecology shall develop and adopt by regulation standards for reuse or disposal of dredged material that does not meet the criteria for sediments having adverse effects (to be adopted by Ecology under element P-2) and that will not be disposed of at unconfined open water disposal sites established by the PSDDA process. These standards will be used by Ecology, shoreline jurisdictions, and local health departments in approving or denying permits for the use or disposal of dredged material. The objective of these disposal standards is to prevent the exposure of aquatic or terrestrial organisms, including humans, to adverse effects from the contaminants in the sediments.

In developing the standards Ecology shall consult with agencies and other parties with technical expertise and shall provide a public education/public involvement program. The standards shall address treatment as well as in-water and upland confined disposal methods. In setting these standards, Ecology shall consider the restrictions that solid and hazardous waste programs and sludge management efforts apply to wastes with similar chemical characteristics.

Target Dates: Adopt interim standards by May 1, 1989. Adopt final standards by March 1, 1990.

S-5. REVISION OF RULES AND PROGRAMS

After the adoption by Ecology of disposal standards for sediments having adverse effects (S-4), the Authority shall review the standards and consider the degree to which local governments and other state agencies should conform their programs to the Ecology standards so that the use or disposal of sediments in compliance with the disposal regulations is not unreasonably precluded. Shoreline master programs, solid waste rules, and the hydraulics permit rules may be affected. The Authority may then amend the Puget Sound Water Quality Management Plan to direct state agencies and local governments to revise their programs. If required, these revisions shall occur promptly and

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[16]This element represents early adoption by the Authority of anticipated PSDDA recommendations. It is included to indicate Authority concurrence and to support Ecology and DNR funding requests for fiscal years 1988-89.

no later than one year after final action by the Authority. Any agency or local government that cannot meet this deadline shall request, at the earliest possible time, an extension from the Authority.

Target Dates: Begin review on April 1, 1990. Adopt plan language by July 1, 1990. Complete state/local revisions by July 1, 1991.

S-6. MULTI-USER CONFINED DISPOSAL SITES STUDY

Ecology shall undertake a feasibility and needs study of multi-user confined disposal sites. This study shall consider the amounts, locations, and contaminant characteristics of sediments projected to be dredged; the fraction of this material that might be disposed of at multi-user sites; the legal feasibility, including liability issues; the financial feasibility of establishing such sites including fee options; the institutional options for such sites; and the technical feasibility of such sites, including in-water and upland methods. The results of the study, including specific recommendations as to whether, and by whom, multi-user sites should be established, shall be provided to the Authority.

Target Date: Begin study by July 1988. Complete study by July 1, 1990.

CONTAMINATED SITE INVESTIGATIONS

S-7. GUIDELINES FOR REMEDIAL ACTIONS

To allow uniform decisions concerning what to do about sediment contamination, Ecology shall develop and adopt guidelines for deciding when existing sediments having adverse effects should be capped, excavated, or otherwise treated. In developing the guidelines, Ecology shall consult with agencies and parties with expertise in these issues and provide a public education/public involvement program. Development of the guidelines shall include consideration of deadlines for making decisions on remedial actions. As a guide in deciding whether to wait for natural processes to cap or dilute the sediments or to undertake remedial actions, the guidelines shall also include consideration of a time by which surface sediments should no longer have adverse effects. Because of the high cost of treatment or removal of contaminated sediments, the guidelines shall include a process and criteria for establishing priorities for such actions. Development of the guidelines should include trigger levels for identifying high levels of contamination requiring expedited remedial action.

Target Dates: Complete guidelines by January 1, 1990.

S-8. INVESTIGATIONS OF CONTAMINATED SEDIMENT SITES (URBAN BAY ACTION PROGRAMS)

This element constitutes an expansion of the ongoing EPA and Ecology program of investigations and source control efforts in urban bays and other locations in the basin where sediment contamination is known or suspected. Although this element contains specific directives and assignments, the Authority intends that EPA, Ecology, and other agencies and local governments exercise flexibility in resolving contaminated sediment problems. EPA is requested to continue or increase existing support for this effort through various programs including the national funding for estuary programs, federal Superfund activities, and federal funding for Ecology water quality and

hazardous waste programs. To organize and coordinate the program, Ecology, in cooperation with EPA, shall undertake an integrated program consisting of the guidelines called for in S-7 and the following components:

8.1. Inventory of Sites with Adverse Effects

To provide information to PSWQA and the public and to allow for tracking of increases or decreases in the extent of sediment contamination, Ecology shall maintain an inventory of sites[17] in the basin known to have sediments with levels of contamination that violate the sediment criteria developed under the Municipal and Industrial Discharges program. The inventory should consist of maps with areas of contamination indicated. All available sources of data, including monitoring, permit applications, and published research studies, shall be used in developing the inventory. The inventory shall be integrated into the Puget Sound Atlas if possible. This site inventory shall be published every two years. The Authority shall assist in distributing the inventory and include a summary of the inventory in the State of the Sound Report. As an aid in targeting source control activities, Ecology's inventory shall include that identifies the chemicals or other characteristics for each site or area that causes it to be on the inventory.

8.2. Priority List and Investigation Schedule

Ecology shall establish a priority list of sites on the inventory and a schedule for their investigation. It is anticipated that the first priority list will come from the existing list of sites for urban bay investigations. After establishment of sediment criteria and publication of the Inventory of Sites with Adverse Effects, revisions to the priority list and schedule will be based on the inventory. This schedule shall call for an investigation to be commenced on every site on the contaminated sediment site inventory within five years of its first appearance on the inventory unless investigations are already underway on six or more sites. Ecology shall reevaluate both the criteria and the time schedule every two years.

8.3. Ranking Method Study

Ecology shall review the existing method of ranking contaminated sites in urban bays for investigations as well as the ranking systems used under the federal Superfund law (CERCLA) and the state Hazardous Waste Cleanup Program and recommend how the ranking of sites with sediments that violate the sediment criteria established under the Municipal and Industrial Discharges program can be made consistent with the other programs. The study also shall identify and compare various funding sources for site investigations, remedial action feasibility studies, and actual remedial actions and shall make recommendations on future funding for sediment remedial actions. Contaminated sediment sites should be ranked and investigated under a separate but comparable system so that funding from the Superfund program may be available should remedial actions with public funds be necessary. The results of this study shall be used in updates of the priority list called for in item 8.2 above.

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[17] "Site" is meant to be used flexibly in establishing the size of an area being discussed. At first, an entire bay may be considered a site suspected of having contamination and scheduled for investigation. As more information is developed, specific hot spots within the bay may be identified as individual sites.

8.4. Investigations of Contaminated Sediment Sites

Ecology and EPA, in cooperation with other agencies and local governments, shall carry out investigations of contaminated sediment sites. Investigations shall be designed on a case-by-case basis using Elliott Bay and Commencement Bay studies as the models. The investigations shall include reviews of existing information on contamination and sources as well as field investigations designed to refine information on levels and distribution of contamination and probable sources.[18]

8.5. Action Teams

For each contaminated sediment site being investigated, Ecology, EPA, and other appropriate agencies will form a team of investigators to work on source controls. The teams should include Ecology regional office inspectors and permit writers who normally handle the area. The team's activities shall be integrated with the Municipal and Industrial Discharges program by focusing activities under that program in areas associated with contaminated sediment sites. The teams shall carry out various source control and investigation actions including:

- o Review existing discharge permits and compliance with them;
- o Reopen and modify discharge permits of sources in the vicinity to control toxicants identified at problem levels in the sediments;
- o Search for unpermitted discharges and take enforcement actions;
- o Investigate contamination in storm drains or groundwater and search for sources of such contamination; and
- o Take other actions to control sources of sediment contamination by seeking to achieve full compliance with applicable laws and regulations in locations that drain into the contaminated area.

Ecology and EPA are encouraged to make use of industry scientists, engineers, and other experts to assist in these efforts.

8.6. Remedial Actions

As will be detailed in the guidelines developed under S-7, when investigations indicate the presence of highly contaminated sediments, they shall be extended to consider the feasibility and reasonableness of taking remedial actions. If remedial actions are necessary, funds for such actions will be sought first from responsible parties and then from public sources.

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[18]Costs for this element are estimated assuming that most of the work will be performed by consultants. If this work is to be done by agency staff, additional staff (FTEs) would be required, but the total cost would be about the same.

8.7. Responsible Parties

The Authority recognizes that identifying the parties responsible for sediment contamination is generally difficult. Often neither the underlying property owner nor the abutting property owner is responsible for the contamination. But cases have occurred and will occur when a responsible party can be identified. Where treatment or removal of contaminated sediments is recommended, Ecology shall attempt to have such remedial actions, including investigations and feasibility studies, undertaken and paid for by responsible parties. Every reasonable attempt will be made to recover cleanup costs from responsible parties including study costs.

Target Dates: Complete ranking system study by June 1, 1988. Complete priority list by December 31, 1988. Complete initial site inventory by October 1, 1989.

MAJOR PUBLIC ACTIONS FOR AUTHORITY REVIEW

1. Adoption of contaminated sediment disposal standards (S-4).
2. Priority list for site investigations (S-8).

LEGISLATION REQUIRED

New legislation may eventually be required to allow the establishment of multi-user dredged material disposal sites.

DNR may request legislation to increase its authority to assess user fees.

ESTIMATED COST

The total estimated cost of the sediment program ranges from $1.0 million to $2.5 million per year. The largest cost element of the program is the investigation of contaminated sediment sites. Even assuming continued federal funding from the Environmental Protection Agency of $500,000 per year, the increase estimated for this program is $1.4 million per year. This level of funding is estimated to be adequate to make good progress on site investigations and source control but does not include public funds to clean up contaminated sediments. Such costs could run $100,000 per acre for removal or treatment and $5,000 per acre for capping. Estimates of costs to dredge and dispose of sediment hot spots in Commencement Bay ranged from $8 to $79 per cubic yard depending on the type of disposal selected. Establishing standards for sediment disposal is projected to cost $882,000 over three years. Studying disposal methods as part of a multi-user confined disposal site study is estimated to cost $650,000 per year over two years.

The PSDDA recommendations that will be reviewed by the Authority are expected to result in agency costs for monitoring and baseline studies of up to $1.3 million in the peak year and more than $600,000 per year on an ongoing basis.

Large public and private sector costs are currently associated with dredging or disposal of dredged material. In recent memory dredging and open water disposal of clean material cost only $2 to $3 per cubic yard. For the past two years testing of material suspected of being contaminated has cost an additional $1 per cubic yard. In addition, disposal fees have increased and will increase more in the future. Disposal of dredged material that cannot go to

open water now costs anywhere from $15 to $40 per cubic yard. Disposal of highly contaminated material, as discussed above for remedial actions, has been estimated at up to $79 per cubic yard. Since annual dredging volumes are in the hundreds of thousands of cubic yards, these are significant costs for the region.

Private sector costs associated with investigating and dealing with contaminated sediments sites may also increase. This would occur when responsible parties are required to investigate and remedy sediment hot spots resulting from their discharges.

ESTIMATED COSTS: CONTAMINATED SEDIMENTS AND DREDGING	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Program Element						
S-1: SEDIMENT PROGRAM POLICIES	0	0	0	0	0	0
S-2: PROGRAM FOR UNCONFINED OPEN WATER DISPOSAL	0	61,100	66,100	16,000	0	0
S-3: UNCONFINED OPEN WATER DISPOSAL SITES[1]	0	0	0	0	0	0
S-4: SEDIMENT DISPOSAL STANDARDS	0	334,700	508,100	38,800	0	0
S-5: REVISION OF RULES AND PROGRAMS	0	0	0	132,600	1,029,400	0
S-6: MULTI-USER CONFINED DISPOSAL SITES STUDY	0	0	410,200	254,100	0	0
S-7: GUIDELINES FOR REMEDIAL ACTIONS:	0	0	24,300	148,400	0	0
S-8: INVESTIGATIONS OF CONTAMINATED SEDIMENT SITES[2]	0	618,000	1,328,300	1,416,100	1,428,400	1,410,200
TOTAL ANNUAL ESTIMATED COSTS:	$0	$1,013,800	$2,337,000	$2,006,000	$2,457,800	$1,410,200

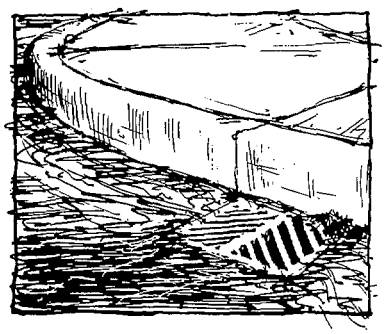
ESTIMATED COSTS: CONTAMINATED SEDIMENTS AND DREDGING	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Agency						
STATE GOVERNMENT						
DNR	0	0	0	1,900	29,200	0
ECOLOGY	0	921,100	2,144,700	1,750,500	1,436,700	1,284,000
FISHERIES	0	0	0	1,900	29,100	0
GAME	0	0	0	1,800	29,200	0
PSWQA	0	12,600	12,600	25,200	0	0
OTHER						
LOCAL GOVERNMENTS	0	80,100	179,700	224,700	933,600	126,200
TOTAL ANNUAL ESTIMATED COSTS:	0	1,013,800	2,337,000	2,006,000	2,457,800	1,410,200

[1]Monitoring and baseline studies are estimated to cost up to $1.3 million in the peak year and $600,000 on an ongoing basis.
[2]Some of the funding may be used for sediment cleanup projects. Estimates assume continued EPA funding of urban bay programs at $500,000 per year.

STORMWATER AND COMBINED SEWER OVERFLOWS (CSOs)

PROBLEM DEFINITION

COMBINED SEWER OVERFLOWS (CSOs)



About ten cities around Puget Sound have combined sewers where sanitary sewage, industrial wastewater, and stormwater are collected in a single sewer system. Neither the pipes nor the sewage treatment plants are sized to carry all of the volume of combined wastewater, and during large storms some of the effluent is discharged directly to the Sound without treatment. In an average year Metro discharges about two billion gallons of raw sewage, untreated stormwater, and industrial effluents from about 20 CSOs in the Seattle area. The volume discharged by other cities is generally not known. The discharge of raw sewage from combined sewer overflows contains large concentrations of fecal coliform bacteria, nutrients, and suspended solids. Sediment samples collected around the Denny Way CSO in Seattle have shown highly elevated concentrations of heavy metals and organic toxicants. The biota around the CSO has also been adversely affected by the discharge. Because of the fecal coliform bacteria in raw sewage, areas around CSOs have been closed to swimming and shellfishing. CSOs are generally located in shallow, shoreline areas where there is often limited flushing or dilution.

Until recently, controlling CSOs was given a low priority by federal and state agencies. Some municipalities have made efforts to control their CSOs. Basic information on flow, frequency of overflow, and effects is lacking for most CSOs discharging in Puget Sound. With the passage of HB 815 by the Washington State Legislature in 1985, all municipalities with CSOs are required to develop plans for the "greatest reasonable reduction at the earliest possible date." The legislation requires submittal of CSO reduction plans to Ecology by January 1, 1988.

Ecology is developing the guidelines and requirements to achieve the greatest reasonable reduction of CSOs, and the municipalities must prepare the plans mandated by HB 815. Ecology must then review the plans, approve them, and negotiate the compliance schedules for implementation of the CSO controls.

STORMWATER

Rainwater which does not seep into the ground flows across the land and is usually discharged to Puget Sound through ditches, pipes, and streams. Impervious surfaces such as roads, roofs, and parking lots do not allow seepage into the ground, and any rain falling on such surfaces becomes runoff. Depending on the land use, the stormwater can become contaminated with pollutants which are transported with the runoff. Most stormwater runoff is discharged to the nearest stream, river, or bay untreated.

Surface water runoff from urban areas contains a complex mixture of suspended solids, nutrients, bacteria, viruses, heavy metals, and toxic organics. Sampling conducted in the Seattle metropolitan area found that average stormwater exceeded EPA water quality criteria for cadmium,

copper, lead, nickel, and zinc. Some storm drains in Seattle were found to be major sources of lead and PCBs found in the sediments of Puget Sound. In more rural areas of the Sound, the contents of runoff tend to contain fewer toxic chemicals and more fecal coliform bacteria. Stormwater discharging into Henderson Inlet in southern Puget Sound periodically violates state fecal coliform standards and has been one factor in the closure of commercial shellfish beds at the head of the inlet.

Besides water quality, water quantity is also a concern--stormwater can cause flooding and disrupt stream habitat for fish and wildlife. Excessive stream flows from stormwater discharges can result in erosion and sedimentation problems.

Under the federally funded Clean Water Act Section 208 planning program, there were some initial efforts by federal, state, and local agencies to research the effects of stormwater and to study stormwater quality and quantity control measures. Because there were no funds to continue the program and implement stormwater controls, very little has been done to address stormwater in the Puget Sound basin. However, a few cities and counties have developed surface water utilities and stormwater programs.

As the population of the Puget Sound basin increases, the quantity of impervious surfaces such as highways, parking lots, and roofs will increase, resulting in less rainwater seeping into the ground and greater quantities of stormwater runoff. With new development, there is a great potential for erosion from construction sites. New parking lots and streets will require stormwater collection systems.

Because Ecology does not have a program to address stormwater, and because of the recent veto of the federal Clean Water Act reauthorization, legal requirements for stormwater programs and/or permits are uncertain.

PROGRAM GOAL

To protect shellfish beds, fish habitat, and other resources, to prevent the contamination of sediments from urban runoff and CSOs, and to achieve water and sediment quality standards, by reducing pollutant loadings from stormwater and CSOs throughout Puget Sound.

STRATEGY

The strategy for achieving this goal is (1) to develop stormwater programs in urbanized areas of Puget Sound in a phased program starting with the largest cities; (2) to require that all cities and counties develop operation and maintenance programs, adopt ordinances for new development, and develop stormwater education programs; and (3) to require all cities with CSOs in the Puget Sound basin to develop and implement plans providing for the greatest reasonable reduction of CSO events and stormwater pollutants.

SUMMARY DESCRIPTION

This program develops and implements stormwater controls for cities and counties (including unincorporated areas), highways, and federal facilities (including military bases). Guidelines, technical manuals, and model ordinances will be developed first. Through a phased program stormwater from existing and new development will be controlled. The current Ecology program to reduce CSO discharges by municipalities is incorporated into the plan.

MAJOR FEATURES

---Stormwater programs are the major vehicle for initiating stormwater planning and implementation of stormwater controls in urbanized areas.

---All cities and counties must develop programs for operation and maintenance of existing stormwater systems and adopt ordinances for stormwater controls for new development. Each city and county reviews its existing ordinances requiring maintenance of privately owned stormwater systems.

---Stormwater education programs must also be developed.

---Ecology provides substantial technical assistance to local jurisdictions in the form of manuals, guidelines, model ordinances, and some research.

---Runoff from federal facilities and highways is addressed.

---CSO reduction plans are required to address the impacts of stormwater as well as sanitary sewage if separation is chosen for CSO control.

PROGRAM ELEMENTS

SW-1. URBAN STORMWATER PROGRAMS

A two-step urban stormwater program shall be developed.

Step 1. Ecology shall develop technical manuals and guidelines (SW-3 and -4) for local stormwater programs. The programs may be based upon permits or other mechanisms, as determined by Ecology in the guidelines process (SW-4).

Step 2. Each city and unincorporated urbanized[19] area shall develop and implement phased stormwater programs consistent with Ecology guidelines. The programs shall be submitted to Ecology for approval.

Starting with the six largest cities in the basin[20] and eventually expanding to cover all cities and urban areas, the urban stormwater program

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[19]In unincorporated areas, it is assumed that the county will have responsibility for the urban stormwater program.

[20]The six largest cities are Seattle, Tacoma, Bellevue, Everett, Bellingham, and Bremerton.

shall seek to control runoff from industrial, commercial, and residential areas including streets and roads.[21] The program shall cover both new and existing development. The program shall allow for early action by smaller cities and unincorporated urban areas which are prepared to implement stormwater control programs. Emphasis shall be placed on controlling stormwater through source controls and best management practices before it is discharged to municipal stormwater systems. The program shall address both water quantity and quality. Achieving water and sediment quality criteria is a goal of the urban stormwater program.

The design of urban stormwater programs shall rely upon the technical manuals, model ordinances, and guidelines developed in SW-3 and -4. Each city or urban area will have the flexibility to design its own program to be phased in over several years, but priorities and deadlines for compliance for the entire program shall be subject to review and approval by Ecology.

At a minimum, each urban stormwater program shall include:

a. Inventories of storm drains and land uses discharging to stormwater systems and identification of problem areas.
b. Monitoring of problem storm drains identified in inventories.
c. Programs for operation and maintenance of storm drains, detention basins, ditches, and culverts.
d. Investigations for illegal hookups and dumping, spill response, and remedial actions.
e. Assurance of adequate local funding for the stormwater program through surface water utilities, sewer charges, fees, or other revenue-generating sources.
f. Agreements with neighboring jurisdictions which share watersheds.
g. Ordinances requiring implementation of best management practices (e.g., erosion/sedimentation controls, detention/retention basins, oil separators, housekeeping measures) for new construction.
h. A public education program aimed at residents, businesses, and industries in the urban area.
i. If after implementation of the control measures listed above, there are still discharges that cause significant environmental problems, retrofitting of existing development and/or treatment of discharges from new and existing development may be required.

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[21] In some cases significant stormwater problems may be originating in urbanized areas outside of a city's jurisdiction. In those situations, the sequencing of areas for urban stormwater programs may be modified by Ecology to address problems in shared watersheds. The neighboring jurisdictions may choose (but will not be required) to develop a joint program to cooperatively resolve the identified problems. Where joint programs are not developed, Ecology shall ensure consistency in programs through its oversight role. The priority watershed process (see the nonpoint program, NP-2, -3 and -4) would require joint efforts.

j. Inspection, compliance, and enforcement measures.[22]
k. An implementation schedule.

Stormwater quality in public stormwater systems in commercial and industrial areas shall have a high priority in city and county programs. Existing storm drains from industrial and commercial facilities which discharge directly into the waters of the state pose a special regulatory problem. Local governments shall report to Ecology on the extent of this problem in their jurisdictions and how they propose to handle it. Ecology shall determine, in consultation with local governments, the appropriate approach to this issue. Direct discharges of commercial and industrial stormwater from permitted point source facilities are addressed in the Municipal and Industrial Discharges program (P-5).[23]

Ecology shall have compliance monitoring and oversight responsibilities for the urban stormwater programs. Ecology shall audit each urban stormwater program every two years to ensure consistent and adequate implementation. If local governments decline to prepare and implement urban stormwater programs, Ecology shall either prepare and implement programs itself or use its regulatory authority under RCW 90.48, the Puget Sound Water Quality Management Plan, or other authority to direct local governments to prepare and implement urban stormwater programs. The effectiveness of the urban stormwater programs shall be evaluated by PSWQA as part of the 1989 and 1991 Puget Sound Water Quality Management Plans.

Urban stormwater programs may be part of the priority watershed action plans (NP-2 and -4).

Target Dates: On July 1, 1989, the six largest cities and another four early action cities/unincorporated areas begin developing stormwater programs. By the year 2000, all cities and urbanized areas in the Puget Sound basin implement urban stormwater programs. Within two years of the initiation of each city or county's program, substantial progress toward implementation of the elements listed above must be demonstrated to Ecology.

SW-2. OPERATION AND MAINTENANCE PROGRAMS AND RUNOFF ORDINANCES

All counties and cities in the Puget Sound basin, whether required to have an urban stormwater program under SW-1 or not, shall adopt ordinances requiring stormwater controls for new development and shall develop operation and maintenance programs for new and existing

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[22]Local government may require Ecology's assistance in enforcement measures.

[23]Comprehensive control of stormwater from non-NPDES permitted industrial or commercial facilities is a potentially expensive task, not currently included in cost estimates for stormwater or municipal and industrial discharges programs.

stormwater systems including runoff from streets and roads.[24] Cities and counties shall adopt ordinances consistent with Ecology's model ordinances (SW-4) requiring stormwater quality and quantity controls for new development. Each city and county shall review its existing ordinances to determine if they are adequate to require and enforce maintenance of privately owned stormwater systems. Each shall also demonstrate that an operation and maintenance program is being implemented. Education programs to inform citizens about stormwater and its effects on water quality, flooding, and fish/wildlife habitat, and to discourage dumping of waste material or pollutants into storm drains will be developed under the Nonpoint Source Pollution program (NP-8).[25]

Ecology shall have compliance monitoring and oversight responsibilities for the stormwater programs. Ecology shall audit each city's and county's stormwater program every two years to ensure consistent and adequate implementation. If local governments decline to prepare and implement programs for the operation and maintenance of existing stormwater systems or to develop and implement runoff ordinances for new development, Ecology shall either prepare and implement these programs itself or use its regulatory authority under RCW 90.48, the Puget Sound Water Quality Management Plan, or other authority to direct local governments to prepare and implement operation and maintenance programs for existing stormwater systems and runoff ordinances for new development. The effectiveness of the stormwater ordinances and maintenance programs shall be evaluated by PSWQA as part of the 1989 and 1991 Puget Sound Water Quality Management Plans.

Target Date: All cities and counties shall adopt ordinances by June 30, 1991.[26] By the same date, they shall demonstrate to Ecology that they have met the operation and maintenance requirements and that existing ordinances for privately-owned systems are adequate.

SW-3. TECHNICAL MANUALS ON STORMWATER AND EROSION CONTROLS

Ecology shall produce the following technical manuals for use by local jurisdictions in stormwater planning. In preparing the manuals Ecology shall use existing literature and shall include field research only if a literature search finds insufficient information applicable to Puget Sound. These manuals may need to be updated. Ecology will provide technical assistance to the cities and counties developing and implementing stormwater programs.

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[24]Some cities and counties have already adopted stormwater control ordinances and/or have operations and maintenance programs which may meet the requirements of this program.

[25]In addition, Ecology's authority to undertake enforcement actions pursuant to RCW 90.48 and RCW 90.52 shall continue.

[26]Those cities and counties with existing ordinances or programs will review them to ensure that they comply with the Ecology program requirements.

a. A manual on erosion control for use by counties and cities in preparing erosion and sedimentation control ordinances for new development. (This can be based on manuals already used by some Puget Sound jurisdictions.)

b. A manual describing designs for operation and maintenance of detention and retention basins to control water quality as well as quantity in the Puget Sound region. (Research may be needed to determine the rates and efficiencies of different detention methods.)

c. A manual identifying which types of land use, such as gas stations, parks, and shopping centers, contribute significant pollutant loading from runoff and describing appropriate best management practices and/or treatment to reduce or eliminate pollutants from those uses.

The development of these manuals shall be closely coordinated with the Guidelines for Stormwater Programs (SW-4). Ecology shall also update these manuals as needed and provide technical assistance to local jurisdictions.

Target Dates: Complete erosion and sedimentation manual by June 30, 1988. Complete detention/retention basin manual by December 30, 1988. Complete BMP/treatment manual by June 30, 1989.

SW-4. GUIDELINES FOR SW-1 AND SW-2

Ecology shall prepare and update guidelines and develop model ordinances for urban stormwater programs (SW-1) and requirements for stormwater programs in all cities and counties (SW-3). Ecology will also provide technical assistance to local jurisdictions. Ecology shall regularly consult with cities and counties as it develops the ordinances and guidelines. Guidelines shall be used by local jurisdictions in preparing their stormwater programs. Ecology shall provide minimum program requirements; local jurisdictions can adopt more stringent requirements.

Because the urban stormwater program is a new initiative for Ecology and the local jurisdictions, and no current guidance is available for either of them to develop and implement stormwater control measures, Ecology shall prepare guidelines for the programs which address the issues listed in SW-1 above. Regulatory and institutional issues such as the use of permits or other measures shall be investigated. SW-2 is also a new program for Ecology and the cities and counties, and guidance needs to be developed.

4.1 Guidelines for SW-1 (Urban Stormwater Programs)

Ecology, in conjunction with local jurisdictions, shall develop guidelines for the requirements of the urban stormwater programs (SW-1). Local stormwater programs are required to address runoff from residential, commercial, and industrial areas including streets and roads.

The guidelines shall include:

a. Procedures for inventorying storm drains and combining this information with land use data.
b. Monitoring requirements and protocols, if necessary.
c. Review of operation and maintenance programs.
d. Procedures for investigations, implementation of spill control measures, enforcement, and remedial actions.
e. Methods for assuring adequate local funding for the urban stormwater program.
f. Guidelines for agreements with neighboring jurisdictions because stormwater and watersheds do not always follow jurisdictional boundaries.
g. Model ordinances for new construction.
h. Requirements for public education programs.
i. Requirements for retrofitting and/or treatment measures, if necessary.
j. Guidelines for inspection, compliance, and enforcement measures.
k. Requirements for implementation schedules.

4.2 Guidelines for SW-2 (Operation and Maintenance Programs and Runoff Ordinances)

Ecology shall develop guidelines and model ordinances to be used by all cities and counties in the operation and maintenance of existing stormwater systems and the preparation of runoff ordinances for new development (SW-2).

The guidelines shall include:

a. Procedures for developing local ordinances, including procedures for Ecology review and approval of ordinances.
b. Minimum requirements for runoff controls required in local ordinances.
c. Model ordinances for use by local governments in preparing their ordinances. The model ordinances shall be designed to control both stormwater and "wash down" water[27] from new and existing developments. The guidelines shall specify which developments and uses shall be subject to special runoff requirements.

Ecology shall also prepare guidelines on the review of existing ordinances for privately owned stormwater systems and the review of operation and maintenance programs.

The guidelines shall lay out acceptable approaches to control stormwater from new development, such as water quality policies for use in SEPA and other permit decisions; density controls to limit development in sensitive areas; development standards to limit the amount of impervious surfaces; regional detention ponds; oil separators or other treatment facilities;

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[27]Equipment cleaning or maintenance may generate polluted water which is not necessarily associated with storm events.

drainage ordinances; erosion control programs; preservation of wetlands; or other elements.

The guidelines shall also describe the minimum requirements for operation and maintenance of existing stormwater systems, the review of existing ordinances requiring maintenance of privately owned systems, and the education program. Ecology shall describe how it will evaluate the programs and what measures will be taken if the minimum requirements are not met by the local jurisdictions.

In giving guidance for SW-1 and -2, Ecology shall address the issue of responsibility and procedures for dealing with direct discharges of stormwater from industrial and commercial facilities into the waters of the state.

Target Date: The guidelines and the model ordinances are completed by June 30, 1989.

SW-5. PUGET SOUND HIGHWAY RUNOFF

Ecology shall require the Washington Department of Transportation (WDOT) to develop a program to control runoff from freeways and highways in the Puget Sound basin. WDOT shall be required to implement best management practices and/or install treatment facilities for new highway construction. Through a phased program, WDOT shall control and/or treat, if necessary, runoff from existing highways. Best management practices shall be used to address water quality and quantity and use of herbicides and pesticides in road rights-of-way. The most heavily traveled segments shall be addressed first, and other segments of the highway system shall be phased into the program. Where highway runoff discharges into stormwater systems owned and operated by local governments or private parties, WDOT shall provide funding for the construction and operation and maintenance of the systems commensurate with their proportional contribution. WDOT shall comply with the requirements of Ecology or local stormwater programs. In its review of WDOT's program, Ecology shall give consideration to site-specific constraints in implementing BMPs and/or treatment measures for existing highways.

Target Date: The highway runoff program will be developed by June 30, 1989. The program will include an implementation schedule.

SW-6. RUNOFF FROM FEDERAL FACILITIES

As part of the state certification process under Section 401 of the federal Clean Water Act, Ecology will require that all NPDES permits for federal facilities, including military bases, written by EPA contain stormwater controls that are at least as stringent as those required for industrial facilities in Municipal and Industrial Discharges program element P-8, including all toxicant and particulate limits and requirements for monitoring, spill control, and public notice. EPA is requested to review existing EPA-issued permits and modify any permit as necessary to include such limits and requirements. (See Municipal and Industrial Discharges program elements P-5, -9, and -11). Before considering a 401 certification for a federal facility permit, Ecology shall seek to be familiar with

the facility site through joint site visits or inspections with EPA or other means (for discharges of wastewater from federal facilities, see Municipal and Industrial Discharges program element P-11).

Target Date: Ecology shall initiate this program on January 1, 1987. After September 30, 1987, Ecology shall not certify the renewal of any NPDES permit for a federal facility under Section 401 of the Clean Water Act unless the permit includes numerical limits and/or other conditions required to comply with all applicable water quality and sediment standards and other elements of this plan.

SW-7. RESEARCH BY ECOLOGY ON WETLANDS AND STORMWATER

Ecology shall partially fund and participate in research on the use of wetlands for stormwater quality and quantity control. Ecology shall cooperate with state and local agencies that have agreed to fund part of the workplan developed by King County which addresses the effects of stormwater on water quality, sediment quality, wetland ecology, groundwater resources, and other issues. Ecology shall encourage a research program designed to obtain the data necessary to support policy and regulatory decisions regarding water quality and the effects of stormwater discharges on wetlands. The King County wetland study will require five years to complete. After the first year, Ecology shall evaluate the results and determine their applicability to Ecology's needs. Funding from local, state, and federal sources should be sought to fund the remaining elements of the research program.

Target Date: Ecology shall participate in the wetlands research project which will commence on January 1, 1987.

SW-8. CSO REDUCTION GUIDELINES

The Authority recognizes that Ecology is nearing completion of guidelines for local planning to achieve greatest reasonable reduction of CSOs. The goal of the guidelines shall be to achieve greatest reasonable reduction of pollutants from both stormwater and sanitary sewage in CSOs. If local governments choose stormwater separation, best management practices shall be required and the impacts of stormwater shall be monitored by the municipality. Ecology shall also update the guidelines and provide technical assistance to local governments implementing the guidelines (SW-9).

Target Date: Ecology published the draft CSO guidelines on November 19, 1986. Public meetings and hearings have been held in December 1986, and adoption of the guidelines is scheduled for January 1986.

SW-9. CSO REDUCTION PLANS BY CITIES (OR SEWER DISTRICTS)

As required by RCW 90.48.480, each city, sewer jurisdiction, or other entity with CSOs[28] shall submit to Ecology a plan to achieve greatest reasonable reduction of CSOs consistent with Ecology guidelines. The plans will include priority ranking of CSOs, implementation schedules, and provisions for funding of the corrections. Ecology will review the plans, develop compliance schedules, and modify NPDES permits.

Target Dates: Cities with CSOs are to submit CSO reduction plans to Ecology for approval on November 1, 1987. Ecology shall approve or disapprove of the plans by January 1, 1988. The controls will be implemented according to a compliance schedule negotiated between Ecology and each jurisdiction.

MAJOR PUBLIC ACTIONS FOR AUTHORITY REVIEW

1. Ecology guidelines for urban stormwater programs (SW-3).
2. Program for Puget Sound highway runoff (SW-5).
3. Ecology CSO reduction guidelines (SW-8).

LEGISLATION REQUIRED

None

ESTIMATED COSTS

The stormwater and CSO program is estimated to cost $370,000 in fiscal year 1988, increasing to $3.1 million in fiscal year 1990 and to $9.1 million in fiscal year 1991. The following discussion explains these costs and some of the costs not included in the estimates.

CSOs

The CSO control programs are expensive. Estimated costs for CSO reduction are based upon a state needs assessment conducted by Ecology. The total costs of CSO corrections for nine cities and Metro[29] over the next 14 years have been estimated to be $163 million.[30] These costs are a result of existing requirements; this plan does not impose new requirements on CSOs.

Urban Stormwater Program

Many cities and counties have already completed several elements of the urban stormwater program. Local governments which already have vigorous stormwater programs underway would be expected to have less of an increase in costs than those with only minimal programs. However,

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[28]Deadline set by current state law. All CSO deadlines in this program are based upon the need to comply with current state law requiring CSO reductions. Cities known to have CSOs and therefore affected by this requirement are Seattle (and Metro), Anacortes, Bellingham, Bremerton, Everett, Marysville, Mount Vernon, Olympia, and Port Angeles.

[29]Costs for the city of Olympia are not available.

[30]Water Quality Protection Needs Evaluation. Executive Summary. Washington Department of Ecology. October 1986.

given the tendency of most local surface water management programs to emphasize flood control rather than water quality control, some additional costs would be incurred by virtually all local governments.

Because source controls and best management practices are emphasized before treatment, the costs to local government may not be as significant as they would be if treatment were required. There will, however, be costs for operation and maintenance of systems, remedial actions, public education, etc.

The Authority has surveyed several large and small cities[31] in the Puget Sound basin regarding estimated costs of the plan's urban stormwater program (SW-1).

a. *Inventories.* All of the larger cities have complete or nearly complete maps and/or inventories of their storm drains. These cities have already met the requirements of the first element of SW-1. The city of Seattle has good maps of the publicly owned storm drains. If it was required to inventory private drains, it would take 2 FTEs per year for two years at a cost of about $250,000. At a cost of $60,000, Bremerton has just started a storm drain inventory that will take 1.5 years to complete. Many of the small cities also have maps or inventories. Port Orchard, however, does not have maps of its storm drains and estimated that it would cost $52,000 (2 FTEs for six months of field work and $2,000 of mapping) to make one. Winslow estimated that it would cost about $85,000 to map its drains.

b. *Land use.* Most cities have accurate zoning maps or master plans describing land uses. For most of them, combining land uses and storm drains is an easy task. Tacoma could use its customer billing records to determine land uses. Combining this information with maps of the stormwater system would cost about $12,000. City staff in Lynden commented that because of the city's small size, they know where the problem areas are.

c. *Ordinances for new development.* Unless the ordinances generated great controversy, most cities thought that the costs of adoption would not be great. Everett staff said the ordinance adoption could be absorbed into their current workload. The costs of reviewing permits by local government was not estimated.

d. *Operation and maintenance programs.* Many cities, large and small, have storm drain maintenance programs which are part of the annual budget for the engineering department. The range of current costs are: Seattle, $1.7 million/year; Tacoma, $1.1 million/year; Bremerton, $300,000/year; Bellingham, $476,000/year; Everett, $150,000/yr; and Lynden, $6,000/year. Marysville does not have a program but has

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[31]Nine cities were surveyed: Seattle, Tacoma, Everett, Bellingham, Bremerton, Olympia, Marysville, Poulsbo, Port Orchard, Winslow, and Lynden.

recently bought a vactor truck. Port Orchard would have to buy a vactor truck ($100,000) and hire 1 FTE ($28,000) to operate it. Winslow is in a similar position. Almost all of the cities said they could do a better job with additional funds. Seattle said it could increase its program five times. Everett maintains only 25 percent of its drains each year. Olympia's program is "hit or miss," and city staff says it would cost about $500,000/year to do a good job.

e. *Complaint response/investigations/illegal hookups/remedial actions.* Several cities have programs to address some of these elements of the urban stormwater program. In Seattle, complaints and investigations are handled by Ecology and Metro, but they estimate that it would take 1 FTE ($65,000/year) and lab costs ($20-40,000/year) for the city to participate in the program. Seattle has been involved in two remedial actions: one cost $17,000 and another cost $90,000. Tacoma has a budget of $281,000 for these activities. Bremerton has a response program. If an investigative program were established, it would cost about $100,00/year. Bellingham does not have a program and thought it would cost about $95,000/year. Olympia does very little currently and estimates the program would cost about $75,000/year. Port Orchard funds a complaint hot line. Poulsbo has already budgeted this program and has full response capability. Lynden is satisfied with its program and does not know what more could be done. Marysville receives very few complaints.

f. *Education.* Of the cities surveyed, only Seattle, Tacoma, and Bellingham had education programs. In Seattle, Metro has brochures, bus ads, and has funded community action projects. The Tacoma-Pierce County Health Department has a budget of $60,000/year to investigate small generators of hazardous waste and to educate businesses about proper disposal. Bellingham has a household hazardous waste program, quarterly news releases, utility billing messages, and a school program. The costs of developing an educational program ranged from $100,000 in Seattle to $20,000 in Olympia to $1,000 in Poulsbo.

g. *Monitoring.* Because only one municipality has initiated a storm drain monitoring program, monitoring costs for the urban stormwater programs are difficult to estimate. Metro has implemented an intensive, aggressive storm drain monitoring program in the heavily polluted Duwamish industrial area of Seattle. The program costs about $75,000 per year. This includes collecting and analyzing approximately 50 samples per year, preparing reports, and discussing the results with Ecology and affected businesses and industries. A storm drain monitoring program in a smaller, less industrialized urban area would cost much less, possibly requiring ten or fewer samples per year. Monitoring costs vary widely according to the parameters analyzed. Conventional parameters (suspended solids, pH, dissolved oxygen, and oil and grease) are inexpensive to measure; a priority pollutant analysis for toxic chemicals can cost $1,200 per sample.

Stormwater Programs for All Cities and Counties

Because there are fewer requirements, the costs for stormwater programs developed by all cities and counties (SW-2) will be less than the urban stormwater programs (SW-1). In addition to (c) and (d) above, cities and counties will have to review their ordinances to determine if they provide for maintenance of privately owned stormwater systems.

Highways

The Washington State Department of Transportation (WDOT) estimates that it would cost $50 million to implement stormwater controls on all state highways in the Puget Sound basin. If the program is phased, covers new construction, and targets the most heavily traveled segments of the highway system, the costs to WDOT would be significantly reduced--approximately half of this original estimate.

The private sector costs of the plan depend on the best management practice or source control chosen. Some housekeeping measures are very inexpensive. For example, paving and building berms and drum storage areas at commercial and industrial sites can prevent spills and leaks from polluting stormwater. According to EPA's "Report to Congress: Nonpoint Source Pollution in the U.S." (January 1984), on-site retention/detention basins can cost between $300 and $2,000 each or $100 to $1,500 per acre served, and roadside swales can cost between $2,000 and $4,000 per acre served. For erosion and sedimentation controls, Metro has prepared a technical memorandum, "A Supplier's Guide to Erosion Control Materials" (June 1984). It lists costs and local suppliers of materials to be used to control runoff from new construction. For example, erosion control fabrics used to protect seeds and soil on bare slopes cost between $0.49 and $10.34 per square yard. The amount of material needed depends on the size of the construction project.

ESTIMATED COSTS: STORMWATER & CSOs	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Program Element						
SW-1: URBAN STORMWATER PROGRAMS[1]	0	0	34,400	595,600	6,779,900	8,012,700
SW-2: OPERATION AND MAINTENANCE PROGRAMS AND RUNOFF ORDINANCES[2]	0	0	0	2,176,900	2,173,300	400,700
SW-3: TECHNICAL MANUALS ON STORMWATER AND EROSION CONTROLS	0	129,300	180,800	50,700	6,700	6,700
SW-4: GUIDELINES FOR NPDES PERMITS - BMP EMPHASIS	0	54,300	104,800	50,700	6,700	6,700
SW-5: PUGET SOUND HIGHWAY RUNOFF[3]	0	0	77,300	37,900	37,600	37,400
SW-6: RUNOFF FROM FEDERAL FACILITIES	0	25,500	38,600	38,000	37,800	37,700
SW-7: RESEARCH BY ECOLOGY ON WETLANDS & STORMWATER	0	79,500	0	0	0	0
SW-8: CSO REDUCTION GUIDELINES[4]	0	0	0	0	0	0
SW-9: CSO REDUCTION PLANS BY CITIES[5]	0	79,700	103,300	101,400	100,500	100,200
TOTAL ANNUAL ESTIMATED COSTS:	$0	$368,300	$539,200	$3,051,200	$9,142,500	$8,602,100

ESTIMATED COSTS: STORMWATER & CSOs	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Agency						
FEDERAL GOVERNMENT						
EPA	0	11,000	11,000	11,000	11,000	11,000
STATE GOVERNMENT						
ECOLOGY	0	357,300	528,200	1,078,800	982,100	979,100
OTHER						
LOCAL GOVERNMENTS	0	0	0	1,961,400	8,149,400	7,612,000
TOTAL ANNUAL ESTIMATED COSTS:	$0	368,300	539,200	3,051,200	9,142,500	8,602,100

[1]Local costs are based on likely impacts upon Seattle, Tacoma, six medium-sized cities or unincorporated areas, and two small cities.
[2]Costs of preparing ordinances and operation & maintenance programs only. Does not include enforcement or costs to private sector. Includes 12 counties, 20 cities over 10,000 population, and 57 smaller cities. Does not include local governments covered in SW-1.
[3]The Washington Dept. of Transportation estimates that improved runoff systems in the Puget Sound region may cost $25 million with phased implementation. This may be funded from the gasoline tax.
[4]This activity is funded by Ecology under House Bill 815, Laws of 1985.
[5]Ecology's "Needs Assessment" estimates local government CSO reduction costs from now to the year 2000 at about $163 million.

LABORATORY SUPPORT

PROBLEM DEFINITION

Many of the programs in this plan depend on the accuracy of laboratory results. These include the programs for Municipal and Industrial Discharges, Contaminated Sediments and Dredging, Stormwater and Combined Sewer Overflows, Nonpoint Source Pollution, Shellfish, Monitoring, and Research.

Laboratories provide the information needed to understand how Puget Sound responds to contaminants and how to design programs to prevent and remedy the effects of contaminants. Many laboratory analyses are conducted in conjunction with federal, state, or local laws designed to prevent degradation of water quality and threats to human health. For instance, the Clean Water Act requires municipal and industrial wastewater discharges to be routinely monitored. Ecology and EPA rely on these results to determine whether the law and associated permit requirements are being followed and whether enforcement action is necessary. The Department of Social and Health Services relies on results of analyses of water quality and shellfish tissues to be sure that fecal coliform levels are within specific levels designed to protect human health. Laboratory analyses are also conducted for routine ambient monitoring to establish trends and for investigations designed to answer specific questions (often done as part of an environmental impact statement or to establish a target area for further study).

Protocols (procedures) for the collection and analysis of environmental samples are currently not standardized. Quality control/quality assurance procedures are generally lacking. In cases where they exist, there is no method to determine to what extent they are followed. Thus, laboratory results may come into question, and their usefulness can be impaired. Some NPDES permittees utilize their own laboratories to test their effluent, and each one may have a slightly different procedure. This results in data that are not comparable. Agencies with large ambient monitoring programs also lack comparable data from year to year. This makes it difficult to determine trends and toxicant loadings in Puget Sound.

Ecology's laboratory program has inadequate staff and financial resources. This has led to delayed turnaround times for analyses, field staff that are not always fully trained in proper sample collection, and other problems that have limited the ability of the laboratory program to support other Ecology programs. The EPA/Ecology lab at Manchester currently has heavy demands on it which can cause analyses to be delayed by up to several months, particularly if a priority pollutant analysis is involved. These delays impede future investigations or enforcement actions that depend on the results of the analyses.

PROGRAM GOAL

To assure the quality and timeliness of physical, chemical, and biological laboratory tests necessary to support the protection and enhancement of the waters of Puget Sound.

STRATEGY

The strategy for achieving this goal is (1) to establish a laboratory certification program administered by Ecology that will certify the accuracy of laboratories used to sample and test water quality, groundwater, potable water, solid/hazardous waste, bioassays, air, soils, sediments, and tissues; and (2) to provide laboratory support for agency sampling programs.

SUMMARY DESCRIPTION

This program calls for certification of laboratories used for compliance monitoring and investigative sampling and provides for adequate laboratory capacity for implementation of the plan.

MAJOR FEATURES

---Ecology adopts quality assurance/quality control protocols and designs a certification program for private and agency laboratories.

---Ecology plans for agency laboratory needs and adequate funding for laboratory analyses.

---Ecology develops sample tracking and quality control programs for its labs.

PROGRAM ELEMENTS

L-1. LABORATORY CERTIFICATION PROGRAM

PSWQA shall submit proposed legislation to the 1987 Legislature authorizing Ecology to conduct a laboratory certification program and to charge fees to laboratories seeking certification. Ecology shall design a plan for a laboratory certification program. Ecology shall certify labs for substances and chemical groups in a phased manner with first priority given to certification that supports water quality programs. Laboratories owned and operated by individual industrial and/or municipal dischargers shall be eligible for certification. Agency-operated laboratories shall also apply for certification under the same rules that apply to private laboratories. This plan shall be coordinated to the maximum extent possible with existing laboratory certification programs. Ecology shall negotiate agreements with other state certification programs to allow for reciprocity.

Through the certification plan Ecology shall adopt rules requiring all certified laboratories to use approved field and laboratory protocols and to comply with specified quality assurance/quality control procedures. Ecology shall establish and implement these protocols prior to implementation of the certification program. Ecology shall consider the use of protocols developed by the Puget Sound Estuary Program. Ecology's certification plan shall evaluate the advisability of charging certification fees. If Ecology's evaluation concludes that certification fees are advisable, Ecology may charge such fees.

During the design and implementation of the certification program Ecology shall work with federal, state, and local agencies and consult with individuals from the scientific community, private labs, environmental groups, and industry.

NPDES permittees shall not be required to use certified labs until the certification program is operational and an adequate number of certified labs are available to perform needed analyses. (See also element P-16.)

Target Dates: PSWQA submits legislation to the 1987 Legislature. Ecology completes draft certification program plan by April 30, 1988. Certification of labs begins by January 1, 1989.

L-2. LABORATORY CAPACITY FOR ECOLOGY PROGRAMS

Ecology shall hire qualified staff to oversee quality control for all sample analyses and shall develop a sample tracking system and a data management plan. Ecology shall biennially submit to the Authority a report on laboratory needs including (1) an estimate of the number and types of analyses needed to support Ecology programs; (2) a review of the service provided by Ecology laboratories including turnaround times, data quality, data management, detection limits, and staff communication; and (3) an analysis of the additional laboratory capacity needed to carry out these analyses within the target turnaround times which Ecology shall specify. Beginning in 1990 each laboratory needs report shall contain a summary of the analyses performed and the turnaround times achieved during the preceding year as well as an update of the laboratory plan described below. Prior to 1990 the report shall include qualitative summaries of analyses performed and turnaround times.

Ecology shall develop and submit to the Authority a laboratory plan that, through a combination of agency laboratory capability and contract laboratory support, assures that all samples are analyzed within the turnaround times contained in the laboratory needs report while meeting the highest possible quality standards. The laboratory plan shall include a consideration of whether additional staff are needed to fully utilize existing laboratory equipment (including night shifts). Ecology shall fully explore the use of laboratory capacity of other agencies (including extra shifts) and contract laboratories before recommending establishment of new laboratory facilities. The plan shall also provide for training Ecology staff to determine the appropriate number and types of analyses for various situations. Finally, Ecology shall conduct annual audits for unnecessary sample analysis requests.

In preparing the laboratory needs report and plan, Ecology shall consult with DSHS and incorporate DSHS laboratory needs related to the Puget Sound plan in the reports.

Target Dates: Ecology submits laboratory plan to the Authority by August 1, 1988. Ecology submits first biennial laboratory needs report to the Authority by August 1, 1988. Ecology begins implementation of laboratory plan by September 1, 1988. Ecology completes first annual audit of unnecessary requests for sample analyses by August 1, 1989.

Each laboratory needs report contains summary of analyses performed, turnaround times, and update of laboratory plan described above by August 1, 1990, and every two years thereafter.

MAJOR PUBLIC ACTIONS FOR AUTHORITY REVIEW

1. Ecology's laboratory certification plan (L-1).
2. Ecology's Laboratory Needs Report (L-2).

LEGISLATION REQUIRED

Legislation authorizing Ecology to conduct the laboratory certification program and to administer certification fees (L-1).

ESTIMATED COST

This program is estimated to cost approximately $400,000 in fiscal year 1988 and between $424,000 and $604,000 per year thereafter. Costs presented for element L-1 of this program are for the water quality component of the certification program and do not include costs for other areas (such as hazardous waste) for which Ecology may eventually certify laboratories. Costs for laboratory analyses needed by other programs in the Puget Sound plan are found in the cost estimates for the programs. If the laboratory study (L-2) recommends new lab facilities for agencies, costs of up to $5 million may be incurred.

Certification fees may eventually be used to fund a portion of the certification element.

The laboratory certification program would entail private sector costs to NPDES permit holders, private professional laboratories, and possibly others who utilize private laboratories. These costs would be highly variable depending on several factors, including: (1) the current quality of the equipment and staff of the lab applying for certification; (2) the protocols called for in the certification program Ecology designs; and (3) whether or not Ecology decides to use certification fees and, if so, how it administers these fees. Given that these three factors will not be defined until the certification program is designed, it is not possible to estimate the actual costs to the private sector.

For NPDES permit holders that currently have laboratories and apply for certification (this is likely to be primarily those with major permits) the present quality of their laboratory and staff would likely be the major factor influencing costs. Finally, because the certification program would require quality assurance/quality control protocols and other measures designed to ensure accurate results, it is likely that fewer repeat analyses would need to be conducted. In turn, this could result in reduced laboratory costs to NPDES permittees and others who use private laboratories.

ESTIMATED COSTS: LABORATORY SUPPORT	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Program Element						
L-1: LABORATORY CERTIFICATION PROGRAM	0	287,500	455,600	448,900	302,000	301,300
L-2: LABORATORY CAPACITY FOR ECOLOGY PROGRAMS[1]	0	112,300	141,800	155,400	122,800	154,000
TOTAL ANNUAL ESTIMATED COSTS:	$0	$399,800	$597,400	$604,300	$424,800	$455,300

ESTIMATED COSTS: LABORATORY SUPPORT	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Agency						
STATE GOVERNMENT						
ECOLOGY	0	384,000	581,600	572,800	424,800	423,800
DSHS	0	15,800	15,800	31,500	0	31,500
TOTAL ANNUAL ESTIMATED COSTS:	$0	399,800	597,400	604,300	424,800	455,300

[1]It is assumed that Ecology will provide additional funding for this element in their 1988-89 budget. Costs are estimated only for the water quality portion of the lab certification program and do not include costs for certification of labs for hazardous waste and other substances.

WETLAND PROTECTION

PROBLEM DEFINITION

THE IMPORTANCE OF WETLANDS

Wetlands are a valuable resource for a number of reasons. First, they are the most biologically productive ecosystems in nature, anchoring the estuarine and freshwater food chains through photosynthesis and the production of innumerable small organisms upon which larger creatures depend.

For a vast diversity of species, including birds, fish, reptiles, invertebrates and mammals, wetlands are an essential habitat for feeding, nesting, cover, and breeding. At least one-third of our state's threatened and endangered species require natural wetlands for their survival.

Wetlands also slow and store floodwaters, reduce shoreline erosion from wind and tidal action, and help recharge groundwater supplies. Wetlands function naturally to improve water quality by filtering out sediments, using excess nutrients, and breaking down some toxic chemicals.

Socioeconomic benefits are provided by wetlands. Wetlands are a scenic destination for hiking, boating, photography, and nature appreciation. Wetlands contribute to a productive commercial and recreational fishery. Wetlands also provide important educational and research opportunities. The economic value of these functions is very high.

THE LOSS OF WETLANDS

More than half of the wetlands along the coasts and riverbanks of Puget Sound have been destroyed by human activity. In the Skagit Valley, for example, 90 to 95 percent of the wetlands have been lost, primarily to agriculture. Commercial development in areas such as the Green/Duwamish and Puyallup river basins has eliminated over 95 percent of the areas' original wetlands. Sensitive, rare, and important wetland types, including herring and smelt spawning beds and salt marshes, have been lost or are threatened. In some cases, such as inland freshwater wetlands, the nature and extent of wetland loss is unknown because wetland inventories are lacking.

Some of the original causes of wetland loss, such as diking wetlands to create pastureland or to control coastal flooding, no longer pose a threat to wetlands. However, wetlands and especially marine shorelines remain choice locations for certain types of industrial, commercial, and residential use. For example, there continues to be incremental loss of some estuarine wetlands from port industrial development and to an unquantified extent from small projects such as bulkheading. These losses can represent significant percentages of some habitat types in certain areas.

A variety of federal, state, and local laws are now in effect which help control wetland loss. However, because of limitations of these laws, important wetlands remain vulnerable to irretrievable loss. For many of these laws the decision to protect wetlands is discretionary rather than

mandatory. And because regulations can be repealed or amended, permanent wetland protection is not assured.

Most of the laws exempt small water bodies and wetlands from regulation, or contain various exemptions, typically for minor development projects or activities. Actions adjacent to wetlands but lying outside a regulatory boundary, such as the 200-foot limit of the Shoreline Management Act, may also adversely affect wetlands. The cumulative effect of these exemptions and limitations is that important wetlands throughout the Puget Sound basin continue to be harmed or lost.

PROGRAM GOAL

To ensure that the most important wetlands of the Puget Sound Basin are preserved in perpetuity and that degradation of other valuable wetlands is minimized.

STRATEGY

The strategy for achieving this goal is to identify those critical wetlands that should be preserved and either purchase or through some other mechanism safeguard those wetlands. Additionally, local governments are required to develop local wetland protection programs which meet minimum state standards promulgated by Ecology, and DNR will develop a program for its state-owned lands. Local wetland inventories will be required if Ecology determines through its rulemaking process that they are needed.

SUMMARY DESCRIPTION

Ecology, with assistance from other state agencies, is required to initiate a program to preserve the most important wetlands of the Puget Sound basin. Preservation is to be achieved through a variety of traditional and innovative mechanisms such as acquisition by purchase, exchange, or gift, use of conservation easements, or other methods.

Ecology is also required to study and develop a program for enhanced regulatory protection of the water quality and habitat functions of Puget Sound wetlands. Ecology's evaluation shall consider the need for wetland inventories, the sizes of wetlands to be protected, the content of use and development standards, the need for legislation to accomplish identified goals, and any other matters deemed important to an effective regulatory program. Local governments will then measure their wetland protection efforts against the minimum requirements established by Ecology and take appropriate actions to meet those requirements. DNR is to develop a program for its state-owned wetlands which is consistent with the Ecology program and with local programs.

MAJOR FEATURES

---Important Puget Sound wetlands are preserved through acquisition or other methods.

---Enhanced regulatory protection of wetlands is accomplished through local government programs which meet minimum state standards.

PROGRAM ELEMENTS

W-1. CRITERIA DEVELOPMENT AND PROGRAM PLANNING

With Ecology as lead and with assistance from DNR, a preservation program shall be prepared which consists of the following:

1. Detailed criteria for selection of wetlands to be preserved, including representative wetlands of various types.

2. Evaluation of techniques and mechanisms for preservation of wetlands, including acquisition by purchase, exchange, or gift, and use of innovative methods such as conservation easements and transfers of development rights.

3. Description of wetlands which have been identified by DNR as having the highest priority for preservation, but which have not yet been acquired through early action, together with the costs and the appropriate mechanisms for preserving them.

4. An analysis of appropriate agencies to acquire and manage different types of wetlands.

This report shall be submitted to the Authority for review.

Technical assistance in developing the program shall be provided to Ecology by the Departments of Natural Resources, Fisheries, and Game. Close coordination with the existing DNR Natural Heritage Program shall be maintained. A working group shall be formed by Ecology consisting of wetland scientists, wetland specialists from governmental agencies, and representatives of Indian tribes, landowners, developers, conservation groups, and industry. The expertise and advice of this group shall be used to develop innovative approaches to wetland preservation and to assist in making a broad range of potentially interested individuals and organizations aware of the wetlands preservation program. This group shall continue to provide assistance throughout the implementation process.

Target Date: Report submitted by January 1, 1988.

W-2. IDENTIFICATION OF WETLANDS TO BE PRESERVED

With Ecology as lead and with assistance from DNR, the wetlands to be preserved shall be identified and ranked. Documentation shall accompany this identification describing the size, location, physical and biological characteristics, and functions of the wetlands and demonstrating how the list of priority wetlands was chosen. Game and Fisheries shall provide technical assistance. Public workshops shall be held to provide education and to encourage participation by a broad spectrum of the public in the selection process. The Authority shall review the selection and associated documentation of wetlands chosen for preservation.

Target Date: First set of important wetlands identified by January 1, 1988. Ranking of all classes of wetlands by July 1, 1989.

W-3. WETLAND PRESERVATION

With DNR as lead and with assistance from other state agencies, the state shall take actions necessary to preserve and protect in perpetuity those wetlands identified under element W-2. This is a multi-year, phased program in which specific sites are protected as funds become available. Early action is taken to acquire important wetlands such as salt marshes already identified through the DNR Natural Heritage Program and important remaining wetlands of the Snohomish Delta.

DNR shall provide technical advice and limited staff support to any agency, organization, or private party wishing to take the lead in preserving any site. State preservation actions should coordinate with and complement preservation programs of private organizations such as The Nature Conservancy and Trust for Public Lands.

Target Date: Initiate acquisition for most important sites on January 1, 1988. Other sites acquired as funding becomes available.

W-4. STATE STANDARDS

By rule, Ecology shall adopt minimum standards for local wetland management programs in the Puget Sound basin. These standards shall prescribe the minimum features that must be contained in local programs. In developing the standards Ecology will study means of enhancing regulatory protection for water quality and habitat functions of wetlands. This will include the identification of wetland types or sizes which require additional protection and necessary and optional means of providing such protection. The rules may contain standards for wetland use and development, such as requirements for water dependency, an absence of practical alternatives, public benefit exceeding public loss from wetland changes, and use of mitigation. In developing the standards Ecology shall identify legislative actions which may be necessary to implement the enhanced regulatory program.

Ecology shall also review existing wetland inventories and determine if they are adequate to meet the needs of the enhanced regulatory program. If Ecology determines that they are not, Ecology shall, as part of the rulemaking process, establish minimum requirements for inventories of important wetlands.

Prior to proposing the state standards, Ecology shall work closely with entities having expertise in wetland management and regulation, such as federal, state, and local governmental agencies, and tribes. In particular, Ecology shall coordinate with efforts of the federal Environmental Protection Agency in classifying and protecting wetlands.

Target Date: Adopt standards by November 1, 1988.

W-5. LOCAL PROGRAM DEVELOPMENT

Local governments shall measure their wetland protection efforts against the state standards and identify what actions are necessary to establish a local program which meets the standards. The assessment and proposed actions shall constitute the local program which must be approved by Ecology.

Local governments are encouraged to use existing authority to implement wetland protection programs prior to the dates identified by this plan, and to consider adopting programs which exceed the minimum state standards to be developed by Ecology.

Target Date: Local governments submit programs to Ecology by May 1, 1989. Ecology completes approval process by November 1, 1989.

W-6. PROGRAM FOR STATE-OWNED LANDS

For state-owned lands managed by DNR, DNR shall:

- Comply with adopted local regulatory programs in management of wetlands on state-owned uplands and aquatic lands, consistent with laws pertaining to state land management.
- Coordinate with Ecology to ensure that management programs for state-owned uplands are consistent with Ecology wetland policies.
- Implement a management program for wetlands on state-owned aquatic lands in the Puget Sound basin consistent with Ecology policies and including review of key regulatory actions of other agencies, use of appropriate conditions in aquatic lands leases, and withdrawal of critical aquatic land areas from leasing.

Target Date: Upon approval of local programs and state policies.

MAJOR PUBLIC ACTIONS FOR AUTHORITY REVIEW

1. Ecology's adoption of acquisition criteria (W-1).
2. Ecology's adoption of preservation priority list (W-2).
3. Ecology's adoption of state standards (W-4).

LEGISLATION REQUIRED

None

ESTIMATED COST

This program is estimated to cost almost $800,000 in fiscal year 1988, $1.3 million in fiscal year 1989, $700,000 in fiscal year 1990, and about $650,000 per year thereafter. The greatest public cost is for wetland acquisition. This plan calls for state funds of $550,000 per year between the years 1988 and 1992, possibly to be financed from the sale of bonds and from the state water quality account. It is intended that the expenditure of these public funds will be coordinated with the wetland acquisition program of The Nature Conservancy to achieve the most effective wetlands protection. Implementation of state wetland protection standards by local governments may entail substantial public and private expense, but the amount of expense is unknown until the standards are

developed.[32] Private sector costs are potentially greatest--and most difficult to estimate--where development activities are severely restricted in wetland areas. The cost impacts of design restrictions and mitigation requirements can conceivably outweigh project benefits in some cases.

The following table shows fiscal year costs for individual elements.

[32]A potential substantial public cost for the 1990-91 biennium is conducting wetland inventories by local governments. This cost would depend on the W-4 standards and is not included in the cost estimate for the program.

ESTIMATED COSTS: WETLANDS	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Program Element						
W-1: CRITERIA DEVELOPMENT AND PROGRAM PLANNING	0	57,700	0	0	0	0
W-2: IDENTIFICATION OF WETLANDS TO BE PRESERVED	0	79,100	146,300	0	0	0
W-3: WETLAND PRESERVATION[1]	0	527,500	555,000	555,000	555,000	555,000
W-4: STATE STANDARDS	0	115,900	27,600	0	0	0
W-5: LOCAL PROGRAM DEVELOPMENT[2]	0	0	495,000	122,600	67,000	66,800
W-6: PROGRAM FOR STATE-OWNED LAND	0	0	27,500	27,500	27,500	27,500
TOTAL ANNUAL ESTIMATED COSTS:	$0	$780,200	$1,251,400	$705,100	$649,500	$649,300

ESTIMATED COSTS: WETLANDS	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Agency						
STATE GOVERNMENT						
DNR	0	568,700	610,000	582,500	582,500	582,500
ECOLOGY	0	188,300	186,000	67,600	67,000	66,800
FISHERIES	0	7,700	5,100	0	0	0
GAME	0	7,200	4,800	0	0	0
PSWQA	0	8,300	5,500	0	0	0
OTHER						
LOCAL GOVERNMENTS	0	0	440,000	55,000	0	0
TOTAL ANNUAL ESTIMATED COSTS:	$0	780,200	1,251,400	705,100	649,500	649,300

[1]In the years 1988, 1989, 1990, 1991, & 1992 $500,000 per year is programmed for wetland acquisition by the state and in cooperation with private organizations such as The Nature Conservancy which contemplates expenditure of $1 million in 1988.
[2]Ecology may determine that inventories are necessary under W-4. Costs for local inventories are not included but could be costly, depending on the level of detail required by the W-4 standards.

OIL SPILL RESPONSE PLANNING

PROBLEM DEFINITION

In December 1985 a major spill of crude oil occurred in Port Angeles harbor as a result of the grounding of the *Arco Anchorage,* a tank ship carrying Alaskan crude oil. This event served to renew the concern for oil spills and their effects in Puget Sound marine waters. Such spills have obvious potential for significant water quality impacts, both short and long term.

When an spill occurs, much of the oil remains at the surface of the water where it is encountered by several species of marine birds. Bird mortality is the most dramatic effect of spilled oil. Effects have, in some instances, been great enough to jeopardize the continued existence of local populations. Surface oil also can affect the floating eggs and larvae of marine fish. In addition, loss of organisms from intertidal beaches can greatly reduce the food available to marine birds and fish. Effects from reduction in prey organisms can result in long-term population changes which are not easily detected immediately following an oil spill.

Oil spills in Puget Sound are violations of both federal and state law. Under the federal CERCLA (Superfund) statute, the party causing the spill is responsible for cleaning it up and paying the costs of doing so. The cleanup effort by the responsible party is conducted pursuant to national, regional, and state "contingency plans," which are complementary programs identifying what is to be done by whom in the event of a spill. The U.S. Coast Guard is the lead agency responsible for oil spill response in Puget Sound, with state and local governments performing a secondary role. The grounding of the *Arco Anchorage* demonstrated that, in practice, two areas of confusion are the use of volunteers and the role of local government in spill response.

PROGRAM GOAL

To enhance spill response capability in Puget Sound and to ensure that federal, state, and local spill response actions are coordinated.

STRATEGY

The strategy for achieving this goal is to use cooperative state and local contingency planning to address issues of concern regarding response to major oil spills.

SUMMARY DESCRIPTION

Ecology is required to complete a revised and updated contingency plan for spills of oil and hazardous substances. The revised plan will fully describe how Ecology personnel will handle various types and levels of spills including coordination with federal, tribal, state, and local agencies; private parties responsible for cleanup; and the public. Contingency plan revision is based on a spill response policy plan that specifies roles, responsibilities, communication, funding, and other matters.

The policy plan and contingency plan revisions are to be completed in cooperation with local, state, tribal, and federal entities and with review and advice from the Oil Spill Advisory Committee, which is continued at least through 1987. Membership on the advisory committee will be increased to ensure appropriate representation by all interested and affected entities. Ecology is charged with following through on the recommendations of the committee.

Ecology will provide for implementation of the revised contingency plan with increased staff.

MAJOR FEATURES

---Ecology develops a clear and complete policy on its spill response actions and responsibilities.

---Ecology revises and updates its spill response contingency plan, including appropriate roles for local governments and volunteers.

---The Oil Spill Advisory Committee assists Ecology in spill response planning.

---Ecology implements the revised contingency plan with increased staff.

---Spill prevention will be considered for comprehensive program development in the 1989 Puget Sound plan revision.

PROGRAM ELEMENTS

OS-1. POLICY PLANNING

Ecology shall conduct a detailed spill response policy analysis as a basis for updating the contingency plan. Ecology shall be assisted by the review and advice of the Oil Spill Advisory Committee, which shall be continued at least through 1987. Ecology shall follow through on the recommendations of the committee, including the preparation of draft legislation. Issues of particular importance to be addressed by the policy analysis include:

Role of local governments and tribes: Methods to maximize involvement of local governments and tribes shall be developed including using existing state and local emergency management channels. Local governments and tribes shall be requested to indicate what specific roles they could fulfill in spill response.

Role of volunteers: Guidelines shall be developed for the use of volunteers in spill response.

Wildlife rescue and rehabilitation: Legal authorities and responsibilities shall be clarified. Funding, coordination and participation, and preparedness shall be addressed.

Equipment: Placement of and authority over spill response equipment

shall be analyzed with respect to maximizing the speed and effectiveness of spill response.

Cleanup authority: Methods shall be examined to maximize Ecology authority to manage cleanup and damage assessment while recognizing the legitimate role of other entities.

Training: Careful attention shall be paid to training which ensures that the contingency plan is implemented correctly. Ecology shall cooperate with federal agencies and industry in staging a spill response drill.

Critical resource areas: An evaluation shall be made of whether information on priorities for protection of critical resource areas in Puget Sound is available and accessible. The need for additional information and/or synthesis of existing information will be evaluated.

Cleanup funding: An examination of current cleanup funding shall be made with recommendations for alleviating potential shortfalls.

Damage assessment: An evaluation of current procedures for damage assessment shall be made including appropriate contractual or other mechanisms for involving expert investigators from the private sector. The availability of funding for damage assessment from spills shall also be examined and recommendations made for alleviating potential shortfalls. An evaluation of the Alaska model for assessing damages on a per-barrel spilled basis shall be undertaken, and draft legislation implementing the Oil Spill Advisory Committee's recommendation on damage assessment shall be prepared.

Target Dates: Ecology shall complete a detailed spill response policy analysis by March 1, 1987. A spill response drill by Ecology, federal agencies, and industry shall occur during calendar year 1987.

OS-2. CONTINGENCY PLAN REVISION

Ecology shall complete major revisions to the existing state Contingency Plan for Spills of Oil and Hazardous Substances. The plan shall be consistent with the policy and roles of local, state, and federal entities involved with spill response. It shall be reviewed by the Oil Spill Advisory Committee.

Ecology shall provide for implementation of the revised contingency plan with increased staff, including on-site coordinators and spill support and damage assessment specialists. Ecology shall also prepare a pamphlet, suitable for the general public, describing the responsibilities of all participants in oil spill response.

Target Dates: Ecology shall complete major revision to the existing state Contingency Plan for Spills of Oil and Hazardous Substances by July 1, 1988. Ecology shall implement the revised contingency plan in fiscal year 1989.

NOTE: Authority consideration of developing a spill prevention program in its 1989 Puget Sound Water Quality Management Plan is included in Chapter 7, The Unfinished Agenda.

MAJOR PUBLIC ACTIONS FOR AUTHORITY REVIEW

1. Policy planning conclusions by Ecology (OS-1).

2. Contingency plan revisions by Ecology (OS-2).

ESTIMATED COST

The following table provides costs associated with policy planning and contingency plan revision together with costs associated with increased staffing necessary to implement changes in policies. These items may again be evaluated in a broader consideration of spill prevention and response during preparation of the Authority's revised Puget Sound plan to be adopted prior to January 1989. Further explanation of the items that may be included in the 1989 Puget Sound plan is contained in Chapter 7. Some private sector costs may result from changes to the contingency plan but cannot be estimated at this time. Improvements in spill response coordination may actually reduce ultimate cleanup costs to the spiller.

ESTIMATED COSTS: OIL SPILL RESPONSE PLANNING	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Program Element						
OS-1: POLICY PLANNING[1]	0	0	0	0	0	0
OS-2: CONTINGENCY PLAN REVISION	0	72,400	199,000	231,700	406,100	405,400
TOTAL ANNUAL ESTIMATED COSTS:	$0	$72,400	$199,000	$231,700	$406,100	$405,400

ESTIMATED COSTS: OIL SPILL RESPONSE PLANNING	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Agency						
STATE GOVERNMENT						
ECOLOGY	0	72,400	144,000	121,700	241,100	240,400
OTHER						
LOCAL GOVERNMENTS	0	0	55,000	110,000	165,000	165,000
TOTAL ANNUAL ESTIMATED COSTS:	$0	72,400	199,000	231,700	406,100	405,400

[1]Expenditures in FY 1987 will be funding with existing agency budgets.

MONITORING

PROBLEM DEFINITION

There is currently no long-term, comprehensive program to monitor Puget Sound and its resources. Some programs of federal, state, and local agencies monitor water, sediment, and biological resources of the Sound, but there is little cooperation or coordination of their monitoring efforts. Frequently, substantial amounts of data are gathered as part of specific, project-related intensive surveys, short-term or localized monitoring, and compliance monitoring. These programs are generally implemented independent of one another. Ambient monitoring, discharge monitoring, intensive surveys, and other programs to assess the quality of Puget Sound water, sediment, habitat, and biological resources are not currently integrated or coordinated. Currently, over $1 million is spent annually by federal, state, and local agencies monitoring various aspects of Puget Sound.

A comprehensive monitoring program could determine the effectiveness of regulatory programs, evaluate long-term trends in environmental quality, and assist in resource management decisions. Preventing overlap and duplication of programs would be a concern in designing a comprehensive program.

PROGRAM GOAL

To develop and implement a comprehensive environmental monitoring program for Puget Sound. Such a program will provide a record of significant changes in key environmental indicators in order to (1) assist decision-making of agencies by identifying problem areas and trends; (2) measure the success of the Puget Sound plan; and (3) provide an ongoing assessment of the health of the Sound.

STRATEGY

The strategy for achieving this goal is (1) to consult with agencies that have monitoring needs and expertise; (2) to review the draft monitoring program developed by a consultant to the Environmental Protection Agency; (3) to reach consensus on an interagency monitoring program; and (4) to provide ongoing interagency coordination among monitoring programs.

SUMMARY DESCRIPTION

This program provides for an interagency committee to recommend a comprehensive monitoring program to the Authority for later adoption.[33]

MAJOR FEATURES

---The Authority forms a Monitoring Management Committee to recommend and coordinate a comprehensive monitoring program.

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[33]Some features of this program started before adoption of the plan in December 1986. The Monitoring Management Committee held its first meeting in October 1986.

---The committee recommends a comprehensive monitoring program in 1987.

PROGRAM ELEMENTS

M-1. MONITORING MANAGEMENT COMMITTEE

The Authority shall form a Puget Sound Monitoring Management Committee chaired by the Authority and consisting of representatives from: the state Departments of Ecology, Game, Fisheries, Natural Resources, and Social and Health Services; Metro; local water and sewer districts and local public health officials; tribes; federal agencies including NOAA, EPA, Fish and Wildlife Service, U.S. Geological Survey, Soil Conservation Service, and the Army Corps of Engineers; Canadian agencies; industry; shellfish growers; the scientific community; and citizen organizations. The Authority shall provide staff support to the committee. Meetings shall be open to the public.

The management committee shall be responsible for recommending a comprehensive ambient monitoring program that responds to the needs of participating agencies in supporting their resource management responsibilities. The relationship of the ambient monitoring program to compliance monitoring shall be considered along with monitoring needs for the specific action programs required by the Puget Sound Water Quality Management Plan. Intensive surveys shall also be considered as will the possible role of citizens in monitoring activities.

Target Date: The Monitoring Management Committee was formed in September 1986 and held its first meeting in October 1986.

M-2. DEVELOPMENT OF MONITORING RECOMMENDATION

The management committee shall present a recommendation to the Authority. The monitoring recommendation shall:

a. Define the goals and objectives of the monitoring program.

b. Define how monitoring data will be used to assist in management of Puget Sound resources by responsible agencies.

c. Review and provide for the specific monitoring needs of programs in the Puget Sound Water Quality Management Plan.

d. Propose a monitoring design based to the extent applicable on the November 1986 consultant report to EPA on Puget Sound monitoring and review a similar report on freshwater (watershed) monitoring.

e. Analyze the data needed to meet the objectives of the monitoring program.

f. Analyze and evaluate existing programs and their relation to objectives of a monitoring program.

g. Identify comprehensive monitoring needs not being met by existing programs.

h. Identify mechanisms to obtain additional needed information either through redirection of existing programs or initiation of new programs.

i. Estimate annual costs associated with existing monitoring in Puget Sound and costs of additional needed monitoring.

f. Recommend a data management system that meets agency needs.

g. Define appropriate mechanisms to fund the monitoring program including allocation of existing funds and new funding.

h. Define the appropriate roles for agencies in implementing the monitoring program.

i. Define how the Puget Sound Atlas would be updated, managed, and integrated with ongoing monitoring activities.

j. Recommend a structure for managing the monitoring program, including mechanisms for making needed refinements and adjustments to ensure program objectives are met in a cost-effective manner.

k. Identify opportunities for citizen monitoring of Puget Sound.

l. Form ad hoc technical working groups to assist it in developing the monitoring program.

Target Date: The committee shall present its recommendations to the Authority by August 1, 1987.

MAJOR PUBLIC ACTIONS FOR AUTHORITY REVIEW

1. The Monitoring Management Committee's recommendations (M-2).

LEGISLATION REQUIRED

None

ESTIMATED COST

Development of the monitoring program is expected to cost approximately $120,000 over the first two fiscal years. Implementation of the monitoring program will cost considerably more. A draft consultant report to EPA in August 1986 has estimated the annual cost of a comprehensive monitoring program at $3.85 million including data analysis, data management, and report production. It is estimated that $1 million of existing monitoring funds can be applied to this, leaving a need for $2.85 million. The monitoring program recommended to the Authority under this program may differ from this preliminary estimate.

Because of the state budgetary cycle, Ecology has requested the appropriation of $700,000 for early implementation of monitoring elements during the next biennium (fiscal years 1988-1989). The monitoring param-

eters and station locations will be decided by the Monitoring Management Committee.

No significant private sector costs have been identified for this program, although private sector representatives are serving on the Monitoring Management Committee. Increased monitoring costs for dischargers are addressed in the Municipal and Industrial Discharges program.

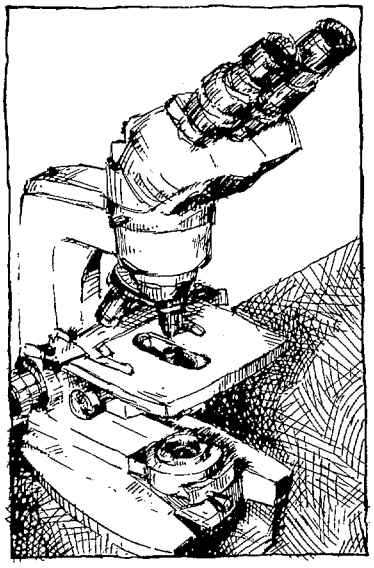
ESTIMATED COSTS: MONITORING	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Program Element						
M-1, -2: MONITORING MANAGEMENT COMMITTEE AND RECOMMENDATION[1]	31,500	434,800	384,800	$31,500	$31,500	$0
TOTAL ANNUAL ESTIMATED COSTS:	$31,500	$434,800	$384,800	$31,500	$31,500	$0

ESTIMATED COSTS: MONITORING	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Agency						
STATE GOVERNMENT						
ECOLOGY	0	350,000	350,000	0	0	0
PSWQA[2]	31,500	84,800	34,800	31,500	31,500	0
TOTAL ANNUAL ESTIMATED COSTS:	$31,500	434,800	384,800	31,500	31,500	0

[1]Includes $350,000 per year in 1988 and 1989 for monitoring to be identified by the Committee. Costs over existing level to implement a comprehensive monitoring program are estimated by EPA consultant report at $2.85 million per year.
[2]It is expected that the EPA will provide support for this project.

RESEARCH

PROBLEM DEFINITION



There is no comprehensive and coordinated program of research for the management of water quality in Puget Sound. Although much of the basic research on the physical and biological systems of Puget Sound has been completed, there are significant questions to be resolved. Some of those questions concern the causes of water quality problems, and others focus on the specific effects on the resources of Puget Sound. Those responsible for setting policies, allocating funds, regulating, and managing the resource do not do so in the context of a firm set of priorities about Puget Sound research needs.

At present, the funds for most of the research conducted on Puget Sound are administered by federal agencies or their state designees. The research is conducted by federal agencies, private consulting firms, universities, nonprofit laboratories, individual scientists, and state and local government agencies. Some of this research funding is driven by the need of regulatory or resource management agencies for answers to questions specifically related to issues of concern in Puget Sound. Some of the research funding is meant to address issues of a more fundamental nature which may or may not be related to water quality or resource management and which may be more useful for marine waters elsewhere in the U.S. or the world.

On many occasions these dissimilar purposes have been combined in the same research due to communication among the funders, regulators, and researchers through the Puget Sound Estuary Program and other formal and informal arrangements. However, there is no mechanism through which the producers, consumers, and funders of research can agree on the priorities for research on Puget Sound. As federal dollars available for research on water quality are being steadily reduced and other sources of research funds have not yet increased, making best use of the funds that are available while additional funds are sought is essential.

Decision-makers and others concerned about Puget Sound have been confused by disputes among scientists about the appropriate interpretation of existing research as well as disagreements about the relative priority of future research projects. The public and policymakers also sometimes suffer from the failure of researchers and publishers of research to make the results comprehensible to the lay reader. On the other hand, scientists on occasion feel that they are not able to contribute their expertise to policy and regulatory decision-making.

Some Puget Sound-related research projects are managed by state agencies, private industry, and other groups which have not been traditionally recognized as centers of Puget Sound research. Much of this research may prove of value, but it is not often published and therefore is not usually as accessible as research done in universities. There are also some who feel that the specific geographic areas now set aside as reference areas for research and monitoring are not adequate in their coverage.

The Authority surveyed all of the major participants in Puget Sound research in order to identify these important issues. The solutions to these problems are not as clear as the problems themselves. It is clear that many of the solutions are dependent on federal government action which a state agency cannot impel. Since research is important to the long-term health of Puget Sound, the greatest need is to develop a broad consensus on institutional mechanisms which will address these issues.

PROGRAM GOAL

To establish a system of priorities and funding for research that (1) adds to our knowledge of the physical and biological systems of Puget Sound; (2) identifies causes and solutions of pollution problems; and (3) assists decision-making activities of regulatory and management agencies while stimulating creativity and excellence in research.

STRATEGY

The strategy for achieving this goal includes (1) the establishment of a committee to make recommendations to the Authority on research priorities, institutional needs, data management, research preserves, and publication of research results; (2) an annual meeting on Puget Sound research; and (3) adoption by PSWQA of research needs and priorities.

SUMMARY DESCRIPTION

The research program establishes the Committee on Research in Puget Sound to develop recommendations on research priorities, on structures to set research and funding priorities, on data and information management, and other questions. An annual meeting on Puget Sound research will respond to the committee report and serve as a forum for exchanges among researchers and others on scientific questions. The program also contains a list of priority short-term and long-term research questions on Puget Sound.

MAJOR FEATURES

---The Committee on Research in Puget Sound is established.

---An annual meeting is held on Puget Sound research.

---Research needs and priorities are identified.

PROGRAM ELEMENTS

R-1. COMMITTEE ON RESEARCH IN PUGET SOUND

PSWQA shall establish a Committee on Research in Puget Sound consisting of representatives of institutions of higher education from around Puget Sound, individual scientists, government agencies, industry, citizens, and nonprofit research organizations. The committee, which will be staffed by the Authority, shall make recommendations to the Authority and to the participants in the first annual meeting on Puget Sound research. The report shall include:

a. Recommendations for short-term and long-term research priorities for Puget Sound using the list of research needs and priorities in the plan as a starting point.

b. Recommendations for a mechanism for setting Puget Sound research priorities in the future.

c. Recommendations for a structure to coordinate funding for Puget Sound research consistent with the research priorities.

d. Recommendations on a state government role in the funding of scientific research on Puget Sound.

e. Recommendations for a mechanism to be used by public officials, legislators, regulators, and resource managers for resolving scientific questions related to policy decisions on Puget Sound.

f. Recommendations for improving access to ongoing Puget Sound-related research, existing data, interpretive publications, and review articles by the scientific and regulatory communities and the public.

g. Recommendations on the need for additional geographic areas reserved for research. The committee should especially consider whether specific representative ecosystems are missing or under-represented in current areas used as reference areas for monitoring or for research.

h. Recommendations on the need for incentives for the publication of research produced by state agencies, industry, and other organizations which may be of use in policymaking but which ordinarily would not be published.

Target Date: Committee established by February 2, 1987.

R-2. ANNUAL MEETING ON PUGET SOUND RESEARCH

PSWQA shall sponsor an annual meeting on Puget Sound research needs and accomplishments at which Puget Sound researchers will give presentations on research accomplishments over the past year. The meeting shall be conducted in such a way as to (1) serve the needs of researchers for scientific exchange and dialogue; (2) serve the needs of regulators, resource managers, and public officials for policy guidance; and (3) serve the needs of the public for translation of research results.

The Committee on Research in Puget Sound will present its report at the first annual meeting for discussion by those attending.

Target Date: March 1988.

R-3. RESEARCH NEEDS AND PRIORITIES

The Authority has a statutory mandate to identify research needs and priorities. The Committee on Research in Puget Sound will, in its report, advise the Authority on long-term and short-term research needs and priorities and on a mechanism to determine those needs and priorities in the future.

The following list of research needs was compiled in consultation with regulatory agencies, individual scientists, and a wide range of institutions conducting scientific research on Puget Sound. Much important work has already been done or is underway on many of the questions.

The list is divided into two sections. The first section describes research that would enhance plan implementation. (There are several research tasks assigned in the other elements of the plan that are not repeated here.) The second section lists research topics that would increase understanding of the Sound and assist management agencies in the future.

General Conclusion

Chemical contamination of Puget Sound poses the greatest long-term threat to human health and the plant and animal life of the region. Biological contaminants do pose serious hazards but do not persist in the environment for indefinite periods as many toxic compounds do. Priority should be give to research on chemical contamination of Puget Sound. Biological contamination and other issues are also of significance and should be addressed as resources are available. Policy and regulatory topics are also listed to indicate areas where research might assist decision-makers as this plan is implemented and revised in the future.

Research Needed for Plan Implementation

1. Chemical Contamination

   a. Which compounds or classes of compounds in contaminated sediments are associated with damage to marine organisms and wildlife?

   b. Which toxic chemicals in bottom sediments are broken down by microorganisms and at what rate? Can this rate be increased?

   c. To what degree are resident and migratory marine birds or mammals adversely affected by toxic chemicals in the water column or bottom sediments of Puget Sound? Where migratory species show evidence of bioaccumulation of toxicants, was that accumulation in the Sound or elsewhere? Are there adverse effects on endangered species? Can any of these animals be used as indicator species of chemical contamination problems in Puget Sound?

   d. Are ducks and other waterfowl affected by toxicants in bottom sediments in wetlands? Would this have implications on the use of wetlands in controlling urban runoff?

e. Do benthic organisms have higher tissue levels of toxic substances near dredged material disposal sites?

f. Which bioassays are the most meaningful measures of chemical pollution and its environmental effects? How reliable are the correlations between biological responses and concentrations of toxic chemicals in bioassays?

2. Biological Contamination

a. What microorganisms are good indicator species for human health hazards?

3. Ecology

a. What are the specific functional values of wetlands and how can they be measured? Can we design mitigation projects that are effective in replacing lost wetland values or other natural habitats? Are there more or less effective ways of achieving mitigation? Is mitigation effective over a long period of time? How should mitigation be monitored for its effectiveness? What should be done if a mitigation project fails?

4. Environmental and Regulatory Policy

a. How can systematic comparisons be made among the many pollution problems in Puget Sound in ways that will assist in ranking problems for funding and other actions?

b. How can a better assessment of the benefits and costs of various programs be prepared to assist in making tradeoffs in pollution management policies? What role should quantitative benefit/cost comparisons play in light of scientific uncertainty and the difficulty of quantifying damage in a complex ecosystem?

Long-Term Research Needs

1. Chemical Contamination

a. How are toxic chemicals in bottom sediments metabolized in fish? Are there adverse effects on commercially important species? Is species reproduction adversely affected by specific toxicants? To what degree are species with higher body burdens of toxic substances less likely to reproduce successfully?

b. What role does the sea surface microlayer play in exposure of organisms to toxic substances in the environment? How significant is microlayer contamination compared to sediment or water column contamination? Can chemical contamination in the surface microlayer be tied to certain discharges or types of

discharges? What are the relative contributions of point and nonpoint sources to contamination of the microlayer? Does particulate material of a certain size or range of sizes affect the microlayer? What is the distribution in time and space of the sea surface microlayer and contamination of the microlayer?

c. What is the contribution of atmospheric deposition to chemical contaminant loading in the surface microlayer, water column, and sediments of the Sound?

d. Are the chemicals used in agriculture, forestry, and highway maintenance being released in sufficient amounts to have an adverse effect on estuarine or marine organisms? Do these chemicals affect shellfish or some critical part of the food web? Do landfills, sludge disposal, and contaminated groundwater have an adverse effect on estuarine or marine organisms?

e. Are bottom paints adversely affecting marine organisms, particularly juvenile salmon and cod and larval and juvenile shellfish?

f. Are there synergistic effects between various chemicals or between chemicals and environmental conditions in the Sound that increase the magnitude of various biological abnormalities?

g. Are there alternatives to chemical disinfection for municipal wastewater discharges into marine waters? What organic chemicals are formed by chlorination or other chemical treatments?

h. Are population distributions of organisms in the water column changed by toxic bottom sediments?

i. What are the migratory patterns of bottom dwelling fish species such as English sole? Do they return to the same regions of shallow water after they spawn in deep water? How do these migratory patterns affect the rate of tumor formation? Do liver tumors decrease the average life spans of species of bottom dwelling fish? Does this change the population distributions of these species?

j. What is the rate of removal of toxic substances from various portions of the Puget Sound basin through burial in sediments or transport to the ocean?

k. What toxic chemicals enter residential and commercial on-site sewage systems and what is the fate of those substances both when the system is working and when it fails?

l. Can marine plants be used as indicators of water pollution?

2. Biological Contamination

   a. What regulates population increases (blooms) of the organism that causes paralytic shellfish poisoning (PSP)? Are there human causes as well as natural causes? Can these blooms be controlled so shellfish will not be contaminated with PSP?

   b. How long do various human pathogens survive in marine water or sediments? Do bottom sediments serve as a regrowth area for fecal coliform bacteria? What pathogens are present in the marine waters of the Puget Sound basin? Are viruses a serious health hazard in municipal wastewater? Does disinfection have any effect on viruses in municipal wastewater?

3. Ecology

   a. What role do seabirds play in the Puget Sound ecosystem? How can sufficient habitat be protected to allow their full functioning within this environment?

   b. How do the many components of the ecosystem interact to preserve the necessary balance among plant and animal groups?

4. Marine Resources

   a. Are there new food species that can be developed and enhanced for aquaculture? How can these species be propagated for a sustained yield? What are the environmental effects of large-scale aquaculture?

   b. What is the present economic value of natural resources in Puget Sound and how does that compare to the potential value?

   c. To what extent can fisheries enhancement programs be used to realize the full potential of Puget Sound as a producer of renewable resources?

5. Environmental and Regulatory Policy

   a. Can quantitative links be established between demographic and land use trends and marine pollution problems? Can such trends then be used to design policies and programs for preventing and solving pollution problems?

   b. What is the proper balance between pollution control strategies that restrict discharges before damage can be observed in the environment and programs that require reductions in discharges only after water quality degradation is shown? In general, how can pollution control programs be protective without being excessively restrictive and costly?

c. How can mitigation programs be better administered to ensure long-term effectiveness of mitigation measures?

MAJOR PUBLIC ACTIONS FOR AUTHORITY REVIEW

None

LEGISLATION REQUIRED

None

ESTIMATED COST

Individual agencies will be expected to provide funding for their staff to participate in the work of the Committee on Research in Puget Sound. The activities of the committee are estimated to cost $40,000 in fiscal year 1988. The costs of the annual meeting are estimated to be $30,500 per year. No private sector costs have been specifically identified for this program, although private sector involvement would be sought in the committee and at the annual meetings.

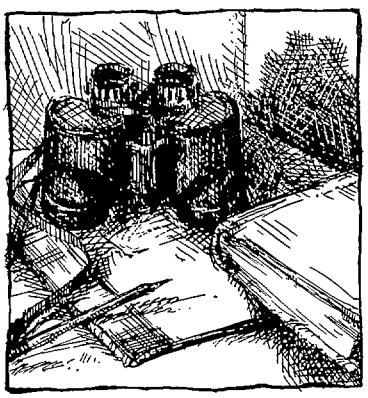
ESTIMATED COSTS: RESEARCH	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Program Element						
R-1: COMMITTEE ON RESEARCH IN PUGET SOUND	0	39,800	0	0	0	0
R-2: ANNUAL MEETING ON PUGET SOUND RESEARCH	0	30,500	30,500	30,500	30,500	0
R-3: RESEARCH NEEDS AND PRIORITIES[1]	0	0	0	0	0	0
TOTAL ANNUAL ESTIMATED COSTS:	$0	$70,300	$30,500	$30,500	$30,500	$0

ESTIMATED COSTS: RESEARCH	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Agency						
STATE GOVERNMENT						
PSWQA	0	70,300	30,500	30,500	30,500	0
TOTAL ANNUAL ESTIMATED COSTS:	$0	70,300	30,500	30,500	30,500	0

[1]Costs included in R-1 and R-2.

EDUCATION AND PUBLIC INVOLVEMENT

PROBLEM DEFINITION



A public opinion poll conducted by the Authority during 1986 shows that most citizens do not adequately understand the nature of the pollution problems in the Sound. Education is necessary to foster public recognition of the Sound as a regional and national resource, and to stimulate public, governmental, and private sector support for the changes in lifestyle and costs related to preserving the Sound. Implementation of the plan will require action at all levels, from individuals to state and federal agencies. Public involvement in actions to clean up and protect Puget Sound is important because the public is a resource that provides information, values, and priorities to the decision-making process.

Pollution prevention requires an ongoing commitment from an informed, involved public. Education supports a strategy of long-term prevention. Experience has also shown that programs which have not adequately educated or involved the public are often met with resistance or animosity.

While enforcement can act as an educational tool, it does not effectively correct many pollution problems which result from individual behaviors such as improper disposal of wastes from households or boats. Collective responsibility is better achieved through education and public involvement.

The PSWQA issue paper on Public Involvement in Water Quality Policy-making noted that the level of public involvement in water quality programs and activities varies widely with the issue and the agency. Generally, there is a lack of dedicated staff time and training devoted to public involvement. A PSWQA survey of citizen groups, city and county governments, tribes, and state agencies showed that certain requirements for effective public involvement were generally not being met. These included: (1) timely, understandable, and complete notice of pending actions; (2) access early in any decision-making process; (3) ease of access to the process; and (4) response to citizens on how comments or recommendations were used.

A survey conducted by the Authority (August 1986) revealed that although a wide variety of educational programs and resources exist, there are no education programs that comprehensively or uniformly educate the general Puget Sound public on topics related to water quality. Existing programs, such as interpretive centers, adopt-a-stream efforts, household hazardous waste pamphlets, or collection days, are generally underfunded and of limited duration and geographic scope. Other programs provide technical information and education programs for selected interest groups such as marine businesses or farmers but not on a Soundwide basis. Several curriculum programs related to Puget Sound have been developed for K-12 schools (kindergarten through grade 12), but there are no funds for dissemination of these materials through the necessary teacher training.

While education and public involvement activities are sometimes very distinct activities aimed at different audiences for different purposes, the

two frequently are inseparable and work toward the same end. For example, community programs such as Snohomish County's Adopt-A-Stream and the Seattle Aquarium's Adopt-A-Beach can be equally effective as public involvement and education techniques. Public policy decisions require participation by citizens who have been educated about the issues.

Within this context, education and public involvement should be considered together in order to integrate and reinforce their complementary aspects.

PROGRAM GOAL

To increase understanding of Puget Sound and its resources and the effects of human activities on them, and to facilitate public involvement in decisions to clean up and protect the Sound.

STRATEGY

The strategy for achieving this goal is to: (1) establish standards for public involvement in implementing the Puget Sound plan; (2) require that state and local governments carry out public involvement programs and promote education as part of the implementation of the plan; (3) develop a comprehensive strategy to inform and educate businesses, governments, and citizens about Puget Sound; (4) provide immediate funding to a small number of local community involvement and educational activities in addition to those supported under the nonpoint program; (5) provide materials, coordination, and encouragement to existing and new educational efforts; and (6) provide support to K-12 educational efforts.

SUMMARY DESCRIPTION

This program makes public involvement and education integral to the implementation of the plan by (1) requiring public involvement and promoting education in all parts of the plan; (2) providing technical assistance; (3) coordinating among existing education and information programs; and (4) developing a long-term integrated plan to promote a water quality ethic around the Sound through both existing and new programs.

MAJOR FEATURES

---PSWQA, supported by an advisory group, develops a long-range public involvement and education strategy.

---PSWQA funds selected local public involvement and education efforts.

---State agencies and local governments follow public involvement policies for plan implementation.

---PSWQA provides technical assistance for public involvement and education, including training on public involvement techniques.

---Ecology designates a public involvement coordinator and prepares a brochure explaining its mailing lists.

---PSWQA prepares a water quality directory.

---PSWQA publicizes education and public involvement programs.

---Funds are provided to allow school teachers to attend training programs.

In addition, education and public involvement are important components of other programs in the plan.[34]

PROGRAM ELEMENTS

EPI-1. LONG-RANGE STRATEGY FOR EDUCATION AND PUBLIC INVOLVEMENT

Beginning in January 1987 PSWQA, aided by an advisory group, shall coordinate the development of a long-range education and public involvement strategy in support of cleaning up and protecting Puget Sound's water quality. The group will include educators, media experts, representatives from environmental and public interest groups, industry, citizens, business, tribes, state and federal agencies, and local governments. The development of the long-range strategy shall include:

a. An inventory of existing information and education programs related to Puget Sound.
b. Examination of the effectiveness of existing education and public involvement strategies on Puget Sound.
c. Analysis of the potential role of the media.
d. Assessment of the potential roles of private sector and grass roots community resources and programs.
e. Coordination and integration of the education and public involvement efforts in other programs called for in the plan.

This effort will result in recommendations to the Authority for existing and new programs which will be considered in preparing the 1989 plan, including recommendations for funding these programs. PSWQA will also recommend ways to establish long-term dedicated funding of education and public involvement.

Target Date: Advisory group established by March 1, 1987. Recommendations to PSWQA by June 1988.

EPI-2. FUNDING FOR MODEL EDUCATION AND PUBLIC INVOLVEMENT PROJECTS

PSWQA shall provide funding for a short-term program (1987-89) until the long-range strategy is developed. The program will focus on projects that could serve as models for public involvement and education, community cleanup, or citizen monitoring of water quality or biological resources. Groups eligible for funding will include citizen and environmental

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[34]For other specific education activities see also SW-1, SF-7, MB-3, NP-2, NP-8, P-23, P-24, P-25, S-4, S-6, and HHW-2. Specific public involvement requirements are also included in NP-1, NP-2, NP-3, SF-7, S-4, S-6, MB-3, MB-5, P-26, W-1, W-2, M-1, M-2, R-1, OS-1, OS-2, and HHW-1.

organizations, tribes, local governments, and educational institutions. Projects eligible will include existing and new programs as well as proposed activities related to any topic addressed in the plan and any area of Puget Sound. PSWQA shall issue guidelines, call for proposals, and select participants.

Target Date: PSWQA issues guidelines by July 1, 1987. Initial funds awarded by October 1, 1987.

EPI-3. PUBLIC INVOLVEMENT POLICY

The following public involvement policies shall be followed by all state and local government agencies in implementing the Puget Sound plan:

a. A broad representation of the public, both those being directly affected and members of the general public, shall be consulted in developing and adopting rules, establishing criteria, setting guidelines, selecting sites or target areas, developing action plans, and carrying out other activities related to the Puget Sound plan.

b. A variety of public involvement techniques shall be used. Where advisory or review committees are deemed helpful to provide public involvement in the implementation of the plan, existing standing committees or commissions and established processes such as SEPA, the Shoreline Management Act, and local comprehensive plan procedures should be evaluated and improved where possible rather than creating new committees. However, new or additional committees or processes should be created if needed to achieve full public involvement. Agencies shall consider reimbursing travel expenses of members of advisory bodies.

c. Agencies shall allocate adequate staff resources to their public involvement programs. Agency staff responsible for public involvement shall receive training in public involvement techniques and skills.

d. State and local government agencies shall use public information techniques that exceed requirements for legal notice or publication in the State Register to ensure that: (l) public information on decisions to be made or actions to be taken for the Puget Sound plan is complete and understandable; (2) the effects--especially effects on special groups or geographic areas--of the proposed decision or action are fully described; (3) the ways in which the public might be affected by the decision or action are fully presented; and (4) the ways in which the public may influence the decision-maker and appeal the decision are explained.

e. To facilitate access to decision-making processes, state and local government agencies shall send notification for public hearings or meetings as early as possible, shall seek to provide both day and evening meetings and hearings, and shall explain how public comment was incorporated into decisions and actions. For decisions affecting

a large geographic area, meetings and hearings shall be held at locations throughout the area.

Target Dates: Policy in effect upon plan adoption, but agencies and local governments can phase implementation.

EPI-4. PSWQA ACTIVITIES

PSWQA shall continue to use its planning and oversight process as a means to provide education and public involvement on water quality issues through seminars, field trips, conferences, public meetings, publications, media, and distribution of PSWQA information to local libraries. The Authority shall use its newsletter, slide shows, and media contacts to publicize opportunities for the public to become involved in policymaking, monitoring, cleanup, or educational activities related to the Sound. PSWQA shall also use its newsletter and slide shows to give recognition to new and existing efforts and programs which are supportive of the goals of the plan.

PSWQA shall coordinate the integration of education and public involvement elements of all programs in the plan in order to avoid duplication of resources.

PSWQA shall work with the Superintendent of Public Instruction and with the Environmental Education Task Force created by the 1986 Legislature to coordinate educational programs on water quality.

EPI-5. PSWQA TECHNICAL ASSISTANCE ON PUBLIC INVOLVEMENT

PSWQA shall establish a program of technical assistance on public involvement for state agencies and local governments to assist them in implementing the Puget Sound plan. Technical assistance shall include developing materials, providing training, evaluating agency public involvement programs upon request, and making recommendations. PSWQA shall monitor public involvement activities of agencies implementing the plan.

Target Dates: Program established July 1987.

EPI-6. INFORMATION ON WATER QUALITY ISSUES

List of Agency Materials: PSWQA shall ask federal and state agencies and local governments to make available to educators and the public reports, brochures, pamphlets, and other up-to-date information related to water quality and the economic and ecological values of Puget Sound. PSWQA shall identify relevant agencies and types of information and shall prepare a preliminary list of materials available and their locations. This list shall be updated regularly and distributed widely.

Water Quality Directory: PSWQA shall prepare a directory, for public use, describing the appropriate contacts for obtaining information on specific issues related to the Puget Sound plan. This directory shall be updated as necessary and shall be widely distributed. PSWQA shall also coordinate with other agencies to make use of existing hotlines to handle inquiries on a wide range of environmental issues related to Puget Sound.

Target Dates: PSWQA prepares list and directory by December 31, 1987.

EPI-7. ECOLOGY COORDINATOR AND MAILING LIST BROCHURE

Ecology shall designate a public involvement coordinator who shall be responsible for coordinating public involvement activities related to Ecology's responsibilities under the Puget Sound plan. In addition, Ecology shall prepare a brochure describing the various mailing lists maintained within the department, defining the purpose of each, and giving instructions on how to get on each list. This list will be updated periodically.

Target Dates: Ecology designates coordinator by January 1, 1988. Ecology prepares brochure by April 1, 1988.

EPI-8. K-12 FUNDING FOR TEACHER TRAINING

PSWQA shall support teacher training programs related to the Sound by providing funds for release time for teacher workshops. The Superintendent of Public Instruction (SPI) shall coordinate this program and allocate the money among the programs chosen to provide the workshops.

Target Dates: SPI begins funding workshops on November 1, 1987.

EPI-9. PSWQA LIBRARY SUPPORT

PSWQA may provide staff support to make its library materials accessible to the public.

MAJOR PUBLIC ACTIONS FOR AUTHORITY REVIEW

Although no elements of the Education and Public Involvement program are identified as major public actions, the Authority will consider the adequacy of public involvement when reviewing major public actions identified in other programs. See also Chapter 6.

LEGISLATION REQUIRED

None

ESTIMATED COST

This program is estimated to cost about $1.25 million per year for the first two years, approximately $500,000 in fiscal years 1990 and 1991 and $120,000 in fiscal year 1992. Funding for the model projects at $645,000 per year is included for fiscal years 1988 and 1989 only. In addition, public involvement and education programs and costs are included in other programs, notably the Nonpoint Source Pollution program. No private sector costs have been identified for this program.

ESTIMATED COSTS: EDUCATION & PUBLIC INVOLVEMENT	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Program Element						
EPI-1: LONG-RANGE STRATEGY FOR EDUCATION AND PUBLIC INVOLVEMENT	0	57,900	21,500	0	0	0
EPI-2: FUNDING FOR MODEL EDUCATION AND PUBLIC INVOLVEMENT PROJECTS	0	644,000	644,000	0	0	0
EPI-3: PUBLIC INVOLVEMENT POLICY	0	0	0	0	0	0
EPI-4: PSWQA ACTIVITIES	0	360,100	337,100	312,000	312,100	0
EPI-5: PSWQA TECHNICAL ASSISTANCE ON PUBLIC INVOLVEMENT	0	42,500	40,500	51,500	51,500	0
EPI-6: INFORMATION ON WATER QUALITY ISSUES	0	81,600	64,100	64,000	67,900	53,400
EPI-7: ECOLOGY COORDINATOR AND MAILING LIST BROCHURE	0	39,200	69,900	68,600	68,000	67,800
EPI-8: FUNDING FOR TEACHER TRAINING[1]	0	44,000	44,000	0	0	0
EPI-9: PSWQA LIBRARY SUPPORT	0	14,100	14,100	14,100	14,100	0
TOTAL ANNUAL ESTIMATED COSTS:	$0	$1,283,400	$1,235,200	$510,200	$513,600	$121,200

ESTIMATED COSTS: EDUCATION & PUBLIC INVOLVEMENT	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Agency						
STATE GOVERNMENT						
COMMUNITY COLLEGES	0	2,300	0	0	0	0
DEPT OF AGRICULTURE	0	5,500	5,500	5,500	5,500	5,500
DNR	0	8,200	5,500	5,500	5,500	5,500
DSHS	0	5,500	5,500	5,500	5,500	5,500
ECOLOGY	0	50,100	76,800	75,400	74,700	74,500
FISHERIES	0	8,200	5,500	5,500	5,500	5,500
GAME	0	8,300	5,500	5,500	5,500	5,500
PSWQA	0	499,100	467,700	388,100	392,200	0
PSWQA PASS-THROUGH GRANTS	0	625,500	625,500	0	0	0
SPI	0	21,200	18,500	0	0	0
STATE PARKS	0	8,300	5,500	5,500	5,500	5,500
OTHER						
LOCAL GOVERNMENTS	0	41,200	13,700	13,700	13,700	13,700
TOTAL ANNUAL ESTIMATED COSTS:	$0	1,283,400	1,235,200	510,200	513,600	121,200

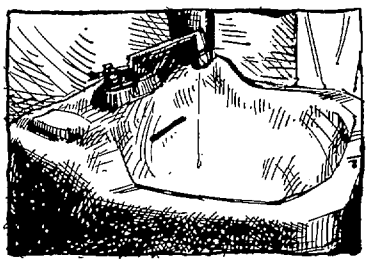
[1]Program administered by Office of Superintendent of Public Instruction (SPI).

HOUSEHOLD HAZARDOUS WASTE

PROBLEM DEFINITION

Household hazardous wastes come from a variety of toxic products used in the home: paints, paint thinners, lawn and garden pesticides, fertilizers, cleansers, degreasers, medicines, cosmetics, transistors, dyes, and automotive products such as antifreeze, batteries, and oil. The use and disposal of many of these products are a chronic source of pollution to Puget Sound both in urban and rural areas.

ENVIRONMENTAL PROBLEMS



Toxicants from household products enter the Sound as components of both point and nonpoint source pollution. Many of them are emptied down drains or flushed down toilets and enter municipal sewage treatment plants. Metro estimates that residential areas contribute 7 to 11 percent of the metals, 31 to 36 percent of the volatile organics, and 55 to 64 percent of the extractable organics to Metro sewage treatment plants. The percentage contribution of household toxicants to smaller treatment plants may be much larger. While secondary treatment degrades or dilutes some of these toxicants, others settle in the sludge, evaporate into the air, or continue in suspension or solution through the discharge pipe. Those in sludge or in the air can then enter Puget Sound through rains and runoff.

Many household wastes are disposed of at landfills. Toxicants can then be transported to the Sound when the landfill leachate is taken to municipal treatment plants or when the leachate in uncontained landfills contaminates surface runoff and groundwater. Many wastes are dumped in storm drains, ditches, or backyards, where they contribute to nonpoint pollution by entering streams, rivers, and groundwater in both rural and urban areas. Fish kills in small streams can occur when concentrated amounts of oil, antifreeze, fertilizers, or pesticides are dumped by householders. Finally, household wastes are sometimes incinerated. They can then contaminate runoff through rainfall or through the ash being spread in yards, backyard pits, or even landfills.

INSTITUTIONAL PROBLEMS

Until recently, household hazardous wastes were not regulated. While specific toxicants found in household products were prohibited from disposal at solid waste landfills, "household quantities" of these toxicants were accepted. However, in 1985 household hazardous wastes were included in the state Hazardous Waste Management Act under the definition of "moderate risk waste." This puts them into the same category of wastes as those generated by small commercial and industrial operations which use very similar products.

While these household substances are now technically regulated, there are very few legal, conventional, proper, or practical disposal mechanisms available to the householder or to small businesses. Several counties and a few cities have collection sites for some household chemicals, and some counties and cities hold collection days when citizens may bring household wastes for appropriate disposal. Only Whatcom County has an

ongoing collection system for all household chemicals, but this, too, is a system only for those willing to deliver their wastes to the site. These collection days and sites are resource-intensive, have their own safety and health issues, and rely on the participation of citizens who have been informed. They depend on local government funding or private sector underwriting of costs, and potentially expose local governments to long-term liability for the wastes. With the exception of these sporadic collection events, the dumpster, garbage can, ditch, storm drain, and backyard incinerator remain as the only disposal mechanisms for most citizens around the Sound.

RCW 70.105.220 addresses this issue by mandating that local governments undertake a planning process to identify local moderate risk disposal options and to implement a disposal program by December 31, 1991. The implementation of this RCW is dependent on funding which has not yet been appropriated.

The Legislature specifically asked that PSWQA address the issue of household hazardous waste education in the Puget Sound Water Quality Management Plan. With the exception of providing education on less-toxic household alternatives, educational efforts on household hazardous wastes are frustrating and futile until household hazardous waste disposal options are available for all citizens. This will happen only when the local hazardous waste planning process is completed and disposal programs are implemented.

PROGRAM GOAL

To improve management of household hazardous waste through the provision of appropriate disposal options and associated education of the public.

STRATEGY

The strategy for achieving this goal is to ensure a phased approach to full implementation of recent amendments to the Hazardous Waste Management Act.

SUMMARY DESCRIPTION

This program provides for management of household hazardous waste by supporting phased implementation of recent legislation that would directly provide disposal options for moderate risk wastes. Education is to focus on implementation of local hazardous waste management plans and less-toxic alternatives for household products.

PROGRAM ELEMENTS

HHW-1. PHASED FUNDING OF LOCAL HAZARDOUS WASTE MANAGEMENT PLANS

PSWQA shall recommend to the Legislature that adequate funds be appropriated to: (1) implement the preparation of local hazardous waste management programs (RCW 70.105.220-235) as currently scheduled by Ecology, including public involvement in and education on the management of household hazardous waste; (2) accelerate the preparation of plans in a few Puget Sound counties for the purpose of early implementation; and

(3) carry out those duties of the hazardous substance information office (RCW 70.102.020(4)) that are related to these activities.

Target Dates: Planning activities per current Ecology schedule for 1987-89 with plans completed by December 31, 1990. Accelerated pilot plans completed by June 30, 1989.

HHW-2. INFORMATION AND EDUCATION ON LESS-TOXIC ALTERNATIVES FOR HOUSEHOLD PRODUCTS

Ecology and PSWQA shall make information available on less-toxic alternatives to household toxicants. Ecology shall continue its support and monitoring of ongoing efforts to collect and develop information on alternative products or practices for toxic household products. The Authority shall distribute this information in its newsletter or by other appropriate means.

Target Date: Authority begins information distribution by March 30, 1987.

MAJOR PUBLIC ACTIONS FOR AUTHORITY REVIEW

None

LEGISLATION REQUIRED

None

ESTIMATED COST

This program is estimated to cost $630,000 per year for the first two years. A major portion of this amount would be allocated to pay for accelerated pilot programs to plan disposal options in three counties. The cost of household hazardous waste education related to this effort is approximately $30,000 a year the first two years and $20,000 a year for the next two years.

These costs do not include the undetermined costs to local governments to implement the actual moderate risk waste collection system. This may or may not be a private sector activity. The grants to local governments with pilot programs could include a study of funding mechanisms for the system.

The impacts of implementation of a moderate risk waste collection and disposal program on the private sector cannot be estimated until collection and treatment systems are designed. This is a relatively new field. For collection and disposal of household hazardous waste, homeowners may incur direct fees or higher taxes or utility bills. Commercial and business enterprises which generate moderate risk waste in small amounts may be subject to increased costs or fees for disposal and increased capital or labor costs for safe collection and storage systems. Conversely, there may be substantial private sector business opportunities in the resulting waste collection and disposal.

ESTIMATED COSTS: HOUSEHOLD HAZARDOUS WASTE	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Program Element						
HHW-1: PHASED FUNDING OF LOCAL HAZARDOUS WASTE MANAGEMENT PLANS[1]	0	605,600	601,100	41,300	41,000	0
HHW-2: INFORMATION AND EDUCATION ON LESS-TOXIC ALTERNATIVES FOR HOUSEHOLD PRODUCTS	0	30,000	30,000	20,000	20,000	0
TOTAL ANNUAL ESTIMATED COSTS:	$0	$635,600	$631,100	$61,300	$61,000	$0

ESTIMATED COSTS: HOUSEHOLD HAZARDOUS WASTE	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Agency						
STATE GOVERNMENT						
ECOLOGY	0	135,600	131,100	61,300	61,000	0
ECOLOGY PASS-THROUGH GRANTS	0	375,000	375,000	0	0	0
OTHER						
LOCAL GOVERNMENTS	0	125,000	125,000	0	0	0
TOTAL ANNUAL ESTIMATED COSTS:	$0	635,600	631,100	61,300	61,000	0

[1]Costs for local hazardous waste management plans per RCW 70.105.220. These estimates do not include any of the funds requested to begin implementation of RCW 70.105.220 in Ecology's 1988-89 budget request. They represent funds to accelerate programs in 3 Puget Sound counties and include a 25% local match.

LEGAL AND PERSONNEL SUPPORT

PROBLEM DEFINITION

LEGAL SUPPORT FOR STATE AGENCIES

The Office of the Attorney General provides legal advice and representation to all state agencies, including those which have enforcement responsibilities. Some state agencies, such as Ecology and Fisheries, have their own enforcement units that work with attorneys from the Attorney General's office. The Attorney General's office also provides advice on agency rulemaking, permit writing, and other tasks related to implementation of state laws and regulations.

A lack of sufficient attorneys to provide advice at various stages of agency activity hinders effective enforcement. Legal advice during the early stages of agency activity (such as permit writing) can dramatically reduce the need for lengthy and expensive litigation. The Puget Sound plan is expected to increase the need for attorneys as existing programs are more vigorously enforced and as new programs are implemented.

LOCAL GOVERNMENT ENFORCEMENT

One of the themes which emerged from the analyses conducted for the plan is that many existing laws and programs designed to protect the water quality and resources of Puget Sound are not being fully enforced. This is true not only of state and federal laws, but also of city and county ordinances regulating land use and development, such as shoreline master programs, zoning ordinances, and local health codes governing on-site septic systems. Due to inadequate resources or law enforcement priorities, enforcement of these laws has not received adequate emphasis from prosecuting attorneys and others.

PERSONNEL SUPPORT

State agencies hire new employees through the state Department of Personnel and must follow the procedures and job classifications established by the Department of Personnel. If appropriate job classifications do not exist, state agencies can work with the Department of Personnel to create new job classifications, but this takes time and requires advance planning. Salaries of many state job classifications currently lag behind salaries for similar positions in the private sector. These factors can lead to delays in hiring and difficulties in acquiring qualified staff.

Lack of sufficient staffing has been identified as a major weakness in the ability of several state agencies to carry out their existing responsibilities. The Puget Sound plan increases the responsibilities of several state agencies and requires them to hire new staff to carry out these new responsibilities.

PROGRAM GOAL

To ensure that state agencies implementing the plan have adequate support by legal counsel and by the state personnel system and that local agencies have adequate staff for enforcement of local programs.

STRATEGY

The strategy for achieving this goal is (1) to request the Attorney General and the Department of Personnel to review and report on their support to agencies carrying out the Puget Sound plan; and (2) to make funds available to local governments for enhanced enforcement.

SUMMARY DESCRIPTION

This program reflects the Authority's concern that agencies responsible for implementing the plan need highly qualified staff and an adequate level of legal support. It calls on the Attorney General and Department of Personnel to provide adequate resources for plan implementation by providing an initial level of support and analyzing the needs of state agencies responsible for implementing the plan.

The local enforcement component reflects the Authority's belief that much can be done to improve protection of wetlands and to prevent nonpoint source pollution if local governments are vigorous in exercising existing legal authority.

MAJOR FEATURES

---The Attorney General plans for the addition of three attorneys and reports to the Authority on the future level of legal support needed.

---The Department of Personnel acquires additional staff to review the state personnel system's ability to support the plan and to assist state agencies responsible for implementing the plan.

---Counties and cities may obtain funds to increase investigations of violations of law and to obtain compliance.

---Prosecutors are eligible for funding for enhanced enforcement and are encouraged to institute special enforcement efforts including civil penalty and educational programs.

PROGRAM ELEMENTS

LP-1. ATTORNEY GENERAL SUPPORT

The Attorney General shall make every effort to support the Puget Sound plan by providing enough attorneys to assist in agency rulemaking, permit writing, and enforcement. Legal expertise should be provided at all stages of environmental protection activities.

The Attorney General shall provide the Authority with estimates of the legal staff support needed by agencies responsible for implementing the plan and shall propose a program for supplying that legal support. In preparing the report the Attorney General's office shall consult with affected agencies to obtain their estimates of support needed. During the interim the Attorney General's office shall plan for three attorneys in its personnel allocation in addition to attorney support needs reflected in agency budget requests for fiscal years 1988-1989.

Target Date: The Attorney General reports results of his review to the Authority by September 1, 1987.

LP-2. DEPARTMENT OF PERSONNEL SUPPORT

Each state agency responsible for implementing the Puget Sound Plan shall prepare a report to the Authority and Department of Personnel concerning whether existing job descriptions, qualifications, salary levels, and hiring procedures are adequate to support their activities. The Authority shall host a meeting of agencies to discuss the results. Based on the reports, the Department of Personnel's response, and resulting discussions, the Authority may amend the plan and make specific recommendations to agencies or the Legislature to improve personnel support for the plan.

Target Date: State agencies report to the Authority and the Department of Personnel by September 1, 1987.

LP-3. DEPARTMENT OF PERSONNEL ASSISTANCE

In order to fill positions authorized for fiscal years 1988 and 1989, state agencies responsible for implementing the plan need immediate support from the Department of Personnel. The Department of Personnel shall provide such assistance to the maximum extent possible and shall immediately designate one staff member to coordinate this effort. The Department of Personnel shall also hire one part-time staff member for fiscal year 1988 to assist with this effort.

LP-4. ENHANCED LOCAL ENFORCEMENT

Local governments are encouraged to strengthen enforcement of laws which protect the water quality and habitat functions of wetlands and which control specific sources of nonpoint pollution. The state will provide matching funds to counties, cities, or local health agencies to augment investigations and prosecutions under those laws.

The enhanced enforcement of wetland protection laws may encompass shoreline master programs, zoning ordinances, or other land development or construction codes which protect wetland water quality or habitat functions. Nonpoint enforcement efforts eligible for state grants include on-site septic systems, pumpout facilities at marinas, farm practices, or other sources which are identified as a result of the local nonpoint planning process. Local governments or health agencies are encouraged to use existing legal authority (including general police power, state health authority, or other legal tools) to adopt such ordinances or regulations as may be necessary to address nonpoint sources of pollution.

Funds will be made available for investigation and prosecution of violations. Preference for grant awards shall be given to applicants whose enhanced enforcement program includes an educational component that publicizes enforcement actions. Efficient and innovative approaches to enforcement such as civil penalties, dedicated fines, and community service shall be encouraged.

Target Date: Program established by July 1987.

MAJOR PUBLIC ACTIONS FOR AUTHORITY REVIEW

None

LEGISLATION REQUIRED

None

ESTIMATED COST

This program is estimated to cost approximately $1.2 million per year. $1 million per year is estimated for enhanced local enforcement (LP-4) to be funded by state matching grants to local governments. Other costs include three additional attorneys in the Office of the Attorney General, additional staff (0.5 FTE) in the Department of Personnel, and other program tasks.

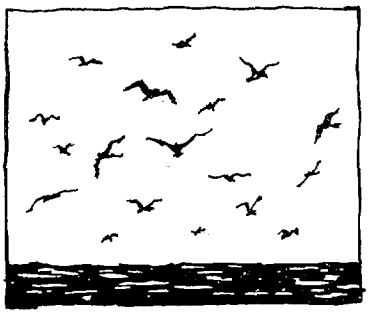
No private sector costs have been identified for this program.

ESTIMATED COSTS: LEGAL & PERSONNEL SUPPORT	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Program Element						
LP-1: ATTORNEY GENERAL SUPPORT	0	244,900	193,700	193,700	193,700	193,700
LP-2: DEPARTMENT OF PERSONNEL SUPPORT	0	57,900	0	0	0	0
LP-3: DEPARTMENT OF PERSONNEL ASSISTANCE	0	27,500	0	0	0	0
LP-4: ENHANCED LOCAL ENFORCEMENT[1]	0	1,018,100	1,017,200	1,016,900	1,016,800	1,016,700
TOTAL ANNUAL ESTIMATED COSTS:	$0	$1,348,400	$1,210,900	$1,210,600	$1,210,500	$1,210,400

ESTIMATED COSTS: LEGAL & PERSONNEL SUPPORT	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Agency						
STATE GOVERNMENT						
ATTORNEY GENERAL	0	225,300	193,700	193,700	193,700	193,700
DEPT OF PERSONNEL	0	27,500	0	0	0	0
DNR	0	13,700	0	0	0	0
DSHS	0	13,700	0	0	0	0
ECOLOGY	0	36,200	17,200	16,900	16,800	16,700
ECOLOGY PASS-THROUGH GRANTS	0	500,000	500,000	500,000	500,000	500,000
FISHERIES	0	11,400	0	0	0	0
GAME	0	11,400	0	0	0	0
PSWQA	0	9,200	0	0	0	0
OTHER						
LOCAL GOVERNMENTS	0	500,000	500,000	500,000	500,000	500,000
TOTAL ANNUAL ESTIMATED COSTS:	$0	1,348,400	1,210,900	1,210,600	1,210,500	1,210,400

[1]Matching grants from state would provide $500,000 per year to local governments. Some Referendum 39 funds may be available in FY 1987 for early action on nonpoint problems.

PRIORITIES FOR ACTION



In developing the Puget Sound plan, the Authority has considered priorities at several stages. The initial scoping process carried out in the second half of 1985 identified the priority problems and sources to be addressed in this first plan. The issue papers again identified the priority problems and potential solutions in each issue area. When the draft plan was developed by the Authority in August 1986, these priorities were translated into a preferred plan, which was published in the draft plan/EIS in September 1986. The draft plan/EIS also included alternative programs which reflected different priorities.

After comments were received on the draft plan/EIS, the Authority met in November to revise the draft preferred plan. The need to set priorities and to include only necessary elements was an important factor considered by the Authority in selecting and revising action elements for inclusion in the revised preferred plan. Low priority items were dropped, and the Authority assigned priorities to the remaining elements of the revised preferred plan. These priorities were used by staff and the Authority in developing the target dates and implementation schedule for the final plan, and are presented in the following table. Although these priorities are incorporated into the implementation schedule for the plan, it is recognized that resource limitations and other difficulties may require further decisions on priorities. Such decisions, if necessary, will be based on the priority scheme presented in the table.

Since only priority elements were included in the final plan, the priority categories used in the table deal with delay and/or phasing of elements rather than deletion of elements. Those actions listed in column C are long-term programs and have been scheduled for delayed implementation in this plan. These actions would be the first chosen for further delays should resources be inadequate for the plan. Actions listed in column B are proposed to begin in the 1987-1989 biennium but may be stretched out or phased in over time in response to funding and staffing limitations. The actions in column A are the most urgent elements. Some are to start immediately. These elements would be considered for delay only after all efforts to arrange adequate resources have been exhausted.

PRIORITIES FOR ACTION[1]

PROGRAM	A. EARLY ACTION/URGENT	B. VERY IMPORTANT -- CAN BE PHASED	C. LONG TERM -- CAN BE PHASED OR DELAYED
NONPOINT SOURCE POLLUTION[2]			
	NP-1 Selection of Priority Watersheds -- Round I	NP-1 Selection of Priority Watersheds *Round II*	NP-10 Evaluation of On-Site Regulations and Programs
	NP-2 Guidelines for Watershed Action Plans	NP-3 Watershed Management Committees	NP-12 Certification of On-site Professionals
	NP-4 Plan Adoption and Implementation -- Round I	NP-4 Plan Adoption and Implementation -- Round II	MB-1 Shoreline Master Program Amendments for Marinas
	NP-5 Program Funding and Incentives -- Round I	NP-5 Program Funding and Incentives -- Round II	MB-5 Enforcement of MSD Regulations
	NP-11 Property Transfers	NP-6 Technical Assistance for Watershed Plans	MB-7 Study of "No Discharge" Areas
	MB-2 Model Ordinances for Sewer Hook-ups for Liveaboards	NP-7 Evaluation, Feedback, Default	MB-8 "No Anchorage" Areas
	MB-3 Boaters Task Force (organization)	NP-8 Education Programs	
	MB-4 Construction of Pumpouts at Priority State Parks	NP-9 Prevention	
	MB-6 Intensive Surveys of Boating Areas	NP-13 Dairy Waste Management Plan	
		NP-14 Cost-sharing Program	
		MB-3 Boaters Task Force (implementation)	
SHELLFISH PROTECTION			
	SF-1 Shellfish Protection and Restoration Policy	SF-7 Public Involvement and Education	SF-3 Testing Selected Shellfish Beds for Toxicants
	SF-2 Restoration and Protection of Commercial Shellfish Beds		
	SF-4 Recreational Shellfish Program		
	SF-5 Annual Inventory		
	SF-6 Funding Sources Assessment		
MUNICIPAL AND INDUSTRIAL DISCHARGES			
	P-1 *Adopt EPA Water Quality Criteria*	P-7 Effluent Limits in Permits -- Particulates	P-3 Dilution Zone Criteria
	P-2 Criteria for Classifying Sediments	P-11 Enhanced Requirements for EPA-Issued Permits	P-9 Spill Control Plans Required
	P-4 Permit Fees	P-14 Inspections (complete phased implementation)	P-10 Explanation of Relaxed and Increased Limits in Permits
	P-5 Procedures Manual and Internal Technical Assistance	P-16 Use of Certified Labs for Self-Monitoring	P-12 Reevaluate Allocation of Permits into Major/Minor Categories
	P-6 Toxicant Effluent Limits in Permits	P-22 Additional Staff for Pretreatment Program	P-15 Study of Independent Verification of Self-Monitoring
	P-8 Monitoring Requirements in Permits		P-17 Data Management
	P-13 Urban Bay Action Teams		P-18 Adopt Enforcement Guidelines as Regulations
	P-14 Inspections (to be phased in)		P-19 Cross-Training for Inspectors
	P-20 Search for Unpermitted Discharges		P-23 Municipal Operator Training
	P-21 Felony Provisions		P-24 Certify Industrial Treatment Plan Operators
	P-26 Public Outreach (revisions to permit notices)		P-25 Employee Education Assistance
			P-26 Public Outreach
CONTAMINATED SEDIMENTS AND DREDGING			
	S-1 Sediment Program Policies	S-6 Multi-User Confined Disposal Sites Study	S-2 *Program for Unconfined Open Water Disposal*
	S-4 Sediment Disposal Standards	S-7 Guidelines for Remedial Actions	S-3 Unconfined Open Water Disposal Sites
	S-8 Investigations of Contaminated Sediment Sites		S-5 Revision of Rules and Programs

[1]This table -- and the Plan -- include only those proposals considered important by the Authority. Low priority proposals were not included in the Plan or this table.

[2]In adopting the Puget Sound Plan the Authority replaced three proposed forest practices elements with an endorsement of the Timber/Fish/Wildlife Process, as described in element FP-1 of the Nonpoint Source Pollution Program.

PRIORITIES FOR ACTION

PROGRAM	A. EARLY ACTION/URGENT	B. VERY IMPORTANT -- CAN BE PHASED	C. LONG TERM -- CAN BE PHASED OR DELAYED
STORMWATER AND COMBINED SEWER OVERFLOWS	SW-3 Technical Manuals on Stormwater and Erosion Controls SW-4 Guidelines for SW-1 and SW-2 SW-6 Runoff from Federal Facilities SW-8 CSO Reduction Guidelines	SW-1 Urban Stormwater Programs SW-2 Operation and Maintenance Programs and Runoff Ordinances SW-5 Puget Sound Highway Runoff SW-7 Research by Ecology on Wetlands and Stormwater (early start) SW-9 CSO Reduction Plans by Cities or Sewer Jurisdictions	SW-7 Research on Effects of Stormwater on Wetlands
LABORATORY SUPPORT	L-1 Laboratory Certification Program L-2 Laboratory Capacity for Ecology Programs		
WETLAND PROTECTION	W-1 Criteria Development and Program Planning W-2 Identification of Wetlands to be Preserved W-3 Wetland Preservation W-4 State Standards W-6 Program for State-Owned Land	W-5 Local Program Development	
OIL SPILL RESPONSE PLANNING	OS-1 Policy Planning OS-2 Contingency Plan Revision		
MONITORING	M-1 Monitoring Management Committee	M-2 Development of Monitoring Recommendation	
RESEARCH	R-1 Committee on Research in Puget Sound R-3 Research Needs and Priorities	R-2 Annual Meeting on Puget Sound Research	R-1 Committee on Research (implement recommendations)
EDUCATION AND PUBLIC INVOLVEMENT	EPI-1 Long-Range Strategy for Education/Public Inv EPI-2 Funding for Model Projects (guidelines) EPI-3 Public Involvement Policy EPI-4 PSWQA Activities EPI-5 PSWQA Technical Assistance on Public Involvement (partial) EPI-7 Ecology Coordinator and Mailing List Brochure EPI-8 Funding for Teacher Training	EPI-2 Funding for Model Projects (disbursement) EPI-3 Public Involvement Policy (implementation) EPI-6 Information on Water Quality Issues (Agcy info, Dir)	EPI-5 PSWQA Technical Assistance on Public Involvement EPI-6 Information on Water Quality Issues EPI-9 PSWQA Library Support
HOUSEHOLD HAZARDOUS WASTE		HHW-1 Phased Funding of Local Hazardous Waste Management Plans HHW-2 Information/Education on Less-Toxic Alternatives	
LEGAL AND PERSONNEL SUPPORT	LP-1 Attorney General Support LP-2 Department of Personnel Support LP-3 Department of Personnel Assistance LP-4 Enhanced Local Enforcement		

ESTIMATED COSTS AND POTENTIAL FINANCING

Public agency costs for implementing the plan have been estimated and are provided in tables immediately following this section. These tables summarize the federal, state, and local costs of each program area for each plan year through fiscal year 1992. It should be noted that the programs in the plan continue past 1992, but that costs have not been estimated past that date.

The total estimated public agency costs from fiscal year 1987 through fiscal year 1992 are $119 million. Available funding will be the product of a number of decisions by the Authority, the Governor, the Legislature, and local jurisdictions.

Private sector compliance costs and possible public capital costs as a result of plan implementation are discussed within each revised program. Following each program description are tables summarizing the estimated costs by program element, by year, and by public agency.

These estimated costs represent the best judgment of the Authority staff in assessing the public agency work involved in plan implementation. The staff have consulted informally with federal, state, and local agencies to develop these estimates. Several agencies provided specific estimates in commenting on the draft plan.

The Authority presumes that increased federal agency efforts will be supported by federal appropriations. The U.S. Environmental Protection Agency is expected to have sufficient resources to perform its role under the revised preferred plan.

State agency functions under the plan are anticipated to be funded and appropriated from the state general fund, permit fees contributed to the general fund, a portion of the state water quality account (cigarette tax), and some of the remaining Referendum 39 funds. It may also be possible that state agencies will use funds from the federal Coastal Zone Management Act, EPA Puget Sound Estuary Program, and proposed revisions to the federal Clean Water Act to implement some plan elements as such federal funds become available. Improvements by the Washington State Department of Transportation to highway drainage systems are expected to be paid for by federal interstate funds, state gas tax, and other highway revenue sources.

Local governments, such as cities, counties, and health districts, are expected to have available funds from the state water quality account and other locally received revenue. Other local amounts may include sewer and storm drainage utility revenue, fees such as those for inspections of on-site septic systems, federal Farmers Home Administration grants, and local general fund sources.

While the 1987 state legislative session will provide guidance on the use of the cigarette tax revenue, it is anticipated that local governments will use some combination of the state water quality account and other locally received revenue to undertake plan activities.

The potential funding sources for plan implementation include:

1. *Water Quality Account.* The 1986 Legislature created the state water quality account to fund activities and projects undertaken by public bodies to improve or protect water quality.

Monies deposited by the state treasurer into this account include the increased tax on tobacco products and state sales and personal property taxes imposed on water quality facilities and activities. The state has pledged a minimum of $80 million for this fund in the 1988-1989 biennium and $90 million for succeeding biennia.

This law, now known as the Centennial Clean Water Act (RCW 70.146), provides that water quality account funds be appropriated and dispersed within the following formula over the first eight years of the fund:

a. no more than 50 percent for pollution control facilities which discharge into marine waters;
b. no more than 20 percent for the prevention of pollution in groundwaters, including the Spokane aquifer;
c. no more than 10 percent for the protection of freshwater lakes and rivers;
d. no more than 10 percent to control nonpoint sources of pollution;
e. at least 10 percent for discretionary activities and facilities determined by Ecology; and
f. no more than 2.5 percent of the fund may be reserved for use by the state Conservation Commission.

2. *State General Fund.* It is anticipated that general funds above current levels must be appropriated for state agencies to implement the plan.

Permit fees can be used at least partially to offset state general fund contributions for plan implementation. It is recommended in the Municipal and Industrial Discharges program that legislation be adopted to recover some state agency costs from permit recipients. It is anticipated that approximately $3.5 million of existing state agency costs and plan-related costs can be collected annually from discharge permit holders to compensate the state for implementing the NPDES program.

3. *State Referendum 39 Funds.* Remaining funds from the waste disposal and management facilities program enacted in 1980 may be applied toward certain eligible plan activities. Some funds ($200,000) have specifically been set aside for early action to implement a portion of the nonpoint program.

4. *Other Forms of State Funding.* State government may decide to enact new types of revenue for plan actions. Among these may be the rededication of the Aquatic Lands Account, the dedication of the boat tax, or a new revenue source such as conservation district levy authority. Another method may be to provide property tax relief as an incentive to accomplish such actions as stream fencing that may otherwise require public funding.

The state Public Works Trust Fund, which receives some local utility tax money, could expand in revenue, or could include plan-related storm drainage or other local infrastructure projects as eligible for funding.

The state gas tax may be an appropriate revenue source for state Department of Transportation plan-related improvements.

Other state assistance could be provided to public agencies through a reallocation of existing state agency budgets to fund some plan activities from current revenues.

5. *Federal Funds.* It is likely that the U.S. Soil Conservation Service will have some funds available for local nonpoint projects. The EPA will likely continue to utilize funds from the National Estuary Program, which has designated Puget Sound as an eligible area, for joint federal-state activities. The Farmers Home Administration may consider funding some activities that assist low and moderate income households in non-urbanized areas. Other potential funding sources for plan activities include Coastal Zone Management Act funds and Community Development Block Grants.

Of special interest may be the reauthorization of the federal Clean Water Act. Although President Reagan vetoed this legislation in November 1986, it is expected to be acted upon again by Congress. Included within the vetoed act were new EPA-distributed nonpoint pollution control funds of up to $100 million a year. Puget Sound plan elements may be eligible for some of these funds if a revised Clean Water Act is made law with new project categories, such as nonpoint pollution.

6. *Local Government Contributions.* It is expected that, following a decision on local match requirements for projects receiving state water quality account funds, local governments will commit funds to undertake plan-related activities. Sources of local contributions may include fee-generated revenue, other general fund sources, or utility rate receipts. New or existing utilities could assume responsibilities for funding storm-water pollution prevention activities. Utilities that may be appropriate include sewer, drainage, and septic maintenance systems. Entities such as city-county health departments, health districts, or conservation districts could be used as agents for undertaking plan activities and for the collection of plan-related fee revenues.

7. *Private Sector Sources.* Private entities may participate in the financing of certain plan elements. For example, the nonprofit organization The Nature Conservancy is contemplating spending $1 million in

1987-1988 for the acquisition of Puget Sound wetlands. Many program elements will result in pollution control actions by private parties. The private sector may incur added costs as plan elements are implemented. These expenses are broadly identified, where possible, in the text of each program area. However, it is difficult to more precisely determine private costs until public agencies adopt regulations called for in the plan and the nonregulatory programs are developed and implemented.

ESTIMATED COSTS: PUGET SOUND WATER QUALITY PLAN	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Program						
NONPOINT SOURCE POLLUTION	0	6,993,200	7,773,200	9,375,300	8,543,200	9,406,500
SHELLFISH PROTECTION	0	618,000	1,931,200	1,895,000	1,894,100	1,888,400
MUNICIPAL AND INDUSTRIAL DISCHARGES	0	1,705,200	2,803,500	3,721,400	4,500,700	4,545,400
CONTAMINATED SEDIMENTS AND DREDGING	0	1,013,800	2,337,000	2,006,000	2,457,800	1,410,200
STORMWATER AND COMBINED SEWER OVERFLOWS	0	368,300	539,200	3,051,200	9,142,500	8,602,100
LABORATORY SUPPORT	0	399,800	597,400	604,300	424,800	455,300
WETLAND PROTECTION	0	780,200	1,251,400	705,100	649,500	649,300
OIL SPILL RESPONSE PLANNING	0	72,400	199,000	231,700	406,100	405,400
MONITORING	31,500	434,800	384,800	31,500	31,500	0
RESEARCH	0	70,300	30,500	30,500	30,500	0
EDUCATION AND PUBLIC INVOLVEMENT	0	1,283,400	1,235,200	510,200	513,600	121,200
HOUSEHOLD HAZARDOUS WASTE	0	635,600	631,100	61,300	61,000	0
LEGAL AND PERSONNEL SUPPORT	0	1,348,400	1,210,900	1,210,600	1,210,500	1,210,400
TOTAL ANNUAL ESTIMATED COSTS:	$31,500	15,723,400	20,924,400	23,434,100	29,865,800	28,694,200

TOTAL ESTIMATED COSTS THROUGH FY 1992 $118,673,400

****** NOTE THAT ESTIMATES FOR 1990 AND BEYOND ARE SPECULATIVE BECAUSE OF THE FLEXIBILITY ALLOWED BY THE PLAN.

ESTIMATED COSTS: PUGET SOUND WATER QUALITY PLAN	FY 1987 COSTS	FY 1988 COSTS	FY 1989 COSTS	FY 1990 COSTS	FY 1991 COSTS	FY 1992 COSTS
By Agency						
FEDERAL GOVERNMENT						
EPA	0	55,000	55,000	55,000	55,000	55,000
STATE GOVERNMENT						
ATTORNEY GENERAL	0	225,300	201,800	193,700	193,700	193,700
COMMUNITY COLLEGES	0	2,300	0	0	0	0
CONSERVATION COMMISSION	0	79,800	102,500	81,900	81,900	81,900
DEPT OF PERSONNEL	0	27,500	0	0	0	0
DEPT OF AGRICULTURE	0	24,800	23,400	16,500	16,500	16,500
DNR	0	612,700	655,600	606,300	633,600	604,500
DSHS	0	811,000	942,800	958,600	935,700	967,200
ECOLOGY	0	4,516,800	7,757,900	8,369,300	8,700,200	8,573,400
ECOLOGY PASS-THROUGH GRANTS		1,625,000	2,510,000	2,135,000	2,135,000	2,135,000
FISHERIES	0	49,400	56,500	34,800	62,100	33,000
GAME	0	37,900	21,300	18,300	45,700	16,500
LABOR & INDUSTRIES	0	11,000	0	0	0	0
PCHB	0	16,500	0	0	0	0
PSWQA	31,500	792,200	589,500	508,400	487,200	0
PSWQA PASS-THROUGH GRANTS		1,225,500	1,225,500	600,000	600,000	0
SPI	0	21,200	18,500	0	0	0
STATE PARKS	0	398,800	566,300	285,200	980,800	465,800
WASHINGTON CONSERVATION CORPS	0	148,000	240,400	240,400	312,300	312,400
OTHER						
LOCAL GOVERNMENTS	0	4,149,500	5,307,800	8,356,300	13,814,100	14,427,300
CONSERVATION DISTRICTS	0	893,200	649,600	974,400	812,000	812,000
TOTAL ANNUAL ESTIMATED COSTS:	$31,500	15,723,400	20,924,400	23,434,100	29,865,800	28,694,200

Chapter 6:
Assuring Plan Implementation

PLAN CONSISTENCY GENERALLY

The Authority is responsible for overseeing the implementation of the Puget Sound Water Quality Management Plan. This chapter describes some of the statutory requirements and other procedures the Authority will use in carrying out its oversight role. It is the Authority's intention to emphasize assistance and coordination, to focus on the most significant activities related to Puget Sound water quality, and to meet all of its statutory obligations.

The principal means by which this plan is implemented is through the actions of state agencies and local governments. The Authority will assist those entities in various ways to assure that their actions are consistent with the plan, as required by the Puget Sound Water Quality Act. There are also significant features of the plan which require close coordination with federal agencies. The Authority's emphasis will be to provide all possible information and assistance to those entities and to coordinate plan implementation at all levels. This effort will be supplemented by the following specific responsibilities which are conferred by the act.

First, the Authority must monitor the performance of state agencies and local governments in implementing specific programs prescribed in the adopted plan. This includes compliance with implementation time schedules as well as attainment of specific management goals, such as the acquisition of important wetlands.

Second, the Authority must review major proposed public actions and determine if a proposed action, whether specifically prescribed as a plan element or not, is consistent with the policy of the Puget Sound Water Quality Act and with the general intent and objectives of the Puget Sound plan. For example, a proposal to construct a cross-Sound oil pipeline might be evaluated for water quality ramifications regardless of whether such an action was specifically identified in the plan.

PLAN CONSISTENCY PROCEDURES

There are several specific reporting and reviewing requirements laid out in the statute creating the Authority. The Authority intends to ensure that these requirements are meaningful steps in implementing the plan.

OVERSIGHT OF PLAN IMPLEMENTATION

1. Each state agency and local government which is given responsibilities by this plan shall be assigned an Authority staff liaison. The liaison will assure that the agency or government understands its responsibilities under the plan and will assist the agency or government in implementation.

   In addition, the Authority will conduct briefings for state and local agencies to inform agency employees about the plan and about program implementation and reporting.

2. Biennially, state agencies and local governments identified in the plan must submit written reports to PSWQA documenting their consistency with the plan, as required by RCW 90.70.070(3). PSWQA will provide instructions to implementing agencies for that purpose.

3. Biennially, the Authority will review the success of plan implementation (including public and private actions) and report the results to the Legislature and the Governor in the State of the Sound Report, as required by RCW 90.70.055(4)(c).

4. In addition to the biennial review described above, state and local implementing agencies are subject to budget and regulatory review by the Authority as prescribed by RCW 90.70.055(5). The purpose of this review is to assist agencies in meeting timelines and other plan requirements and to ensure that they have adequate resources to fulfill their responsibilities under the plan.

REVIEW OF MAJOR PUBLIC ACTIONS

The Authority's Role in Responding to Proposed Major Public Actions

As provided in RCW 90.70.070, the Authority will review major public actions being considered by state agencies or local governments in order to determine whether the proposed action is consistent with the Puget Sound Water Quality Act and plan, with Authority goals and objectives, and with review criteria developed by the Authority. As a result of such review the Authority may respond to a proposal in a variety of ways. In most instances it is expected that no significant inconsistencies will exist and that at most the Authority staff might provide informal comment. Formal written comment from the Authority would be infrequent and unusual. The Authority will keep a record of its review and comment activities.

Finally, while the Authority is authorized to intervene in administrative or judicial proceedings, the Authority intends that intervention would be the least common form of response, reserved for very rare circumstances.

The Authority emphasizes that its review of major public actions does not replace the authority of the permit issuing agency to make the substantive decision on a permit or other matter. Furthermore, Authority review of a proposed action does not in any sense constitute an appeal of an agency decision; the Authority does not intend to function as an appellate body.

In order to define further the Authority's role in reviewing major public actions, and to provide guidelines for determining an appropriate level of Authority response, the Authority establishes the following criteria governing its involvement:

- o Whether the action is critical to implementation of the Puget Sound Water Quality Management Plan.
- o Whether the action may be in direct and substantial conflict with the plan.
- o Whether the action entails significant adverse water quality impacts which cannot be mitigated.
- o Whether the action will have multiple effects or implications for various water quality issues or programs.

The Authority will respond to a proposal within the established review period or within a timely period if no formal response period exists.

Notice of Actions Subject to Review

In order to ensure that the Authority is aware of activities which potentially merit its attention, the Authority will inform state and local agencies of the specific types of actions for which notice to the Authority should be given.[1]

To determine which actions to review other than actions specifically implementing the Puget Sound plan, the Authority will use the criteria listed above to determine which proposed actions are "major." These actions may include program, policy and permit actions, including actions taken under the State Environmental Policy Act (SEPA).

With respect to SEPA, the Puget Sound Water Quality Authority is an agency with environmental expertise regarding Puget Sound water quality, pursuant to WAC 197-11-920(2) (the SEPA rules). Accordingly, the Authority may review as major public actions those decisions for which it receives draft environmental impact statements pursuant to WAC 197-11-455(1)(c), but will respond only where the proposal meets the criteria listed above. In addition, in conducting SEPA functions state and local agencies shall consider water quality impacts and the requirements of this plan.

[1]Failure of a state agency or local government to provide such notice to the Authority should not void or otherwise invalidate the action taken.

Chapter 7:
The Unfinished Agenda

INTRODUCTION

The Authority is required by the statute establishing it to "...review the plan at least every two years and revise the plan, as deemed appropriate." The statute mandated the inclusion of 19 elements in the 1987 plan. While this list included almost all of the major water quality concerns for the Sound, time did not permit the Authority to explore all of the mandated elements fully and made impossible the exploration of several important issues not mentioned in the statute.

This chapter discusses issues important to Puget Sound water quality that will be examined in preparation for a revised plan to be adopted before January 1, 1989. While the issues will be examined during the next two years, the 1989 plan will not necessarily include elements addressing them. Instead, these issues represent concerns which have been raised by our advisory committee, other government agencies, the public, and others and which, in the judgment of the Authority, deserve analysis. The Authority will engage in a scoping process before embarking on detailed studies of these issues. That process will help determine exactly how the Authority will proceed with the examination of these issues and whether there are others which merit attention.

1987 PLAN ELEMENTS REQUIRING ADDITIONAL ANALYSIS

SPILL PREVENTION AND RESPONSE

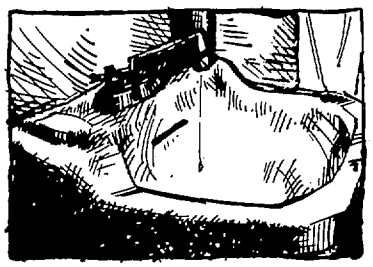
One issue that the Authority added to the 19 elements in the statute was response to oil spills. This addition was stimulated by the large oil spill in Port Angeles on December 21, 1985. Due to time constraints, the examination of this issue was limited to an analysis of the response to that spill. The plan calls for Ecology to revise the state's contingency plan with advice from the Oil Spill Advisory Committee. However, the next plan could include an overall spill prevention program as well as addressing response to spills.

The issues that require investigation include the transportation of oil, radioactive materials, and other hazardous materials on water, on land, and in pipelines. One transportation issue of particular importance is the proposed shipment of spent nuclear fuel from Asia through Puget Sound to the Eastern United States. Storage of those same hazardous substances on land is of equal importance as an issue.

Also worthwhile is an examination of the effectiveness of the regulatory processes in spill prevention, especially response to general complaints from the public. With regard to several of these issues, it would be necessary to coordinate with the Ecology Oil Spill Advisory Committee.

TREATMENT OF DOMESTIC WASTES

A major part of the analytical work in preparation for the 1987 plan has focused on municipal sewage treatment and on-site septic systems. There are five issues subsumed in those subjects which are of potential interest.



a. Several municipalities are now planning to construct secondary treatment plants on Puget Sound. Simultaneously, the 1987 Puget Sound Water Quality Management Plan and other government initiatives are requiring local governments to address combined sewer overflows, stormwater, pretreatment, inflow/infiltration and other related issues. The Authority may wish to address the institutional, financial, and substantive issues involved with the integration of these matters. However, the Authority does not intend to be involved in compliance scheduling with regard to these issues.

b. In other parts of the United States and in other countries, there are on-site sewage technologies in use on both a large and small scale that may hold promise in Puget Sound. Preparation for the next plan could include an analysis of these alternative methods to see if they would benefit Puget Sound water quality and are physically, economically, and culturally feasible here. In addition, the need for new design criteria in regulations for larger on-site systems may be studied for Puget Sound.

c. One byproduct of industrial and municipal waste treatment and the maintenance of on-site septic systems and marine sanitation devices is sludge--the resultant solid waste. With increasing population and more secondary treatment plants, there will be a larger volume of sludge produced. This subject was addressed in the issue paper discussion, but the effects on water quality and the economics of sludge disposal for all four sources could be examined in more detail.

d. The use of chlorine as a disinfectant in sewage effluent is quite common. Concern has been raised about whether the damage caused by the toxic compounds formed by action of the chlorine is greater than the damage that would be caused by the bacteria added to the environment if chlorine were not used. This question is tied to the feasibility and effectiveness of alternate disinfection techniques.

e. An issue that relates both to spill prevention and response and to treatment of domestic wastes is emergency overflow. Pipes transporting untreated sewage occasionally discharge into the Sound or associated waters due to electrical or mechanical failure. In some instances these overflows cause fish kills or beach closures. The Authority may wish to examine this issue to determine how frequently such incidents occur and how they can be prevented and managed more efficiently.

WILDLIFE HABITAT

The Authority's statute called for a plan element "...on protecting, preserving and, where possible, restoring... wildlife habitat...throughout Puget Sound." The only habitat examined closely in the 1987 plan was wetlands. The Authority could expand the scope upland and into the water and sediments and look more thoroughly at the plant and animal resources of the Puget Sound Basin.

THE USE OF PESTICIDES, HERBICIDES, AND OTHER TOXICANTS

In preparing the 1987 plan, agricultural practices, forest practices, and on-site septic systems were examined. Some features of the plan would result in increased control of chemical contamination from the full range of sources. However, in each of those three areas, analysis could be expanded to more completely address the effects of the use of pesticides, herbicides, and hazardous household materials on water quality. These contaminants are also commonly used along power lines and roads and in landscaping.

AQUACULTURE AND PARALYTIC SHELLFISH POISONING

The protection of commercial shellfish beds is a significant concern of the 1987 plan and a driving force behind many of the nonpoint, point, and stormwater elements. Many citizens are concerned in turn with the water quality impacts of aquaculture, especially pen-rearing or tank-rearing of finfish. Paralytic shellfish poisoning is an issue which may or may not be a water quality issue, but which is certainly of great concern for both commercial and recreational shellfish.

FEDERAL FACILITIES

There are several major military bases and other federal installations directly on Puget Sound and in the drainage of the Sound, and plan elements in the point source and stormwater areas call for pollution controls for these facilities comparable to requirements for other industrial and municipal areas. However, a more thorough examination may be necessary because among these facilities are major industrial dischargers and transshippers of significant quantities of oil, hazardous chemicals, and radioactive materials. Some of these bases are located in rural areas and have populations the size of small cities with the runoff and sewage treatment issues that are normally found in more urbanized parts of the Sound. A major new Navy base may be constructed in Everett. There are significant numbers of abandoned military and other federal facilities on Puget Sound which may have hazardous wastes on site.

LABORATORY NEEDS FOR LOCAL GOVERNMENT

The key to success of many of the municipal and industrial discharges elements in the plan is the implementation of laboratory support elements which will improve the enforcement capabilities of state agencies. In the same way it may be important for the success of the nonpoint and stormwater elements that local governments also have their laboratory needs met. The Authority may wish to examine those needs, especially in relation to the monitoring and enforcement tasks faced by counties and cities.

COSTS OF RESEARCH AND MONITORING

The 1987 Puget Sound Water Quality Management Plan will require a substantial increase in research and monitoring by both public and private sector organizations. Many of the tests and procedures which will be required

are very expensive. The Authority may want to make an effort to determine whether the costs of research and monitoring can be reduced significantly through new technologies or new methodologies.

ISSUES NOT ADDRESSED IN THE 1987 PLAN REQUIRING ANALYSIS

ATMOSPHERIC DEPOSITION OF POLLUTANTS

Many of the particles and other air pollutants from transportation, industrial, and other sources eventually enter Puget Sound from surface runoff and direct deposition into the Sound and the streams flowing into it. It is unclear what proportion of the total loading of contaminants comes from this source and whether there are resultant water quality problems.

CONTAMINATION OF THE SURFACE MICROLAYER

Recent scientific studies have revealed that the microscopic layer at the surface of the Sound has, in some areas, become a hazard to the survival of the fish eggs and larvae of other species deposited there. The extent of the problem and the sources of the contamination require analysis.

SOLID WASTE/HAZARDOUS WASTE DISPOSAL

The management of wastes stored on land is usually directed toward prevention of groundwater pollution. The relationships between groundwater and marine water in transmission of contaminants is poorly understood on a Soundwide basis. In some instances contaminants leach directly into Puget Sound or into streams in the watershed. Proposals for large-scale incineration, an alternative to landfills, may lead to additional atmospheric deposition into the Sound. Another land disposal method, the use of injection wells, may also be worth examination.

TRANSBOUNDARY WATER QUALITY ISSUES

The Authority planning area extends to the Canadian border. Many of the issues of concern in the Straits of Georgia and Juan de Fuca relate to the differences in policy and practice on either side of that border. For example, the City of Victoria discharges raw sewage; narrow passages in the San Juan Islands are traversed by oil tankers operating under different national regulations; and industries discharging into the Fraser River do so with fewer restraints than would be the case in Washington. There is also the potential for joint research and monitoring projects across the border. The Authority has already initiated a dialogue on these issues through the participation of Canadian representatives on the Monitoring Management Committee.

PUBLIC USE OF BEACHES

There have been regular closures of beaches in the Puget Sound region due to emergency releases of raw sewage. Very few efforts are directed toward the systematic examination of recreational beaches to see if bacteriological or chemical contamination is a threat to human health.

As shoreline development continues on Puget Sound, access to the Sound by the public diminishes. This reduction in access may result in a reduction in use which could have a beneficial effect on habitat and water quality.

However, it could also result in a decline in public concern about Puget Sound. The Authority may wish to survey the relationship between these issues.

WATER QUANTITY AND USE

In some of the areas of concern to the Authority, the ways in which water is used and managed can have a significant impact on water quality. Water usage is related to the need for additional wastewater treatment capacity including on-site systems. Habitat for fish and other organisms can be enhanced or reduced through management of flow rates.

ISLANDS

The islands of Puget Sound affect and are affected by water quality in the Sound in ways that are different from their mainland neighbors. For example, the connections between groundwater and marine water quality are much more evident. This is especially clear with regard to solid/hazardous waste disposal and suitability of soils for on-site septic systems. Spills can have a larger impact on a more vulnerable island ecology. With each of the old and new issues examined for possible inclusion in the 1989 plan, the Authority could determine if some or all of the islands require alternative approaches to those taken elsewhere in the planning area.

Appendix A: Glossary

AEROBIC
Living, active, or occurring only in the presence of oxygen. For example, soil microorganisms which degrade sewage effluent from septic systems need oxygen in order to function.

ALGAE
Aquatic, nonflowering plants that lack roots and use light energy to convert inorganic nutrients such as nitrogen and phosphorus into organic matter by photosynthesis. Common algae include single-celled dinoflagellates, diatoms, seaweeds, and kelp. An algal bloom can occur when excessive nutrient levels and other physical and chemical conditions enable the algae to reproduce rapidly.

AMPHIPODS
Small shrimp-like crustaceans, for example, sand fleas and related forms. Many live on the bottom (i.e., are benthic) and feed on algae and detritus.

ANADROMOUS FISH
Species, such as salmon, which are born in fresh water, spend a large part of their lives in the sea, and return to fresh water rivers and streams to procreate.

AROMATIC
A chemical substance characterized by the presence of at least one benzene ring. These substances generally have a strong smell and are often persistent in the environment due to the stability of the benzene ring.

BASELINE STUDY
A study that seeks to document the existing state of an environment.

BENTHIC ORGANISM
Organisms that live in or on the bottom of a body of water.

BEST MANAGEMENT PRACTICE (BMP)
A method for preventing or reducing the amount of pollution generated by an activity. The term originated with the rules and regulations developed pursuant to Section 208 of the federal Clean Water Act (40 CFR 130).

BIOACCUMULATION
The process by which a contaminant accumulates in the tissues of an individual organism. For example, certain chemicals in food eaten by a fish tend to accumulate in its liver and other tissues.

BIOASSAY
A test procedure that measures the response of living plants, animals, or tissues to a sample. For example, marine worms have been exposed to the sediments of Puget Sound, and their responses have been used to determine areas in the Sound where the sediments may be harmful to life.

BIOCHEMICAL OXYGEN DEMAND (BOD)
The quantity of oxygen-demanding materials present in a sample as measured by a specific test. A major objective of conventional wastewater treatment is to reduce its biochemical oxygen demand so that the oxygen content of the water body will not be significantly reduced. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

BIODEGRADATION

The conversion of organic compounds into simpler compounds through biochemical activity. Toxic compounds can sometimes be converted into nontoxic compounds through biodegradation. Unfortunately, in some cases complex compounds are first converted into intermediate substances that can be more toxic than the original substance.

BIOMAGNIFICATION

The process by which concentrations of contaminants increase (magnify) as they pass up the food web so that each animal in the web has higher tissue concentrations than did its food. For example, concentrations of certain contaminants can increase as they are passed from plankton to herring to salmon to seals.

BIOTA

The animals and plants that live in a particular location or region.

BIOTRANSFORMATION

The chemical transformation of substances by biological processes. Toxic chemicals ingested by fish may be changed by chemical reactions in the fish into other chemicals. These new compounds may be harmless, or they may be more toxic than the original contaminant.

BOG

A wetland with poor drainage generally characterized by extensive peat deposits and acidic waters. Vegetation includes sedges, sphagnum moss, shrubs, and trees.

BOTTOMFISH

Fish that live on or near the bottom of the water, for example, English sole.

CARCINOGENIC

Capable of causing cancer.

CATEGORICAL INDUSTRY and CATEGORICAL STANDARDS

To deal with the tremendous number of individual industrial and commercial operations that may require water pollution standards, EPA has established 34 industrial categories based on a standard industrial classification developed for tax purposes. Some examples are adhesives and sealants, explosives manufacturing, ore mining, pulp and paperboard mills, and textile mills. As part of the settlement of a lawsuit, EPA identified 22 of these industrial categories for which federal pretreatment standards would be developed. As of February 1986 21 such sets of standards have been adopted. An industry in an industrial category for which pretreatment standards have been set is referred to as a categorical industry, and the federal pretreatment standards are referred to as categorical standards.

CERTIFIED SHELLFISH BED

An area where commercial shellfish harvesting is approved by DSHS based on measurements of fecal coliform bacteria. Fecal coliform bacteria are used as a predictor of human health risk.

CFR

Code of Federal Regulations, the compilation of federal regulations adopted by federal agencies through a rulemaking process. For example, pretreatment regulations are found in 40 CFR 403.

CLEANUP ACTIVITIES

Actions taken by a public agency or a private party to correct an environmental problem. Activities can include either the prevention of pollution by the treatment or control of contaminants (for example, treatment of wastewater before discharge) or the removal from the environment of contaminants introduced by past practices (for example, digging up and incinerating soil contaminated with dioxin).

COLIFORM BACTERIA

A type of bacteria that is coil or helix shaped. Fecal coliform bacteria are those coliform bacteria that are found in the intestinal tracts of mammals. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animals and may indicate the presence of pathogens.

COMBINED SEWER OVERFLOW (CSO)

A pipe that discharges untreated wastewater during storms from a sewer system that carries both sanitary wastewater and stormwater. The overflow occurs because the system does not have the capacity to transport and treat the increased flow caused by stormwater runoff.

COMBINED SEWER SYSTEM

A wastewater collection and treatment system where domestic and industrial wastewater is combined with storm runoff. Although such a system does provide treatment of stormwater, in practice the systems cannot handle major storm flows resulting in untreated discharges from combined sewer overflows.

CONTAMINANT

A substance that is not naturally present in the environment or is present in unnatural concentrations or amounts and which can, in sufficient concentration, adversely alter an environment. Federal regulations (40 CFR 230) for the discharge of dredged or fill material into navigable waters regulated by Section 404 of the federal Clean Water Act define contaminant as a chemical or biological substance in a form that can be incorporated into, onto, or be ingested by and that harms aquatic organisms, consumers of aquatic organisms, or users of the aquatic environment.

CONVENTIONAL CONTAMINANT

Conventional contaminants as specified under the Clean Water Act are total suspended solids, coliform bacteria, biochemical oxygen demand, pH, and oil and grease. pH is a measure of the acidity or alkalinity of the water. Today a large number of toxic contaminants are of concern in addition to the conventional contaminants.

CROSS-MEDIA, INTERMEDIA

Between or among media. A treatment method that transfers a volatile organic compound from wastewater to the air allows an intermedia transfer of the contaminant.

CUMULATIVE EFFECTS

The combined environmental impacts that accrue over time and space from a series of similar or related individual actions, contaminants, or projects. Although each action may seem to have a negligible impact, the combined effect can be severe.

CWA

The federal Clean Water Act, previously known as the Federal Water Pollution Control Act (33 U.S.C. 1251 *et seq.*).

DESORPTION

The movement of substances into solution from particles where they have been sorbed. Opposite of sorption.

DETENTION
The process of collecting and holding back stormwater for delayed release to receiving waters.

DISCHARGE, DIRECT OR INDIRECT
The release of wastewater or contaminants to the environment. A direct discharge of wastewater flows directly into surface waters while an indirect discharge of wastewater enters a sewer system.

DISINFECTION
The destruction of infectious agents such as bacteria or viruses. Most wastewater treatment plants use chlorine for disinfection.

DISPOSAL
A method by which unwanted materials are gotten rid of. Unfortunately, unless contaminants are converted to less harmful substances or removed from the material before disposal, they may be released again into the environment. In these cases the waste has only been relocated.

DISSOLVED OXYGEN
Oxygen that is present (dissolved) in water and therefore available for fish and other aquatic animals to use. If the amount of dissolved oxygen in the water is too low, then the marine animals will die. Wastewaters often contain oxygen-demanding substances that can consume dissolved oxygen if discharged into the environment without treatment.

DOMESTIC WASTEWATER
The wastewater that flows from sinks, toilets, showers, and other facilities that are routinely used by people.

DREDGING
Any physical digging into the bottom of a water body. Dredging can be done with mechanical or hydraulic machines, and it changes the shape and form of the bottom. Dredging is routinely done in many parts of Puget Sound in order to maintain navigation channels that would otherwise fill with sediment and block ship passage.

DRY WELL
A pit in the ground, often filled with gravel, into which stormwater is routed. The dry well holds the runoff until it percolates into the ground.

DSHS
The Washington Department of Social and Health Services, which is responsible for implementing public health legislation.

ECOLOGY (WDOE)
The Washington Department of Ecology, which is responsible for implementing many environmental protection laws including the state Clean Water Act and the Shoreline Management Act. Note that the abbreviation DOE is confusing because the federal Department of Energy uses the same term. Ecology is the preferred term for referring to the Department of Ecology.

ECOSYSTEM
A community of living organisms interacting with one another and with their physical environment, such as a rain forest, pond, or estuary. An ecosystem, such as Puget Sound, can be thought of as a single complex system. Damage to any part may affect the whole. A system such as Puget Sound can also be thought of as the sum of many interconnected ecosystems such as the rivers, wetlands, and bays.

Ecosystem is thus a concept applied to various scales of living communities and signifying the interrelationships that must be considered.

EFFLUENT
The liquid flowing out of a facility or household into a water body or sewer system. For example, the treated liquid discharged by a wastewater treatment plant is the plant's effluent.

EIS
Environmental impact statement, a document that discusses the likely significant impacts of a proposal, ways to lessen the impacts, and alternatives to the proposal. EISs are required by the national and state environmental policy acts.

EPA
The U.S. Environmental Protection Agency, which administers many federal environmental laws. EPA Region 10, which includes Puget Sound, is headquartered in Seattle.

EROSION
Wearing away of rock or soil by the gradual detachment of soil or rock fragments by water, wind, ice, and other mechanical and chemical forces.

ESTUARY
A confined coastal water body where ocean water is diluted by in-flowing fresh water and tides are experienced.

FECAL COLIFORM see COLIFORM BACTERIA

FLOCCULATION
The aggregation of small suspended particles into a loose mass caused by ionic changes or changes in solubility. Many contaminants dissolved or carried in fresh water change form through this process when the fresh water enters the salt waters of Puget Sound.

FOOD WEB
A community of organisms which are connected by dependence upon one another for food.

FOREST PRACTICE
Any activity conducted on or directly pertaining to forest land and relating to growing, harvesting, or processing timber. These activities include but are not limited to: road and trail construction, final and intermediate harvesting, precommercial thinning, reforestation, fertilization, prevention and suppression of disease and insects, salvage of trees, and brush control.

FULL-TIME EQUIVALENT (FTE)
The work one person does in one year--used to estimate costs and people needed to perform plan actions.

FUNGICIDE
A substance that destroys or inhibits growth of fungus.

GROUNDWATER
Underground water supplies, also called aquifers. Aquifers are created by rain which soaks into the ground and flows down until it is collected at a point where the ground is not permeable. Groundwater then usually flows laterally toward a river or lake or the ocean. Wells tap the groundwater for our use.

HABITAT

The specific area or environment in which a particular type of plant or animal lives. An organism's habitat must provide all of the basic requirements for life and should be free of harmful contaminants. Typical Puget Sound habitats include beaches, marshes, rocky shores, the bottom sediments, mudflats, and the water itself.

HAZARDOUS WASTE

Any solid, liquid, or gaseous substance which, because of its source or measurable characteristics, is classified under state or federal law as hazardous and subject to special handling, shipping, storage, and disposal requirements. Washington state law identifies two categories, Dangerous and Extremely Hazardous. The latter category is more hazardous and requires greater precautions.

HEALTH RISK

The risk or likelihood that a person's health will be adversely affected. Estimating health risks is a complex and inexact practice.

HERBICIDE

A substance used to destroy or inhibit growth of vegetation.

HOLDING TANK

An enclosed container used as part of an on-site sewage disposal (septic) system or on a boat to store sewage temporarily for later pumpout to a truck or to a marina pumpout facility.

HYDROCARBON

An organic compound composed of carbon and hydrogen, for example, petroleum compounds.

HYDROLOGIC CYCLE

The continual cycling of water between the land, the sea, and the atmosphere through evaporation, condensation, precipitation, absorption into the soil, and stream runoff.

IMPERVIOUS

A surface that cannot be easily penetrated. For instance, rain does not readily penetrate asphalt or concrete pavement.

INDUSTRIAL USER

A commercial or industrial facility which discharges anything other than domestic waste to a sewage treatment plant. Industrial users may be subject to pretreatment requirements.

INSECTICIDE

A substance, usually a chemical, that is used to kill insects.

INTERFERENCE

A contaminant can interfere with the normal treatment plant process if it diminishes the efficiency of the treatment process. For example, a toxic chemical can kill the beneficial bacteria in a treatment plant and interfere with the biological treatment process, thus causing the release of excessively contaminated effluent.

INTERTIDAL AREA

The area between high and low tide levels. The alternate wetting and drying of this area makes it a transition between land and water and creates special environmental conditions.

LAND USE

The way land is developed and used in terms of the types of activities allowed (agriculture, residences, industries, etc.) and the size of buildings and structures permitted. Certain types of pollution problems are often associated with particular land use practices, such as sedimentation from construction activities.

LEACHATE

Water or other liquid that has dissolved (leached) soluble materials, such as organic and mineral salts, from a solid material, such as a layer of soil or debris. Rainwater that percolates through a sanitary landfill and picks up contaminants is called the leachate from the landfill.

MARINE SANITATION DEVICE (MSD)

A device installed on a boat to treat or hold sewage. Section 312 of the federal Clean Water Act requires all vessels with installed toilets to have approved MSDs. Federal regulations describe three types of MSDs: Type I and Type II MSDs are treatment devices while Type III MSDs are holding tanks.

MARSH

A wetland where the dominant vegetation is non-woody plants such as grasses and sedges, as opposed to a swamp where the dominant vegetation is woody plants like trees.

MEAN ANNUAL FLOW

The average amount of water that flows past a given point in one year.

MEAN HIGH WATER (MHW)

The average height (over many years) reached by the high tides.

MEAN HIGHER HIGH WATER (MHHW)

The average height (over many years) reached by the higher of two high tides each day. Puget Sound has two high tides and two low tides each day.

MEDIA

In pollution control programs, media are the components of the environment that may be contaminated with a substance. Thus lead can be discharged to the air, to the water, or on the land. A program that handles lead contamination in all media is a cross-media or multimedia program. A disposal practice that allows contaminants to go from water to air allows cross-media or intermedia transfers.

METABOLISM

All chemical processes occurring within an organism, including both synthesis and breakdown of organic materials.

METALS

Metals are natural elements found in rocks and minerals that are naturally released to the environment by erosion. Certain metals, such as mercury, lead, nickel, zinc, and cadmium, are of environmental concern because they are released to the environment in excessive amounts by man's activities. They are generally toxic to life at certain concentrations. Since metals are elements, they do not break down in the environment over time.

MICROLAYER, SEA SURFACE MICROLAYER

An extremely thin layer of organic substances that is part of the top layer of water. It is of concern because contaminants such as oil, grease, toxicants, and pathogens may be present at much higher concentrations in the microlayer than they are in the water column and may therefore pose a danger to fish eggs and other organisms that come into contact with the surface.

MICROORGANISMS
Minute organisms, such as bacteria, which are barely visible to the unaided eye.

MONITOR
To systematically and repeatedly measure something in order to track changes. For example, dissolved oxygen in a bay might be monitored over a period of several years in order to identify any trends in its concentration.

MUNICIPAL DISCHARGE
Effluent from a municipal sewage treatment plant.

NPDES
National Pollutant Discharge Elimination System, a part of the federal Clean Water Act, which requires point source dischargers to obtain permits. These permits are referred to as NPDES permits and are administered by the Washington State Department of Ecology.

NUTRIENTS
Essential chemicals needed by plants or animals for growth. Excessive amounts of nutrients can lead to degradation of water quality by promoting excessive growth, accumulation, and subsequent decay of plants, especially algae. Some nutrients can be toxic at high concentrations.

OXYGEN DEMANDING MATERIALS
Materials such as food waste and dead plant or animal tissue that use up dissolved oxygen in the water when they are degraded through chemical or biological processes. Biological Oxygen Demand (BOD) is a measure of how much oxygen demand a substance has.

PAH
Polycyclic (polynuclear) aromatic hydrocarbon. A class of complex organic compounds, some of which are persistent and cancer-causing. These compounds are formed from the combustion of organic material and are ubiquitous in the environment. PAHs are commonly formed by forest fires and by the combustion of gasoline. They often reach the environment through atmospheric fallout and highway runoff.

PARALYTIC SHELLFISH POISONING (PSP)
An illness, sometimes fatal to humans, caused by a toxin produced by a type of plankton called *Gonyaulax.* During certain times of the year and at certain locations, these organisms proliferate in "blooms" (sometimes called red tide) and can be concentrated in clams, mussels, and other bivalves. Consumption of the shellfish can then cause an acute illness in humans. The shellfish, lacking a nervous system, are unaffected.

PARAMETER
A quantifiable or measurable characteristic of something. For example, height, weight, sex, and hair color are all parameters that can be determined for humans. Water quality parameters include temperature, pH, salinity, dissolved oxygen concentration, and many others.

PATHOGEN
A disease-causing agent, especially a virus, bacteria, or fungi. Pathogens can be present in municipal, industrial, and nonpoint source discharges to the Sound.

PCBs
Polychlorinated biphenyls, a group of man-made chemicals, including about 70 different but closely related compounds made up of carbon, hydrogen, and chlorine. If released to the environment, they

persist for long periods of time and can biomagnify in food chains because they are not water-soluble. PCBs are suspected to cause cancer in humans. PCBs are an example of an organic toxicant.

PELAGIC
Associated with or living in the water column, as opposed to the bottom or the shoreline.

PERCOLATE
To pass through a permeable substance. For instance, septic effluent percolates through soil. A percolator makes coffee by percolating hot water through coffee grounds.

PERCOLATION TEST
A test that measures the rate at which water can percolate into the soil at a particular location. The test involves digging a small test pit, filling it with water, and measuring how far the surface of the water drops over a given time period. Soil with a low percolation rate, as determined by the test, may be unsuitable for an on-site septic system.

PERSISTENT
Compounds that are not readily degraded by natural physical, chemical, or biological processes.

PESTICIDE
A general term used to describe any substance--usually chemical--used to destroy or control organisms (pests); includes herbicides, insecticides, algicides, fungicides, and others. Many of these substances are manufactured and are not naturally found in the environment. Others, such as pyrethrum, are natural toxins which are extracted from plants and animals.

pH
The degree of alkalinity or acidity of a solution. A pH of 7.0 indicates neutral water while a pH of 5.5 is acid. A reading of 8.5 is alkaline or basic. The pH of water influences many of the types of chemical reactions that will occur in it.

PHENOLS
Aromatic organic alcohols, acidic and often toxic.

PHOTOSYNTHESIS
The process by which green plants use light energy to make carbohydrates from carbon dioxide and water.

PLANKTON
Small plants and animals that are suspended in the water and either drift with the currents or swim weakly. Phytoplankton are plants that use light to make food. Zooplankton are animals that eat phytoplankton and each other.

POLLUTANT
A contaminant that adversely alters the physical, chemical, or biological properties of the environment. The term includes pathogens, toxic metals, carcinogens, oxygen-demanding materials, and all other harmful substances. Particularly with reference to nonpoint sources, the term is sometimes used to apply to contaminants released in low concentrations from many activities which collectively degrade water quality. As defined in the federal Clean Water Act, pollutant means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into water.

PRETREATMENT
The treatment of wastewaters to remove contaminants prior to discharge into municipal sewage systems.

PRIMARY PRODUCTION
The production of plant matter (plant tissues) from carbon dioxide and water through photosynthesis. By comparison, secondary production is the production of animal tissue. Different plant communities are often compared by measuring their rates of primary production.

PRIMARY TREATMENT
A wastewater treatment method that uses settling, skimming, and chlorination to remove solids, floating materials, and pathogens from wastewater. Primary treatment removes about 35 percent of BOD and less than half of the metals and toxic organic substances.

PRIORITY POLLUTANTS
Substances listed by EPA under the Clean Water Act as toxic and having priority for regulatory controls. The list includes toxic metals, inorganic contaminants such as cyanide and arsenic, and a broad range of both natural and artificial organic compounds. The list of priority pollutants probably includes substances which are not of concern in Puget Sound and does not include all known harmful compounds.

PUGET SOUND, WATERS OF
As defined in RCW 90.70.005, all salt waters of the state of Washington inside the International Boundary line between Washington and British Columbia, and lying east of 123° 24' west longitude (east of Port Angeles).

RCRA
The Resource Conservation and Recovery Act, the federal law that classifies and regulates solid and hazardous waste.

RCW
Revised Code of Washington, the compilation of the laws of the state of Washington published by the Statute Law Committee. For example, the law that created the Puget Sound Water Quality Authority is incorporated in the code as Chapter 90.70 RCW.

REGULATORY FRAMEWORK
A particular set of laws, rules, procedures, and agencies designed to govern a particular type of activity or solve a particular problem.

RESPIRATION
The metabolic processes by which an organism takes in and uses oxygen and releases carbon dioxide and other waste products.

SALINITY
A measure of the quantity of dissolved salts such as in seawater.

SALMONID
A fish of the family Salmonidae (as distinct from a salmonoid which is merely a fish that resembles a salmon). Fish in this family include salmon and trout. Many Puget Sound salmonids are anadromous.

SANITARY WASTEWATER
Wastewater which includes sewage and may contain pathogens. Sanitary wastewater is not sanitary.

SECONDARY TREATMENT
A wastewater treatment method that usually involves the addition of biological treatment to the settling, skimming, and disinfection provided by primary treatment. Secondary treatment may remove up to 90 percent of BOD and significantly more metals and toxic organics than primary.

SEDIMENT
Material suspended in or settling to the bottom of a liquid, such as the sand and mud that make up much of the shorelines and bottom of Puget Sound.

SEPA
The State Environmental Policy Act, a state law intended to minimize environmental damage. SEPA requires that state agencies and local governments consider environmental factors when making decisions on activities, such as development proposals over a certain size and comprehensive plans. As part of this process, environmental documents are prepared and opportunities for public comment are provided.

SEPARATED SEWER SYSTEM
A wastewater collection and treatment system where domestic and industrial wastewater is separated from storm runoff. A separated system consists of independent sanitary wastewater and stormwater systems. The stormwater is generally discharged directly into open water, and the sanitary wastewater goes to a treatment plant.

SEPTAGE
The material that is pumped out of a septic tank.

SHELLFISH
An aquatic animal, such as a mollusk (clams and snails) or crustacean (crabs and shrimp), having a shell or shell-like exoskeleton.

SHELLFISH CONTAMINATION
The contamination of certain bivalves (clams, mussels, oysters) which filter water to feed and tend to collect or concentrate waterborne contaminants in their tissues.

SHORELINE DEVELOPMENT
As regulated by the Shoreline Management Act, the construction over water or within a shoreline zone (generally 200 feet landward of the water) of structures such as buildings, piers, bulkheads, and breakwaters, including environmental alterations such as dredging and filling, or any project which interferes with public navigational rights on the surface waters.

SLUDGE, WASTEWATER TREATMENT SLUDGE
Semi-solid matter resulting from the treatment of wastewater. Some of the contaminants that were in the wastewater remain in the sludge after treatment. The treated wastewater can be discharged to the Sound, but the sludge must be disposed of elsewhere. Sludge is usually at least partially dried before disposal and may be added to soil to increase plant growth.

SMELT
A family of small fishes, some of which spawn on beaches, burying their eggs in the sand, and some of which are anadromous.

SMOLT
A salmon or anadromous trout that is making its first descent to the sea from the fresh waters where it was born.

SOIL PERMEABILITY
The ease with which gases, liquids, or plant roots penetrate or pass through a layer of soil.

SOLUBLE
Able to go into solution, especially in water. Alcohol is very soluble in water whereas oil is not soluble in water.

SORPTION
The combination of processes by which one material takes up and retains another. Includes absorption in which the substance taken up goes into the other material and adsorption in which the substance taken up adheres to the surfaces of solids or liquids with which they are in contact. In aquatic systems many chemicals sorb to sediment particles and are transported by the particles.

STORMWATER
Water that is generated by rainfall and is often routed into drain systems in order to prevent flooding.

STORM DRAIN
A system of gutters, pipes, or ditches used to carry stormwater from surrounding lands to streams, lakes, or Puget Sound. In practice, storm drains carry a variety of substances such as oil and antifreeze which enter the system through runoff, deliberate dumping, or spills. This term also refers to the end of the pipe where the stormwater is discharged.

STRATIFIED ESTUARY
An estuary with a freshwater layer floating on top of a saltwater layer. The freshwater layer flows out towards the ocean and the saltwater layer flows inward towards the land. Puget Sound is a stratified estuary.

SUBTIDAL
Below the ebb and flow of the tide. Used to refer to the marine environment below low tide.

SUSPENDED SOLIDS
Organic or inorganic particles that are suspended in and carried by the water. The term includes sand, mud, and clay particles as well as solids in wastewater.

SWAMP
A wetland where the dominant vegetation is composed of woody plants like trees, as opposed to a marsh where the dominant vegetation is non-woody plants like grasses.

TECHNOLOGY-BASED STANDARDS
Technology-based effluent standards are developed by considering the effluent quality that can be achieved using various process or treatment technologies, and the costs of those technologies, rather than basing effluent standards on the environmental effects of different loadings of pollutants.

TERATOGENIC
Causing birth defects.

TOXIC
Poisonous, carcinogenic, or otherwise directly harmful to life.

TOXIC SUBSTANCES AND TOXICANTS
Chemical substances, such as pesticides, plastics, detergents, chlorine, and industrial wastes that are poisonous, carcinogenic, or otherwise directly harmful to life.

TREATMENT
Chemical, biological, or mechanical procedures applied to an industrial or municipal discharge or to other sources of contamination to remove, reduce, or neutralize contaminants.

TURBIDITY
A measure of the amount of material suspended in the water. Increasing the turbidity of the water decreases the amount of light that penetrates the water column. High levels of turbidity are harmful to aquatic life.

VOLATILE
Readily vaporizable at a relatively low temperature.

WAC
Washington Administrative Code, which contains all state regulations adopted by state agencies through a rulemaking process. For example, Chapter 173-201 WAC contains water quality standards.

WATERSHED
The geographic region within which water drains into a particular river, stream, or body of water.

WATER TABLE
The upper surface of groundwater or the level below which the soil is saturated with water.

WETLANDS
Habitats where the influence of surface- or groundwater has resulted in development of plant or animal communities adapted to such aquatic or intermittently wet conditions. Wetlands include tidal flats, shallow subtidal areas, swamps, marshes, wet meadows, bogs, and similar areas. Wetlands as defined by the Shoreline Management Act include all land within 200 feet of the ordinary high water mark, floodways, and floodplain areas.

ZONING
To designate, by ordinances, areas of land reserved and regulated for different land uses.

Appendix B: Acronyms

AET--Apparent effects threshold
BMP--Best management practice
BOD--Biochemical oxygen demand
CERCLA--Comprehensive Environmental Response, Compensation, and Liability Act (also known as "Superfund")
CFR--Code of Federal Regulations
CSO--Combined sewer overflow
CWA--Clean Water Act
DNR--Washington Department of Natural Resources
DSHS--Washington Department of Social and Health Services
EIS--Environmental Impact Statement
EPA--U.S. Environmental Protection Agency
FDA--U.S. Food and Drug Administration
FTE--Full-time equivalent
MGD--Millions of gallons per day
MSD--Marine sanitation device
NEPA--National Environmental Policy Act
NOAA--National Oceanic and Atmospheric Administration
NPDES--National Pollution Discharge Elimination System
PAH--Polycyclic (polynuclear) aromatic hydrocarbon
PCB--Polychlorinated biphenyl
PCHB--Pollution Control Hearings Board
POTW--Publicly-owned treatment works
PSDDA--Puget Sound Dredged Disposal Analysis
PSEP--Puget Sound Estuary Program
PSP--Paralytic Shellfish Poisoning
PSWQA--Puget Sound Water Quality Authority
RCRA--Resource Conservation and Recovery Act
RCW--Revised Code of Washington
SCS--U.S. Soil Conservation Service
SEPA--State Environmental Policy Act
SMA--Shoreline Management Act
SPCC--Spill prevention control and countermeasure
SPI--Superintendent of Public Instruction
T/F/W--Timber/Fish/Wildlife Project
USC--United States Code
WAC--Washington Administrative Code
WDF--Washington Department of Fisheries
WDG--Washington Department of Game
WDIS--Wastewater Discharge Information System
WDOT--Washington Department of Transportation

Appendix C: Puget Sound Water Quality Act

Chapter 90.70
PUGET SOUND WATER QUALITY AUTHORITY

Sections

90.70.001 Legislative findings——Policy.
90.70.005 Definitions.
90.70.011 Puget Sound water quality authority——Membership——Terms——Vacancies——Compensation.
90.70.025 Authority's powers.
90.70.035 Appointment of advisory committees——Duties.
90.70.045 Hiring of staff——Assignment of government employees to authority.
90.70.055 Water quality management plan——Progress reports——"State of the Sound" report——Budget and activities review.
90.70.060 Water quality management plan——Requirements——Record of public comments.
90.70.070 Water quality management plan——Incorporation by state and local governments——Review and report on implementation——Deviations from plan.
90.70.080 Adoption of rules, ordinances, and regulations.
90.70.900 Termination of authority——Expiration of chapter.
90.70.901 Severability——1985 c 451.

90.70.001 Legislative findings——Policy. The legislature finds that Puget Sound and related inland marine waterways of Washington state represent a unique and unparalleled resource. A rich and varied range of marine organisms, composing an interdependent, sensitive communal ecosystem reside in these sheltered waters. Residents of this region enjoy a way of life centered around the waters of Puget Sound, featuring accessible recreational opportunities, world-class port facilities and water transportation systems, harvest of marine food resources, shoreline-oriented life styles, water-dependent industries, tourism, irreplaceable aesthetics and other activities, all of which to some degree depend upon a clean and healthy marine resource.

The legislature further finds that the consequences of careless husbanding of this resource have been dramatically illustrated in inland waterways associated with older and more extensively developed areas of the nation. Recent reports concerning degradation of water quality within this region's urban embayments raise alarming possibilities of similar despoliation of Puget Sound and other state waterways. These examples emphasize that the costs of restoration of aquatic resources, where such restoration is possible, greatly exceed the costs of responsible preservation.

The legislature declares that utilization of the Puget Sound resource carries a custodial obligation for preserving it. The people of the state have the unique opportunity to preserve this gift of nature, an understanding of the results of inattentive stewardship, the technical knowledge needed for control of degradation, and the obligation to undertake such control.

The legislature further finds that the large number of governmental entities that now affect the water quality of Puget Sound have diverse interests and limited jurisdictions which cannot adequately address the cumulative, wide-ranging impacts which contribute to the degradation of Puget Sound. It is therefore the policy of the state of Washington to create a single entity with adequate resources to develop a comprehensive plan for water quality protection in Puget Sound to be implemented by existing state and local government agencies. [1985 c 451 § 1.]

90.70.005 Definitions. Unless the context clearly requires otherwise, the definitions in this section apply throughout this chapter:

(1) "Authority" means the Puget Sound water quality authority.

(2) "Chair" means the presiding officer of the Puget Sound water quality authority.

(3) "Plan" means the Puget Sound water quality management plan.

(4) "Puget Sound" means all salt waters of the state of Washington inside the international boundary line between the state of Washington and the province of British Columbia, lying east of one hundred twenty-three degrees, twenty-four minutes west longitude. [1985 c 451 § 2.]

90.70.011 Puget Sound water quality authority——Membership——Terms——Vacancies——Compensation. (1) There is established the Puget Sound water quality authority composed of seven members who are appointed by the governor and confirmed by the senate. The governor shall select one of the seven members to act as chair of the authority and be presiding officer of the authority. In making these appointments, the governor shall seek to include representation of the variety of interested parties concerned about Puget Sound water quality. The commissioner of public lands and the director of ecology shall serve as ex officio, nonvoting members of the authority. The six appointed members, one from each of the six congressional districts surrounding Puget Sound, shall serve four-year terms. Of the initial members appointed to the authority, two shall serve for two years, two shall serve for three years, and two shall serve for four years. Thereafter members shall be appointed to four-year terms. Vacancies shall be filled by appointment for the remainder of the unexpired term of

the position being vacated. The chair of the authority shall serve at the pleasure of the governor.

(2) The voting members, exclusive of the chair, shall be compensated as provided in RCW 43.03.250. The voting members shall be reimbursed for travel expenses as provided in RCW 43.03.050 and 43.03.060.

(3) The chair of the authority shall be a full time employee responsible for the administration of all functions of the authority, including hiring and terminating staff, contracting, coordinating with the governor, the legislature, and other state and local entities, and the delegation of responsibilities as deemed appropriate. The salary of the chair shall be fixed by the governor, subject to RCW 43.03.040.

(4) The chair shall prepare a budget and a work plan which are subject to review and approval by the authority. [1985 c 451 § 3.]

90.70.025 Authority's powers. In order to carry out its responsibilities under this chapter, the authority may:

(1) Develop interim proposals and recommendations, before the plan is adopted, concerning the elements identified in RCW 90.70.060;

(2) Enter into, amend, and terminate contracts with individuals, corporations, or research institutions for the purposes of this chapter;

(3) Receive such gifts, grants, and endowments, in trust or otherwise, for the use and benefit of the purposes of the authority. The authority may expend the same or any income therefrom according to the terms of the gifts, grants, or endowments;

(4) Conduct studies and research relating to Puget Sound water quality;

(5) Obtain information relating to Puget Sound from other state and local agencies;

(6) Conduct appropriate public hearings and otherwise seek to broadly disseminate information concerning Puget Sound;

(7) Receive funding from other public agencies;

(8) Prepare a biennial budget request for consideration by the governor and the legislature; and

(9) Adopt rules under chapter 34.04 RCW as it deems necessary for the purposes of this chapter. [1985 c 451 § 5.]

90.70.035 Appointment of advisory committees——Duties. (1) The authority shall appoint one or more advisory committees to assist in the development of the plan. In making these appointments, the authority shall seek to include representation of all interested parties, including local governments, environmental and health agencies, tribal organizations, business, labor, citizens' groups such as environmental and public interest organizations, agricultural interests, recreational interests, and the fisheries and shellfish industries.

(2) The advisory committee or committees shall assist the authority to formulate policy goals and strategies, review the plan and make recommendations for its amendment to the authority, review the authority's reports, and review the authority's budget request proposals. [1985 c 451 § 6.]

90.70.045 Hiring of staff——Assignment of government employees to authority. (1) The chair shall hire staff for the authority. In so doing, the chair shall recognize the many continuing planning and research activities concerning Puget Sound water quality and shall seek to acquire competent and knowledgeable staff from state, federal, and local government agencies that are currently involved in these activities.

(2) As deemed appropriate, the chair may request the state departments of ecology, community development, fisheries, game, agriculture, natural resources, and social and health services to each assign at least one employee to the authority. The chair shall enter into an interagency agreement with agencies assigning employees to the authority. Such agreement shall provide for reimbursement, by the authority to the assigning agency, of all work-related expenditures associated with the assignment of the employees. During the term of their assignment, the chair shall have full authority and responsibility for the activities of these employees.

(3) The chair shall seek assignment of appropriate federal and local government employees under available means. [1985 c 451 § 7.]

90.70.055 Water quality management plan——Progress reports——"State of the Sound" report——Budget and activities review. The authority shall:

(1) Prepare and adopt a comprehensive Puget Sound water quality management plan, as defined in RCW 90.70.060. In preparing the plan and any substantial revisions to the plan, the authority shall consult with its advisory committee or committees and appropriate federal, state, and local agencies. The authority shall also solicit extensive participation by the public by whatever means it finds appropriate, including public hearings throughout communities bordering or near Puget Sound, dissemination of information through the news media, public notices, and mailing lists, and the organization of workshops, conferences, and seminars;

(2) During the plan's initial development and any subsequent revisions, submit quarterly progress reports to the governor and the legislature.

(3) Submit the plan to the governor and the legislature no later than January 1, 1987. The authority shall review the plan at least every two years and revise the plan, as deemed appropriate;

(4) Prepare a biennial "state of the Sound" report and submit such report to the governor, the legislature, and the state agencies and local governments identified in the plan. Copies of the report shall be made available to the public. The report shall describe the current condition of water quality and related resources in Puget Sound and shall include:

(a) The status and condition of the resources of Puget Sound, including the results of ecological monitoring, including an assessment of the economic value of Puget Sound;

(b) Current and foreseeable trends in water quality of Puget Sound and the management of its resources;

(c) Review of significant public and private activities affecting Puget Sound and an assessment of whether such activities are consistent with the plan; and

(d) Recommendations to the governor, the legislature, and appropriate state and local agencies for actions needed to remedy any deficiencies in current policies, plans, programs, or activities relating to the water quality of Puget Sound, and recommendations concerning changes necessary to protect and improve Puget Sound water quality; and

(5) Review the budgets and regulatory and enforcement activities of state agencies with responsibilities for water quality and related resources in Puget Sound. [1985 c 451 § 4.]

90.70.060 Water quality management plan——Requirements——Record of public comments. The plan adopted by the authority shall be a positive document prescribing the needed actions for the maintenance and enhancement of Puget Sound water quality. The plan shall address all the waters of Puget Sound, the Strait of Juan de Fuca, and, to the extent that they affect water quality in Puget Sound, all waters flowing into Puget Sound, and adjacent lands. The authority may define specific geographic boundaries within which the plan applies. The plan shall coordinate and incorporate existing planning and research efforts of state agencies and local government related to Puget Sound, and shall avoid duplication of existing efforts. The plan shall include:

(1) A statement of the goals and objectives for long and short-term management of the water quality of Puget Sound;

(2) A resource assessment which identifies critically sensitive areas, key characteristics, and other factors which lead to an understanding of Puget Sound as an ecosystem;

(3) Demographic information and assessment as relates to future water quality impacts on Puget Sound;

(4) An identification and legal analysis of all existing laws governing actions of government entities which may affect water quality management of Puget Sound, the interrelationships of those laws, and the effect of those laws on implementation of the provisions of the plan;

(5) Review and assessment of existing criteria and guidelines for governmental activities affecting Puget Sound's resources, including shoreline resources, aquatic resources, associated watersheds, recreational resources and commercial resources;

(6) Identification of research needs and priorities;

(7) Recommendations for guidelines, standards, and timetables for protection and clean-up activities and the establishment of priorities for major clean-up investments and nonpoint source management, and the projected costs of such priorities;

(8) A procedure assuring local government initiated planning for Puget Sound water quality protection;

(9) Ways to better coordinate federal, state, and local planning and management activities affecting Puget Sound's water quality;

(10) Public involvement strategies, including household hazardous waste education, community clean-up efforts, and public participation in developing and implementing the plan;

(11) Recommendations on protecting, preserving and, where possible, restoring wetlands and wildlife habitat and shellfish beds throughout Puget Sound;

(12) Recommendations for a comprehensive water quality and sediment monitoring program;

(13) Analysis of current industrial pretreatment programs for toxic wastes, and procedures and enforcement measures needed to enhance them;

(14) Recommendations for a program of dredge spoil disposal, including interim measures for disposal and storage of dredge spoil material from or into Puget Sound;

(15) Definition of major public actions subject to review and comment by the authority because of a significant impact on Puget Sound water quality and related resources, and development of criteria for review thereof;

(16) Recommendations for implementation mechanisms to be used by state and local government agencies;

(17) Standards and procedures for reporting progress by state and local governments in the implementation of the plan;

(19) An analysis of resource requirements and funding mechanisms for updating of the plan and plan implementation; and

(20) Legislation needed to assure plan implementation.

The authority shall circulate and receive comments on drafts of the plan mandated herein, and keep a record of all relevant comments made at public hearings and in writing. These records should be made easily available to interested persons. [1985 c 451 § 8.]

Reviser's note: Subsection (18) of this section was vetoed.

90.70.070 Water quality management plan——Incorporation by state and local governments——Review and report on implementation——Deviations from plan. (1) In conducting planning, regulatory, and appeals actions, the state agencies and local governments identified in the plan must evaluate, and incorporate as applicable, the provisions of the plan, including any guidelines, standards, and timetables contained in the plan.

(2) The authority shall review the progress of state agencies and local governments regarding the timely implementation of the plan. Where prescribed actions have not been accomplished in accordance with the plan, the responsible state agencies and local governments shall, at the request of the authority, submit written explanations for the shortfalls, together with their proposed remedies, to the authority.

The results of the review and a description of the actions necessary to comply with the plan shall be included in the biennial state of the Sound report.

(3) The state agencies and local governments identified in the plan shall review their activities biennially and document their consistency with the plan. They shall submit written reports or updates of their findings to the authority.

(4) The authority shall review the major actions affected by the plan being considered by the state agencies and local governments and shall comment in a timely manner regarding consistency with the plan and may participate in administrative and subsequent judicial proceedings with respect to such actions. Any deviations from the plan, identified by the authority, shall be transmitted in writing by the authority to the responsible state agency or local government. [1985 c 451 § 9.]

90.70.080 Adoption of rules, ordinances, and regulations. (1) To implement this chapter, state agencies are authorized to adopt rules that are applicable to actions and activities on a less than state-wide geographic basis. State agencies are encouraged to adopt rules that protect Puget Sound water quality before the adoption of the plan by the authority.

(2) To implement this chapter, counties, cities, and towns are authorized to adopt ordinances, rules, and regulations that are applicable on less than a county-wide, city-wide, or town-wide basis. Counties, cities, and towns are encouraged to adopt ordinances, rules, and regulations that protect Puget Sound water quality before the adoption of the plan by the authority. [1985 c 451 § 10.]

Reviser's note: "This act" [1985 c 451] has been changed to "this chapter." "This act" consists of the enactment of RCW 90.70.001, 90.70.005, 90.70.011, 90.70.025, 90.70.035, 90.70.045, 90.70.055, 90.70.060, 90.70.070, 90.70.080, 90.70.901, the 1985 c 451 amendment to RCW 90.70.900, and the repeal of RCW 90.70.010, 90.70-.020, 90.70.030, 90.70.040, and 90.70.050.

90.70.900 Termination of authority——Expiration of chapter. The Puget Sound water quality authority shall cease to exist and this chapter shall expire on June 30, 1991. [1985 c 451 § 11; 1983 c 243 § 6.]

90.70.901 Severability——1985 c 451. If any provision of this act or its application to any person or circumstance is held invalid, the remainder of the act or the application of the provision to other persons or circumstances is not affected. [1985 c 451 § 14.]