



**ENVIRONMENTAL SERVICES**

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## **BELLINGHAM BAY ACTION PROGRAM:**

### **Initial Data Summaries and Problem Identification**

For

**U.S. Environmental Protection Agency  
Region 10 - Office of Puget Sound  
Seattle, Washington**

**August 1989**



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**PTI** Environmental Services  
15375 SE 30th Place  
Suite 250  
Bellevue, Washington 98007

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# BELLINGHAM BAY ACTION PROGRAM: INITIAL DATA SUMMARIES AND PROBLEM IDENTIFICATION

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by

D.S. Becker, R. Sonnerup, and J.J. Greene

For

U.S. Environmental Protection Agency  
Region 10, Office of Puget Sound

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## LIST OF ACRONYMS

AET	apparent effects threshold
BOD	biochemical oxygen demand
COE	U.S. Army Corps of Engineers
CSO	combined sewer overflow
DSHS	Washington Department of Social and Health Services
DW	dry weight
EAR	elevation above reference
Ecology	Washington Department of Ecology
EDB	ethylene dibromide
EOF	emergency overflow
EPA	U.S. Environmental Protection Agency
FCBI	fecal coliform bacteria index
FDA	U.S. Food & Drug Administration
HAET	highest apparent effects threshold
HPAH	high molecular weight polycyclic aromatic hydrocarbons
LAET	lowest apparent effects threshold
LPAH	low molecular weight polycyclic aromatic hydrocarbons
MGD	million gallons per day
MPN	most probable number
NPDES	National Pollutant Discharge Elimination System
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyls
PCP	pentachlorophenol
ppt	parts per thousand
PSDDA	Puget Sound Dredged Disposal Analysis
PSP	paralytic shellfish poisoning
SCS	suspended combustible solids
SEPA	State Environmental Policy Act
TOC	total organic carbon
TOX	total organic halides
TPH	total petroleum hydrocarbons
TS	total solids
TSS	total suspended solids
TVS	total volatile solids
WAC	Washington Administrative Code
WDF	Washington Department of Fisheries
WPCC	Water Pollution Control Commission
WW	wet weight
WWTP	wastewater treatment plant
ZID	zone of initial dilution



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The following members of the Bellingham Bay work group contributed to the development of this report:

Jacqueline Anderson	Concerned Southside Citizens
Mike Brennan	Whatcom Chamber of Commerce
Bert Brun	U.S. Army Corps of Engineers
Dr. Doug Bulthuis	Department of Ecology-Padilla Bay Research Reserve
Michael A. Clausen	Bellingham Cold Storage
Mike Cochrane	Lummi Fisheries
Marc Crooks	Washington Department of Ecology
Ed Dahlgren	Georgia-Pacific
Bruce Dierking	Bellingham Yacht Club
Don Ellis	Port of Bellingham
Clare Folgelson	Concerned Southside Citizens
Jack Garner	Bellingham Public Works
Theresa Gemmer	Concerned Southside Citizens
Bill Geyer	Planning and Economic Development-Bellingham
Jim Humphreys	Washington Sea Grant
Walt Ingram	Bellingham Parks Board
Tip Johnson	Bellingham City Council
Arnie Klaus	Puget Sounders
Mike MacKay	Lummi Fisheries
Bill McCourt	Bellingham Public Works
Greg Mills	North Cascades Audubon Society
Mary Lou Mills	Washington Department of Fisheries
Patti Mullin	Washington Sea Grant
Becky Peterson	Whatcom County Council of Governments
Pat Petuchov	Nooksack Fisheries
Vallana Piccolo	Puget Sound Water Quality Authority
Drew Sandilands	Inner Sound Crab Association
Paul Schissler	Fairhaven Neighbors
Art Stendal	Washington Department of Wildlife
Ken Thomas	Bellingham Public Works
Dirk Visser	Inner Sound Crab Association
Terry Wahl	Citizen
Mike Walsh	Puget Sound Gillnetters Association
Bert Webber	Huxley College, Western Washington University

## EXECUTIVE SUMMARY

### STUDY OVERVIEW

The U.S. Environmental Protection Agency and the Washington Department of Ecology are sponsoring the Bellingham Bay Action Program. The goals of the program are to 1) protect the Bellingham Bay ecosystem against further degradation associated with anthropogenic inputs of pollutants, 2) identify degraded areas of the bay that are amenable to remedial actions, and 3) protect important resources from contamination. The primary objective of this report is to support the development of the Bellingham Bay Action Plan by assessing the severity and spatial extent of environmental degradation in the bay, and ranking specific problem areas in terms of priority for evaluation of remedial action.

The results of this report are based on a synthesis of information collected largely between 1980 and 1989. To achieve the objective of the report, the following four questions were addressed:

- Are parts of Bellingham Bay degraded as a result of chemical contamination, microbial contamination, or eutrophication?
- Does any observed chemical contamination, microbial contamination, or eutrophication result in adverse biological effects?
- Does any observed chemical or microbial contamination result in potential threats to public health or resource utilization?
- Can the sources of any observed chemical contamination, microbial contamination, or eutrophication be identified?

### DECISION-MAKING APPROACH

Information on the spatial extent and severity of environmental degradation in Bellingham Bay was examined within a decision-making framework to prioritize areas for remedial action. The framework allowed a large amount of detailed environmental information to be organized so that the data can be readily used by regulatory decision-makers and easily updated. The decision-making approach used for Bellingham Bay was similar to the approaches used earlier in action programs for Elliott Bay, Everett Harbor, Budd Inlet, Sinclair Inlet, and Dyes Inlet.

Key environmental indicators that could be used to characterize the spatial extent of environmental impacts were identified for each pollutant category. The various indicators were then used to develop indices of contamination and biological effects that were based on comparisons with either reference conditions for Puget Sound or regulatory standards and criteria. Finally, the values of these indices of contamination and biological effects were used to identify and rank problem areas for potential remedial action.

Each environmental indicator used in the decision-making framework to characterize each pollutant category was selected for the following reasons:

- It was known to be adequately sensitive to contamination
- It has been used in other action plans in Puget Sound
- It was represented by a sufficient amount of information in Bellingham Bay.

The indicators used to evaluate sediment chemical contamination included concentrations of selected metals (i.e., arsenic, copper, lead, mercury, silver, and zinc) and organic compounds (i.e., high and low molecular weight polycyclic aromatic hydrocarbons and total polychlorinated biphenyls). Sufficient data were not available to evaluate chemical contamination of the water column. The biological indicators used to evaluate the potential effects of sediment chemical contamination included the amphipod mortality bioassay using *Rhepoxynius abronius*, and *in situ* depressions in the abundances of major taxonomic groups of benthic macroinvertebrates (i.e., Polychaeta, Mollusca, Amphipoda, and Crustacea other than Amphipoda). Although bioaccumulation and fish pathology have been used as biological indicators in other urban bay action programs, sufficient data were not available to evaluate these indicators in Bellingham Bay.

The indicators used to evaluate microbial contamination in Bellingham Bay included concentrations of fecal coliform bacteria in water and shellfish tissue. Although these bacteria are not pathogens, they are commonly used as indicators of the potential presence of pathogens from contamination by mammalian fecal material. The indicator used to evaluate eutrophication was concentration of dissolved oxygen. If the concentration of dissolved oxygen is substantially reduced as a result of eutrophication, adverse biological effects can occur.

## IDENTIFICATION OF PROBLEM STATIONS

### Chemical Contamination

Thirteen of the total of 66 stations evaluated for sediment chemical contamination were considered problem stations. An additional 26 stations were classified as potential problem stations. Mercury was found to be the major problem chemical in the sediments of Bellingham Bay. Most of the stations considered to be problem stations or potential problem stations were identified as such on the basis of either elevated mercury concentrations or depressions in the abundances of benthic macroinvertebrates.

The 13 problem stations can be grouped into the following four problem areas:

- The mouth of Whatcom Creek Waterway (five stations)
- The area near the terminus of the Georgia-Pacific deepwater outfall (two stations)
- The area immediately inshore of the terminus of the Post Point wastewater treatment plant outfall (five stations)
- A small area off the Fairhaven shoreline (one station).

The first three problem areas are located near potential sources of contamination, whereas the fourth area is not located near an obvious potential contaminant source.

Most of the 26 stations classified as potential problem stations were located in a large group that extended from the I&J Street and Whatcom Creek waterways along the eastern shoreline of Bellingham Bay to Post Point and into the central part of the bay. Only two stations appeared to be separate from the large group. The large group encompassed the four problem areas.

### **Microbial Contamination**

Problem areas with respect to microbial contamination in Bellingham Bay were identified on the basis of violations of the Washington state water quality standards and the FDA guideline for tissues. For marine waters, the state standard was violated at two stations near the Georgia-Pacific deepwater outfall. However, a large fraction of the bacteria could have been comprised of *Klebsiella*, which is a fecal coliform bacteria that is often associated with pulp mill discharges but is not specific to mammalian fecal pollution. The state standard was also violated five times between 1980 and 1987 at a station near the Starr Rock dredged material disposal area and four times during the same time period at a station near the Post Point WWTP outfall.

For fresh waters, the state standard was violated at all five stations evaluated in this study. All of those stations were located at the mouths of the five major sources of fresh water to Bellingham Bay (i.e., Nooksack River, Squalicum Creek, Whatcom Creek, Padden Creek, and Chuckanut Creek).

For bacteria in shellfish tissue, the FDA guideline was violated on the basis of geometric mean values at one station in Portage Bay. On the basis of individual shellfish, the standard was violated at two stations in Portage Bay and at a single station off Post Point.

### **Eutrophication**

Problem areas with respect to eutrophication in Bellingham Bay were identified on the basis of violations of the Washington state water quality standard of 6.0 mg/L for marine waters. Concentrations of dissolved oxygen were evaluated for only three stations in Bellingham Bay. The state standard was violated at least one time since 1980 at all three stations. However, the total number of violations during that period was highest for the station near the Post Point wastewater treatment plant outfall (16 violations), lowest for the station near Pt. Francis (3 violations), and intermediate in magnitude at the station near the Starr Rock dredged material disposal site.

## **IDENTIFICATION OF DATA GAPS AND RECOMMENDATIONS**

Although a relatively large amount of information was reviewed for this report, a number of important gaps were found in the historical database. A data gap was considered important if it substantially limited the degree to which a comprehensive evaluation of environmental degradation in Bellingham Bay could be conducted. In most cases, additional field sampling would be required to collect this missing information.

## **Contaminant Sources**

Almost no information was found on contaminant input to Bellingham Bay from the Nooksack River and storm drains. In addition, few environmental samples were collected near either of these potential contaminant sources. The Nooksack River should be considered for future evaluation because it drains a large area influenced by agricultural activities and several small communities. In addition, the river is the major source of fresh water to the bay. Storm drains should be evaluated because surface runoff from industrial and urban areas could sometimes contain substantial concentrations and quantities of contaminants.

## **Indicators of Contamination**

A relatively large amount of historical information was found for metals concentrations in sediment and the abundances of benthic macroinvertebrates in Bellingham Bay. By contrast a relatively small amount of information was available for other important indicators of contamination such as sediment concentrations of organic compounds in sediment, sediment toxicity, bioaccumulation, and fish pathology. Additional information on these latter indicators would allow a more comprehensive assessment of environmental degradation in the bay.

For chemical contaminants in general, vertical profiles of contamination at selected locations in Bellingham Bay would be useful for evaluating whether subsurface sediments could cause environmental problems if they were exposed by natural processes or anthropogenic activities. Vertical profiles would also be useful for evaluating historical patterns and sources of contamination, temporal variability of contaminant concentrations in the environment, and the likely recovery periods if present contaminant sources are controlled.

For organic compounds, additional stations should be located in areas of Bellingham Bay near potential contaminant sources, using appropriate detection limits. In addition to sampling more stations, a greater range of chemicals should be analyzed for, such as pesticides, dioxins, tributyltin, and compounds characteristic of pulp mill discharges (e.g., alkylated phenols, guaiacols, and resin acids).

For sediment toxicity, additional stations should be located in areas where chemical analyses suggest that sediment toxicity may be a problem. It would be preferable if additional bioassays (including a long-term test to assess potential chronic toxicity) were conducted in conjunction with the amphipod mortality test, to evaluate other species that may be responsive to different contaminants than the amphipods.

For bioaccumulation, concentrations of mercury and PCB in muscle tissue of Dungeness crabs and whole body tissue of edible bivalve molluscs should be measured in the more contaminated areas of Bellingham Bay, to evaluate the risk to human health from consumption of contaminated seafood. If problems are found for crabs and bivalve molluscs, surveys of bioaccumulation in commercially or recreationally important fish should be considered.

## Geographic Locations

Little information was found on contamination and biological effects in many nearshore areas of inner Bellingham Bay. Because many of these areas are influenced by surface drainage, it is recommended that they be prioritized with respect to the likelihood of contamination and that the areas having the highest priority be evaluated.

Very little information on contamination and biological effects was found for Chuckanut Bay and the entire northwest shoreline of Bellingham Bay, from Portage Bay to Little Squalicum Creek. Except for the Nooksack River, there are no major potential sources of contaminants in these areas. However, nonpoint contaminant sources may influence these areas. Water currents may also carry contaminants into these areas. Therefore, a limited number of stations should be sampled at representative locations in these areas to identify any potential environmental problems.

## INTRODUCTION

The U.S. Environmental Protection Agency (EPA) and the Washington Department of Ecology (Ecology) are sponsoring the Bellingham Bay Action Program. The goals of the program are to 1) protect the Bellingham Bay ecosystem against further degradation associated with anthropogenic inputs of pollutants, 2) identify degraded areas of the bay that are amenable to remedial actions, and 3) protect important resources from contamination. Remedial actions may include source control activities (i.e., to reduce specific discharges of contaminants) and cleanup of contaminated sediments. The primary objective of this report is to support the Bellingham Bay Action Program by assessing the severity and spatial extent of environmental degradation in the bay, and ranking specific problem areas in terms of priority for remedial action. The location of the Bellingham Bay study area is shown in Figure 1.

The results of this report, based on a synthesis of information collected largely between 1980 and 1989, represent the conditions expected to be found in Bellingham Bay at the present time. Information collected prior to 1980 was reviewed and summarized to provide an historical perspective of environmental degradation in the bay. To achieve the objective of the report, the following four questions were addressed:

- Are parts of Bellingham Bay degraded as a result of chemical contamination, microbial contamination, or eutrophication?
- Has any observed chemical contamination, microbial contamination, or eutrophication resulted in adverse biological effects?
- Has any observed chemical or microbial contamination resulted in potential threats to public health or resource utilization?
- Can the sources of any observed chemical contamination, microbial contamination, or eutrophication be identified?

This report is divided into eight major sections. The first section describes the approaches used to evaluate environmental degradation within Bellingham Bay. The reasons for choosing each of the environmental indicators used in this report (e.g., chemical, water quality, ecological, toxicological) are also discussed. The second section describes the physical setting of the bay, including geographic location, climate, shoreline topography, physical oceanography, surface drainage, land use, and beneficial uses. The next four sections summarize existing information on contaminant sources, chemical contamination and associated biological effects, microbial contamination, and eutrophication. The seventh section identifies problem stations based on the environmental indicators used in this report. The final section describes gaps in the existing database and additional information needed to provide a more detailed evaluation of environmental degradation in the bay.

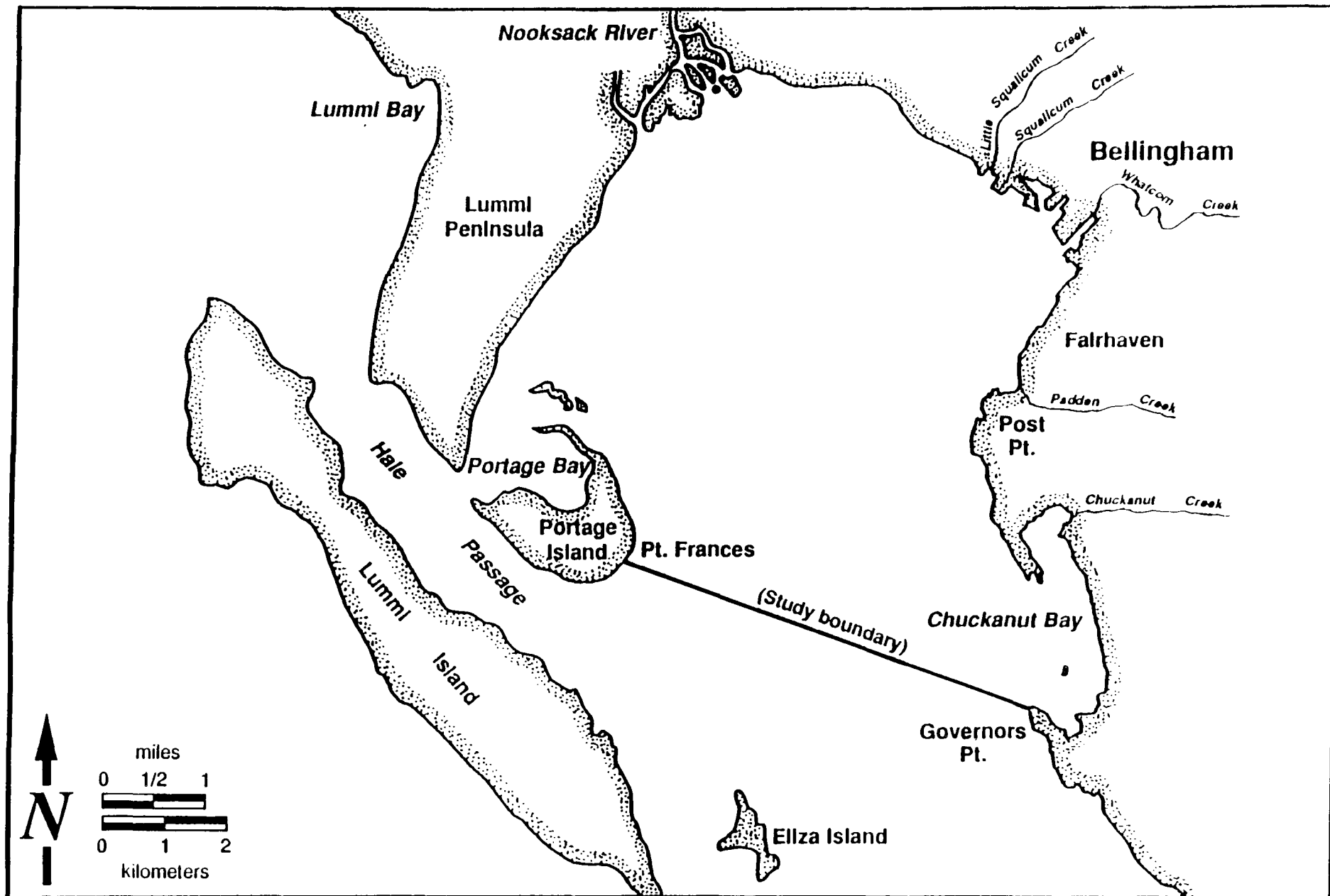


Figure 1. Location of Bellingham Bay study area



## DECISION-MAKING APPROACH

Information on the spatial extent and severity of environmental degradation in Bellingham Bay was examined within a decision-making framework to prioritize areas for remedial action. The framework allowed a large amount of detailed environmental information to be organized so that the data can be readily used by regulatory decision-makers and easily updated (Figure 2). The decision-making approach used for Bellingham Bay was similar to the approaches used earlier in action programs for Elliott Bay, Everett Harbor, Budd Inlet, Sinclair Inlet, and Dyes Inlet (Tetra Tech 1985b,c, 1988a,b). The details of the decision-making framework and its application in Bellingham Bay are provided below.

### OVERVIEW OF DECISION-MAKING FRAMEWORK

The decision-making framework developed for the Bellingham Bay Action Program was based on a "preponderance-of-evidence" approach to identifying problem stations associated with chemical contamination, microbial contamination, and eutrophication (Figure 3). In addition, the decision-making process allowed data gaps to be identified. The initial stage of the approach involved a review of information concerning the potential sources of the three major kinds of pollution. The results were used to identify potential problem areas within the bay. In the next stage, the available physical, chemical, and biological data for each pollutant category were then reviewed. Key environmental indicators that could be used to characterize the spatial extent of environmental impacts were identified for each pollutant category. The various indicators were then used to develop indices of contamination and biological effects based on comparisons with either reference conditions for Puget Sound or regulatory standards and criteria. Finally, the values of these indices of contamination and biological effects were used to identify problem stations for potential remedial action.

### IDENTIFICATION AND EVALUATION OF KEY POLLUTANT INDICATORS

The environmental indicators used in the decision-making framework to characterize each pollutant category (see Figure 3) are briefly summarized below, and described in detail in the section entitled "Data Summaries." The information used for each indicator was subjected to a quality assurance/quality control review to ensure that only data of acceptable quality were used in the study. Generally, each indicator was selected for the following reasons:

- It was known to be adequately sensitive to contamination
- It has been used in other action programs in Puget Sound
- It was represented by a sufficient amount of information in Bellingham Bay.

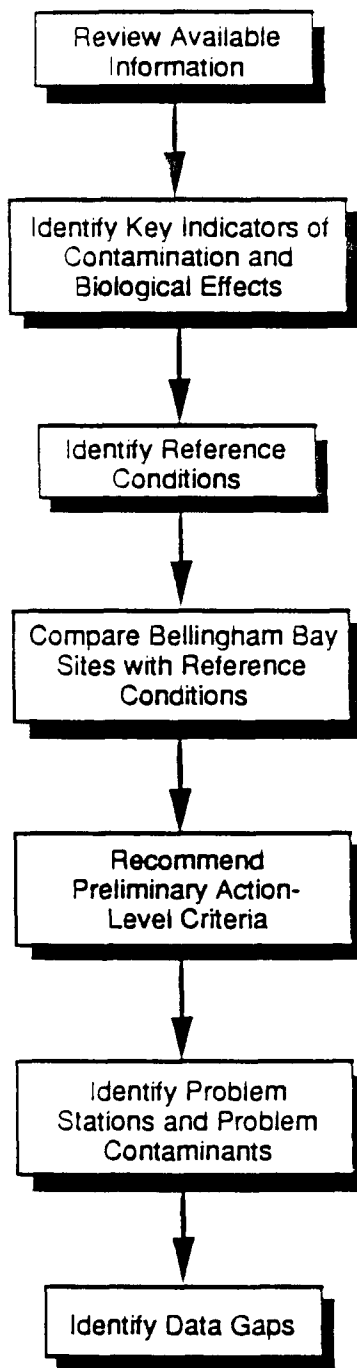


Figure 2. Decision-making framework for evaluation of environmental degradation

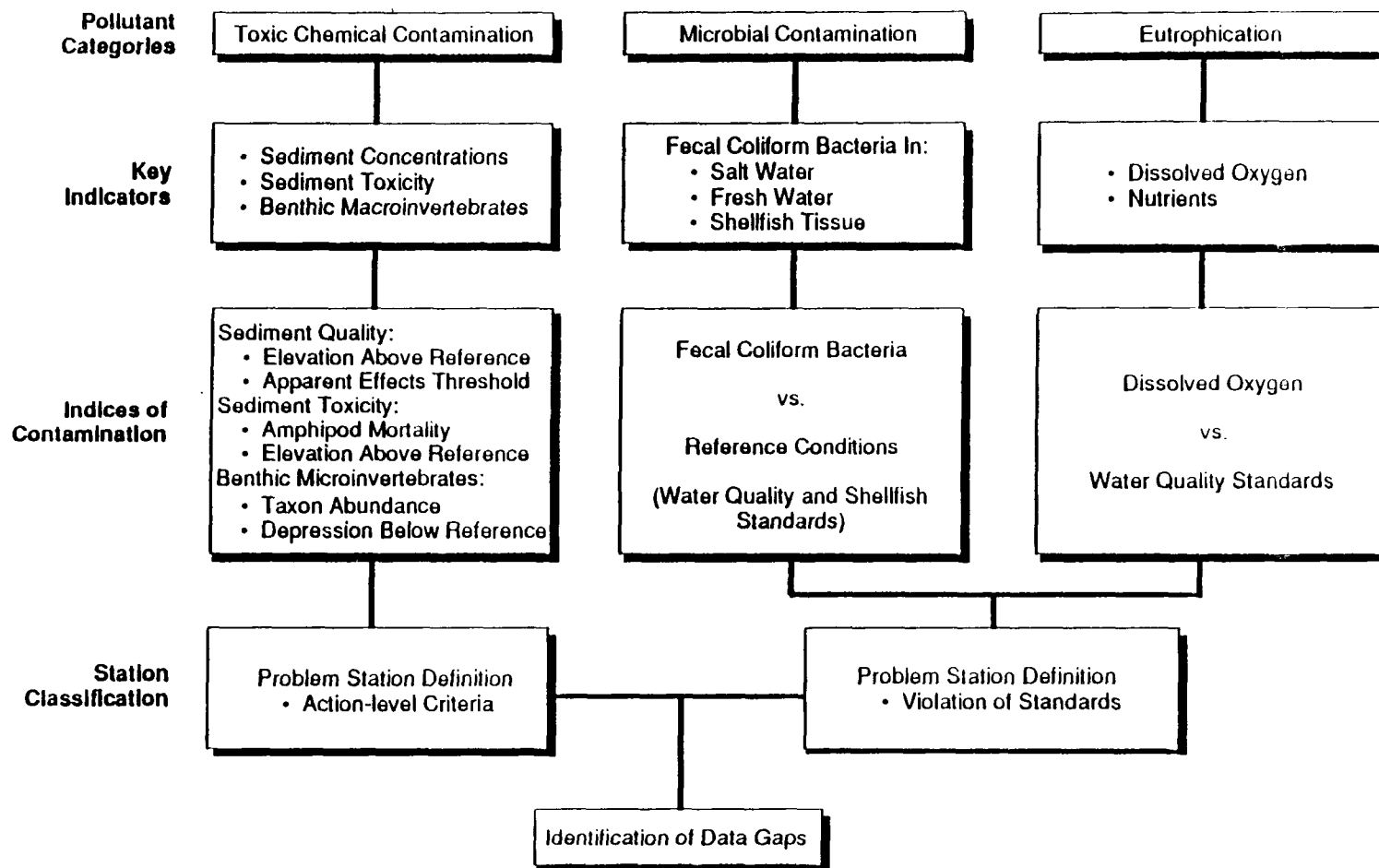


Figure 3. Preponderance-of-evidence approach to evaluate toxic chemical contamination, microbial contamination, and eutrophication in Bellingham Bay

## **Chemical Contamination**

The primary kinds of information on chemical contamination that were evaluated are as follows:

- Chemical concentrations in water and sediment
- Chemical concentrations in tissues of organisms (i.e., bioaccumulation)
- Sediment toxicity as estimated by the amphipod mortality bioassay (i.e., an acute lethal test)
- Alterations of benthic macroinvertebrate assemblages
- Pathological conditions in organisms.

A subset of these indicators (based on data availability) was used to identify and rank problem areas.

## **Microbial Contamination**

The occurrence of fecal coliform bacteria in marine water, fresh water, storm drain effluent, and shellfish tissue indicates the presence of sewage-derived material from point and nonpoint sources. Although these bacteria are relatively harmless, they are often associated with a variety of bacterial and viral pathogens that can pose a public health risk. For this reason, the concentration of fecal coliform bacteria at each station was used as a key indicator of microbial contamination in Bellingham Bay. Data on concentrations of microbial pathogens were not found for Bellingham Bay.

## **Eutrophication**

The indicators used to characterize eutrophication in Bellingham Bay were concentrations of nitrogen, phosphorus, and dissolved oxygen. The values of these indicators at any given time are influenced by temperature, salinity, rainfall, tidal exchange, flushing rates, and other factors. The concentration of dissolved oxygen at each station was used as a key indicator of eutrophication in Bellingham Bay. Concentrations of nitrogen and phosphorus were simply described, as no water quality criteria are available for these variables.

## **INDICES OF CONTAMINATION**

As a method of interpreting the raw data for the environmental indicators identified above, indices of contamination were developed for each of the key indicators in the three major pollutant categories (i.e., chemical contamination, microbial contamination, and eutrophication). These indices were not used in place of the original data (e.g., contaminant concentrations), but in addition to them. The original data were used to identify and characterize detectable levels of contaminants and their effects on the environment. The indices were used to reduce large data sets into interpretable station-specific numbers that reflect the relative magnitudes of the variables throughout Bellingham Bay.

## Chemical Contamination

Indices of chemical contamination and associated biological effects for Bellingham Bay were developed for chemical concentrations in sediments, sediment toxicity, and effects on benthic macroinvertebrate assemblages. Although other action programs have used bioaccumulation and fish pathology as additional key indicators of adverse biological effects, a sufficient amount of information was not available for these indicators in Bellingham Bay.

**Sediment Chemistry Indices**—Two kinds of indices were used to characterize chemical concentrations in sediments: elevation above reference (EAR) and apparent effects threshold (AET). Because state sediment quality criteria are not yet available, these indices were used to evaluate the degree of chemical contamination in Bellingham Bay.

EAR values were generated by comparing the concentrations of chemical contaminants measured in sediments from Bellingham Bay with reference values found in Carr Inlet, a nonurban embayment used as a reference area for other urban bay action programs in Puget Sound. Carr Inlet was considered an appropriate reference area, because it is relatively uncontaminated and has been surveyed for chemical contaminants using relatively low detection limits.

EAR values for chemical contaminants measured in Bellingham Bay were calculated using the expression:

$$EAR_{ij} = C_{ij}/C_{ir}$$

where:

$EAR_{ij}$  = EAR for sediment concentration of chemical i at station j

$C_{ij}$  = Sediment concentration of chemical i at station j

$C_{ir}$  = Mean concentration of chemical i at reference area r.

An EAR value greater than 1 indicates the concentration of a particular chemical in sediments from a particular station in Bellingham Bay exceeds the average reference concentration for that chemical in Carr Inlet. Statistically valid comparisons between these values would require replicated sediment chemistry data to be collected in both the study and reference areas. Because sediment chemistry samples generally are not replicated, the significance of an EAR value for a given chemical was determined by comparing it with Puget Sound-wide reference data. If the concentration of a given chemical in sediments from Bellingham Bay was greater than the maximum concentration for that chemical in all Puget Sound reference areas, the EAR value for that chemical was judged to be significant. It is possible to have EAR values greater than 1 (i.e., concentrations that exceed the average values in Carr Inlet) that are not deemed to be significant because they fall within the range of all Puget Sound reference areas.

AET values were used to determine the likelihood that the observed chemical concentrations in sediments would result in adverse biological effects. AET values have been developed for a wide variety of chemical contaminants in sediments throughout Puget Sound (Tetra Tech 1986;

Barrick et al. 1988). AET values represent the chemical concentration above which a particular biological effect has always been observed. To date, AET values have been developed for reductions in the abundances of benthic infauna and for three kinds of sediment bioassays [i.e., amphipod mortality test, oyster larvae abnormality test, and Microtox test (i.e., a bioassay based on reductions in bacterial luminescence)]. Comparisons of contaminant concentrations in Bellingham Bay sediments with their corresponding AET values were used as one method of predicting the presence of adverse biological effects in the bay. In addition, these comparisons were used to assist in the identification of problem stations.

**Biological Effects Indices**—Biological effects indices for sediment toxicity and alterations of benthic macroinvertebrate assemblages were developed using the EAR approach described above.

The EAR analysis for toxicity of Bellingham Bay sediments was based on available data for mortality measured in the amphipod (*Rhepoxynius abronius*) sediment bioassay. The EAR index was calculated using the expression:

$$EAR_j = M_j/M_r$$

where:

$EAR_j$  = EAR for amphipod mortality at station j

$M_j$  = Mean mortality at station j

$M_r$  = Mean mortality at reference area r.

The reference area used in this analysis was Sequim Bay. Significance of the EAR values was determined by statistical comparisons of individual bioassay responses to sediments from the study area with the response to sediment from the reference area. Statistical significance was determined using a comparisonwise error rate of 0.05.

The analysis of EAR values for alterations of benthic assemblages in Bellingham Bay was based on available data for abundances of major taxa [e.g., Polychaeta, Mollusca, Amphipoda, and Crustacea other than Amphipoda (i.e., Other Crustacea)]. The EAR indices were calculated using the expression:

$$EAR_{ij} = A_{ir}/A_{ij}$$

where:

$EAR_{ij}$  = EAR for benthic indicator i at station j

$A_{ir}$  = Mean abundance of taxon i at reference area r

$A_{ij}$  = Mean abundance of taxon i at station j.

The equation for benthic EAR indices was designed so the values for adverse responses (i.e., depressed abundances) would be greater than 1, and thereby be consistent with the indices used for sediment chemistry and toxicity. The reference areas used in this analysis were specific to each benthic survey evaluated and included Samish Bay and outer Bellingham Bay. Reference areas were

selected to be as similar as possible to test stations in terms of conventional sediment variables (e.g., grain size organic content), to minimize the potential confounding influence of the conventional variables on effects related to chemical toxicity. Significance of EAR values was not determined statistically, because more than half the data set was characterized by only two replicate measurements. That level of replication was considered inadequate for statistical comparisons. Instead, EAR values greater than 5.0 were considered significant. This value corresponds to an abundance depression of 80 percent relative to reference values. This critical value was chosen because past studies in Puget Sound have found that abundance depressions of a lower magnitude generally cannot be consistently discriminated from reference values, given the inherent level of variability of benthic abundances.

## **Microbial Contamination**

The index of microbial contamination was based on concentrations of fecal coliform bacteria. The EAR index was calculated as the ratio between the geometric mean concentration at a station in Bellingham Bay and the Washington state water quality standard for the bay. The ratio was structured so that the value of the index increased as the elevation above the water quality standard increased. The fecal coliform bacteria index (FCBI) is expressed as:

$$FCBI_{ij} = F_{ij}/F_{wqij}$$

where:

$FCBI_{ij}$  = Index for medium i (i.e., marine water, fresh water, or shellfish tissue) at station j

$F_{ij}$  = Geometric mean concentration in medium i at station j

$F_{wqij}$  = Water quality standard for medium i.

Regulatory standards for fecal coliform bacteria concentrations vary by medium (e.g., shellfish tissue vs. water) and state classification of local waters.

## **Eutrophication**

Potential effects associated with eutrophication were evaluated based on direct comparisons of dissolved oxygen concentrations at stations in Bellingham Bay with Washington state water quality standards. Dissolved oxygen was selected to represent the effects of eutrophication because oxygen depletion may adversely affect biota.

## **IDENTIFICATION OF PROBLEM STATIONS**

The environmental contamination and effects indicators (i.e., EAR values) were assembled in a matrix format to facilitate comparisons among stations. These comparisons allow the decision-maker to address the following questions:

- In comparison to a reference area, is there a significant elevation in sediment contamination or biological effects at any station?

- Which indicators are significantly elevated?
- What are the relative magnitudes of the indices (i.e., which indices suggest the highest degrees of environmental degradation)?

Matrices were not used to evaluate microbial contamination and eutrophication because single, rather than multiple, indicators (i.e., concentrations of fecal coliform bacteria and dissolved oxygen, respectively) were used to identify problem stations. Evaluation of these data was therefore relatively straightforward.

Information summarized in the matrix for chemical contamination was used to classify stations according to likely environmental degradation problems. Classifications were made using the action-level criteria provided in Table 1. The classifications were based on the degree of significance of each individual indicator and the total number of indicators found to be significant at a station. For example, a station could be considered a problem station if a single indicator exhibited an unusually high degree of significance, or if two indicators at that station showed moderate degrees of significance. Once problem stations were identified, their spatial locations were evaluated to determine if they could be grouped into larger problem areas.

Problem stations for microbial contamination were defined as those stations where the concentration of fecal coliform bacteria exceeded either the Washington state water quality standard or the U.S. Food and Drug Administration (FDA) guideline for tissue.

Although concentrations of nutrients were available for the study area, only concentrations of dissolved oxygen were used to identify problem stations for eutrophication in Bellingham Bay. Elevated or depressed nutrient concentrations are not necessarily environmental problems. Problem stations for eutrophication were defined as those stations where, at least once since 1980, concentrations of dissolved oxygen were less than the Washington state water quality standards.



**TABLE 1. ACTION-LEVEL CRITERIA USED  
FOR BELLINGHAM BAY**

Classification	Number of Significant Indicators	Condition Observed
Problem station	1	Chemical <sup>a</sup> concentration >HAET <sup>b</sup> or
	1	Amphipod mortality >50% or
	1	Benthic depression <sup>b</sup> >95%
Problem station	2	Chemical <sup>a</sup> concentration >LAET <sup>b</sup> and amphipod mortality is significant <sup>c</sup> , but <50%
	2	Chemical concentration >LAET <sup>b</sup> and benthic depression <sup>d</sup> >80%, but <95%
Potential problem station	1	Chemical <sup>a</sup> concentration >LAET <sup>b</sup> or
	1	Amphipod mortality is significant <sup>c</sup> , but <50% or
	1	Benthic depression <sup>d</sup> >80%, but <95%

<sup>a</sup> Any single metal or organic compound.

<sup>b</sup> HAET = highest AET for all Puget Sound indicators  
LAET = lowest AET for all Puget Sound indicators.

<sup>c</sup> Significantly different ( $P \leq 0.05$ ) from reference area value.

<sup>d</sup> Any major taxon; abundance depression relative to value observed in reference area.

## PHYSICAL SETTING

### PROJECT LOCATION

Bellingham Bay is a relatively large embayment located in the most northern part of Puget Sound, approximately 24 km from the Canadian border (Figure 1). For the purposes of the present study, the bay was bounded by a line drawn from Point Frances to Governors Point, and included Chuckanut Bay and Portage Bay. Bellingham Bay is approximately 12 km long and 8-9 km wide. Depths are relatively shallow and rarely exceed 30 meters (Figure 4). A large delta is located in the northern part of the bay at the mouth of the Nooksack River. The delta extends approximately 2 km into the bay. The bottom of Bellingham Bay exhibits a gentle slope, and is comprised primarily of fine-grained sediment. However, coarse-grained sediments are found off Post Point, and substantial amounts of woody debris are found in sediments near the city of Bellingham.

Most of the urban and industrial activity in Bellingham Bay is confined to its northeast corner near the city of Bellingham. The industrialized area closest to the city has been referred to as inner Bellingham Bay, and has been influenced by extensive shoreline modifications (i.e., dredging, filling, bulkheading, and riprapping) to accommodate commercial and industrial uses. The area includes three dredged industrial waterways (i.e., Squalicum Creek, I&J Street, and Whatcom Creek waterways).

### CLIMATE

The prevailing winds over Bellingham Bay are from the south. However, northeast winds are frequently encountered between November and January. Wind speed averages 2-6 m/sec, and is generally highest from the southeast between November and January (Shea et al. 1981).

Precipitation averages approximately 86 cm per year, and is highest between October and April (Shea et al. 1981). At lower elevations, most of the precipitation occurs as rain. The Nooksack River drains mountainous areas that experience considerable snowfall. The discharge of this river peaks twice a year, once during the period of maximum rainfall and again during early summer when the snow melts at higher elevations.

### SHORELINE TOPOGRAPHY

The shoreline and beaches of Bellingham Bay range from steep rock faces to sand and mud flats (Webber 1977). Along the east and west shorelines of the bay, beaches generally are narrow and steep, and consist primarily of rock outcroppings and pockets of coarse sediment (Broad et al. 1984). In the northwestern part of the bay near the mouth of the Nooksack River, the shoreline is characterized by broad sand and mud flats. In inner Bellingham Bay, the shoreline has been extensively modified by dirt fill, riprap, bulkheads, and artificial lagoons. In the southern part of the bay, narrow beaches comprised of coarse sediment are found at the base of the bluffs of the Lummi Peninsula and Portage Island. Intertidal areas presently occupy approximately 42 km<sup>2</sup> of

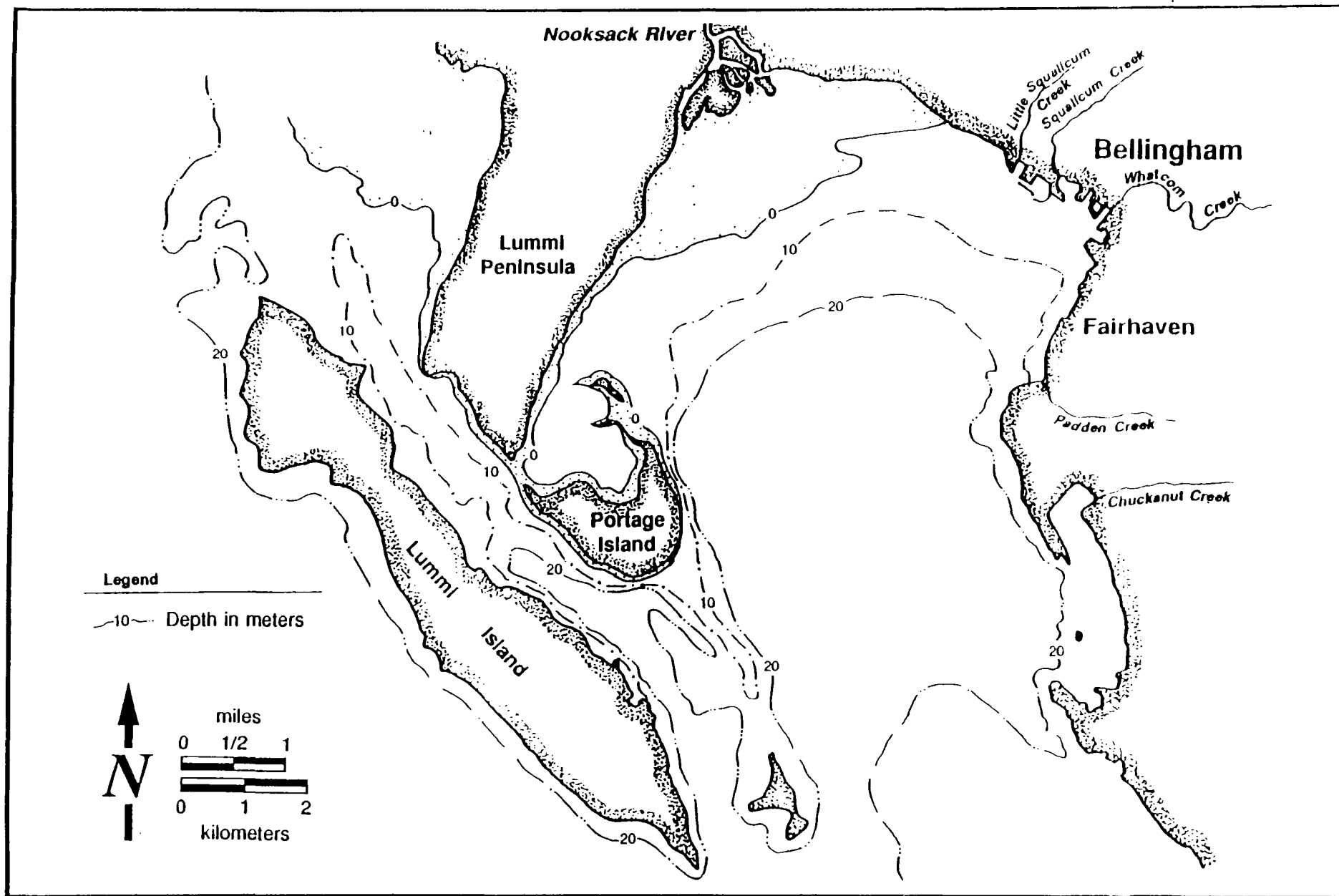


Figure 4. Depth distributions in and around Bellingham Bay

Bellingham Bay (Webber 1977). Approximately 1.4 km<sup>2</sup> of the original intertidal areas in inner Bellingham Bay have been converted to upland areas.

The history of shoreline development within the city limits of Bellingham was reviewed by Hitchman (1972). In 1853, the first industry a sawmill, was located on the bay at Whatcom Creek. By 1910, Whatcom Creek Waterway had been dredged and much of the area around the head of the waterway had been modified for street development.

In 1920, a port commission was created to manage development of the waterfront. In the late 1920s, Squalicum Creek Waterway was dredged and wharves were built to accommodate fishing vessels. Breakwaters were added to this area in 1934. By 1958, the boat harbor on Squalicum Creek Waterway had been expanded to accommodate 500 vessels and nearby land had been filled for industrial use, which included a cold storage plant. In the early 1960s, additional dredging and filling occurred in the Whatcom Creek Waterway to attract shipping and industry.

By 1970, the Port of Bellingham owned one-quarter (i.e., 2,000 acres) of the city shoreline, 500 acres of which were available for industries. In 1974, a sanitary landfill on the western side of Whatcom Creek Waterway was filled and a diked lagoon was added to treat effluent from the Georgia-Pacific lumber mill located across the waterway. In addition, a log pond on the Georgia-Pacific property was filled with sediment dredged from Whatcom Creek Waterway.

In 1981, the Squalicum Harbor marina (between the Squalicum Creek and I&J Street waterway) was expanded by dredging and filling intertidal areas. Currently, an area near Post Point is being dredged and a docking facility built to accommodate the Alaska State Ferry System, which will begin using the facility by 1990.

## PHYSICAL OCEANOGRAPHY

The physical oceanography of Bellingham Bay has been extensively reviewed by Shea et al. (1981) and Broad et al. (1984). Those authors discussed the results of numerous earlier studies, including Driggers (1964), Collias et al. (1966), Collias (1971), Schumacher and Reynolds (1975), CH2M HILL (1976), Parker (1977), U.S. Army Corps of Engineers (COE) (1977), and Webber (1978).

Bellingham Bay is part of a complex of interconnected embayments that exchange water with Rosario Strait through a network of channels and passages. Most oceanic water enters Bellingham Bay at depth through the northern end of Rosario Strait between Lummi and Vendovi islands. The mouths of Bellingham and Samish bays are interconnected, and water is exchanged between the two embayments. Exchange of water through Hale Passage is limited by a shallow sill (i.e., <5-meter depth). The residence time of water in Bellingham Bay is typically 4-5 days, but can vary between 1 and 11 days.

The major source of freshwater input to Bellingham Bay is the Nooksack River. Other sources of freshwater are relatively minor, and include Little Squalicum, Squalicum, and Whatcom creeks near Bellingham, Padden Creek near Fairhaven, and Chuckanut Creek near Chuckanut Bay.

An analysis of tide and current information revealed a southward flow from the bay at all depths. However, surface flows exhibited wind-induced fluctuations. Winds are from the south during most of the year, causing surface water to be retained in the northern part of the bay.

When winds are from the west or southwest, surface water flows to the east and down the shoreline past Post Point. When winds are from the north or northeast, surface water flows south along the shorelines of Lummi Peninsula, Portage Island, and Lummi Island.

The water near the bottom of Bellingham Bay is similar in character to the water of Rosario Strait. Bottom salinities, ranging from 29 to 31 parts per thousand (ppt), are relatively stable throughout the year. Water temperatures range from 8 to 13° C, and are warmest during late summer and early fall and coldest during winter and spring. The concentration of dissolved oxygen varies throughout the year, generally lowest in summer and early fall and highest in winter. Bottom currents are relatively slow (i.e., 0.1-0.2 m/sec).

The characteristics of water in the upper 10 meters of Bellingham Bay vary with depth and time. Most of the variability is due to freshwater input and seasonal changes in air temperature. Salinity is generally lowest in the northern part of the bay, near the mouth of the Nooksack River. A 2-meter layer of brackish water is commonly found throughout the bay, but may deepen with increasing wind velocity. Surface salinities typically range from 20 to 26 ppt, but may be as low as 10 ppt when the influence of the Nooksack River is particularly strong. The water column is usually isothermal from surface to bottom in late fall and early spring, but may be stratified during other times of the year as a result of surface warming or cooling. As with bottom currents, surface currents in Bellingham Bay are relatively slow (i.e., 0.2-0.3 m/sec).

## **SURFACE DRAINAGE/LAND USE**

Bellingham Bay is influenced by drainage from eight watersheds (Creahan 1988). The largest is the Nooksack River Watershed, which drains an area of approximately 1,500 km<sup>2</sup>. However, all of the flow does not reach Bellingham Bay. Part of it enters Lummi Bay by way of the Lummi River, which branches off from the Nooksack River below Ferndale. The river is the primary source of sediment entering Bellingham Bay, with an average discharge of 650,000 m<sup>3</sup> of sediment per year (Kramer, Chin and Mayo 1977). The sediment load of the Nooksack River is influenced by both natural (e.g., glacial scour) and anthropogenic factors. Major anthropogenic factors include agriculture in the lower reaches of the river and logging in the upper reaches.

The Squalicum Creek Watershed drains an area of 65 km<sup>2</sup> via Squalicum Creek and some direct runoff into Bellingham Bay. The creek originates at Squalicum Lake, and flows through the city of Bellingham into the bay. The city, therefore, occupies part of the watershed. The creek is influenced by channelization, vegetation removal, and stormwater runoff.

The Chuckanut Bay Watershed drains an area of 34 km<sup>2</sup> via Chuckanut Creek and direct runoff into Chuckanut Bay. The watershed is occupied primarily by forested land, but some residential and commercial areas are present. The watershed is minimally impacted by anthropogenic activities.

The Whatcom Creek Watershed drains an area of approximately 26 km<sup>2</sup> via Whatcom Creek. The creek flows from Lake Whatcom through the city of Bellingham into Bellingham Bay. The city occupies much of the watershed, and the creek is strongly influenced by residential, commercial, and industrial activities. Impacts have included channelization, vegetation removal, and stormwater runoff. Fish kills have occurred in the creek on numerous occasions.

The Gooseberry Point Watershed drains an area of 23 km<sup>2</sup> via direct runoff from the Lummi Peninsula. Almost all of the watershed is located on the Lummi Indian Reservation. Most of the watershed is occupied by forested land, but some residential, commercial, industrial, and agricultural areas are present. The watershed is minimally impacted by anthropogenic activities.

The Padden Creek Watershed drains an area of 16 km<sup>2</sup> via Padden Creek. The creek flows from Lake Padden through a largely residential area, and enters Bellingham Bay near Post Point. The creek is influenced, to some degree, by urban and industrial stormwater runoff.

The North Bellingham Bay Watershed drains an area of approximately 10 km<sup>2</sup> via direct runoff into Bellingham Bay. The watershed is occupied by urban, residential, industrial, agricultural and forested areas. The watershed is influenced by stormwater runoff and leaking septic tanks.

The South Bellingham Bay Watershed drains an area of approximately 5 km<sup>2</sup> via direct runoff into Bellingham Bay. The watershed is occupied by residential and industrial areas as well as public parks. The watershed is influenced by stormwater runoff.

## BENEFICIAL USES

The beneficial uses of Bellingham Bay are defined as those activities that depend on the environmental quality of the bay. These uses include commercial and recreational fishing, shellfish harvesting, aquaculture, boating, and water contact recreation.

Bellingham Bay is used extensively by both anadromous and marine fishes (Shea et al. 1981). The major kinds of economically important anadromous fish include the following:

- Coho salmon (*Oncorhynchus kisutch*)
- Chum salmon (*Oncorhynchus keta*)
- Chinook salmon (*Oncorhynchus tshawytscha*)
- Pink salmon (*Oncorhynchus gorbuscha*)
- Sockeye salmon (*Oncorhynchus nerka*)
- Steelhead trout (*Oncorhynchus mykiss*)
- Cutthroat trout (*Oncorhynchus clarkii*)
- Dolly Varden (*Salvelinus malma*)
- Longfin smelt (*Spirinchus thaleichthys*).

All of the streams flowing into Bellingham Bay are used by one or more of the anadromous species listed above. In addition, three salmon hatcheries are located in this area. One hatchery, maintained by the Washington Department of Fisheries (WDF), is located on a tributary of the north fork of the Nooksack River. Another hatchery, maintained by the Lummi Tribe on Skookum Creek, contributes a substantial number of salmon to the Nooksack River. The third hatchery, maintained by the Maritime Heritage Center, is located at the mouth of Whatcom Creek. A salmon

holding pen operated by the Maritime Heritage Association is located in the Squalicum Harbor marina (MacKay, M., 8 August 1989, personal communication).

During the late spring and early summer, juvenile salmon leave the streams and migrate within 1 km from the shore of Bellingham Bay (Sjolseth 1970). Although many juveniles migrate along the shoreline of inner Bellingham Bay, most have historically avoided the inner portion of Whatcom Creek Waterway (U.S. DOI 1967). Recreational fishing for salmon occurs in all nearshore waters from the northwestern part of Bellingham Bay to Chuckanut Bay (CH2M HILL 1984). The total commercial catch of salmon in Bellingham Bay in 1983 was approximately 2 million pounds, with a value of \$1.8 million (CH2M HILL 1984).

The major kinds of economically important marine fishes in Bellingham Bay include the following:

- Pacific herring (*Clupea harengus pallasii*)
- Pacific cod (*Gadus macrocephalus*)
- Various rockfishes (Scorpaenidae)
- Lingcod (*Ophiodon elongatus*)
- Rock sole (*Lepidopsetta bilineata*)
- English sole (*Parophrys vetulus*)
- Starry flounder (*Platichthys stellatus*).

Except for the northwest corner of Bellingham Bay, the entire bottom of the bay is considered part of the recreational fishery for marine fishes (CH2M HILL 1984). Pacific herring are valuable primarily for the sac-roe fisheries they support. Commercial fishing for marine fishes occurs primarily in the deeper water of the central part of the bay. The total commercial catch of marine fishes other than salmon in Bellingham Bay was 830,000 pounds in 1983, with a value of almost \$300,000 (CH2M HILL 1984).

Shellfishing in Bellingham Bay is focused primarily on Dungeness crabs (*Cancer magister*), Pacific oysters (*Crassostrea gigas*), and several species of clams, including the native littleneck clam (*Protothaca staminea*), the Manila clam (*Tapes japonica*), the horse clam (*Tresus capax*), and the butter clam (*Saxidomus giganteus*). The latter two clam species are harvested primarily as part of a subsistence fisheries by the Lummi tribe (Cochrane and MacKay 1989). The remaining species support commercial or recreational fisheries. The total commercial catch of shellfish in the bay in 1983 was 110,000 pounds, with a value of \$150,000 (CH2M HILL 1984). Tribal commercial harvest of Manila clams on tidelands of the Lummi Reservation has grown rapidly in recent years. In 1988, over 162,000 pounds were harvested by tribal diggers (Cochrane and MacKay 1989). The total annual value of all shellfish resources managed for commercial harvest by the Lummi Tribe (including locations outside the study area) exceeds \$500,000. Major tribal shellfish areas are found in and around Portage Bay and Portage Island, and along the Lummi Peninsula.

Dungeness crabs occur throughout most of Bellingham Bay (CH2M HILL 1984). Harvesting of oysters and clams occurs primarily near the southern part of the Lummi Peninsula and around Portage Island. The Washington Department of Social and Health Services (DSHS) recommends against recreational shellfish harvesting throughout most of inner Bellingham Bay because of

potential chemical contamination. This recommendation is made for all urban bays in Puget Sound (Lilja, J., 4 August 1989, personal communication).

Outbreaks of paralytic shellfish poisoning (PSP) are known to occur relatively frequently in Whatcom County (Lilja, J., 4 August 1989, personal communication). The northern part of Bellingham Bay has experienced outbreaks of PSP since the 1950s. DSHS monitors shellfish in Bellingham Bay for PSP outbreaks on an infrequent basis. Records are kept of these outbreaks and periods of beach closures related to PSP.

Although limited information is available regarding the presence of marine mammals in Bellingham Bay, at least four species have been documented to occur in the vicinity of the bay (Shea et al. 1981). These species include the harbor seal (*Phoca vitulina richardsi*), harbor porpoise (*Phocoena phocoena*), killer whale (*Orcinus orca*), and gray whale (*Eschrichtius robustus*). Additional species that may occur in the bay on rare occasions include the California sea lion (*Zalophus californianus*), northern sea lion (*Eumetopias jubatus*), Dall porpoise (*Phocoenoides dallii*), and minke whale (*Balaenoptera acutorostrata*).

Bellingham Bay is not used extensively by large populations of waterfowl (Kraege, D., 7 August 1989, personal communication). However, the bay lies on the flight path between the Fraser River estuary and Skagit Bay and is used as a stopover point for waterfowl migrating between these two areas. These waterfowl include brant, snow geese, mallard, widgeon, green-winged teal, and pintail. Bellingham Bay is also used as an overwintering area for diving ducks such as scoter and golden eye.

A variety of public and private recreational facilities are located in the study area, primarily in inner Bellingham Bay (Figure 5) (CH2M HILL 1984). The Port of Bellingham operates the only major marina (Squalicum Harbor marina) in the study area. It is located between the Squalicum and I&J Street waterways. Other boating facilities include the Hilton Harbor marina, the Central Floats moorage, the Harris Street boat ramp, and the Boulevard Park boat ramp. A variety of parks and public access points are located along the shoreline of the bay. The largest shoreline park in inner Bellingham Bay is Boulevard Park near Fairhaven, which is operated jointly by Whatcom County and the city and Port of Bellingham and includes 790 meters of shoreline. Other parks in this area include Marine Park (183 meters of shoreline), Little Squalicum Park, and the Maritime Heritage Center. Although the latter area is located on Whatcom Creek, it has direct access to the bay near the mouth of the creek. Shoreline parks in outer Bellingham Bay include the Fish Point Property (534 meters of shoreline), the Marine Drive Viewpoint (427 meters of shoreline), and Portage Island Park (12,800 meters of shoreline).



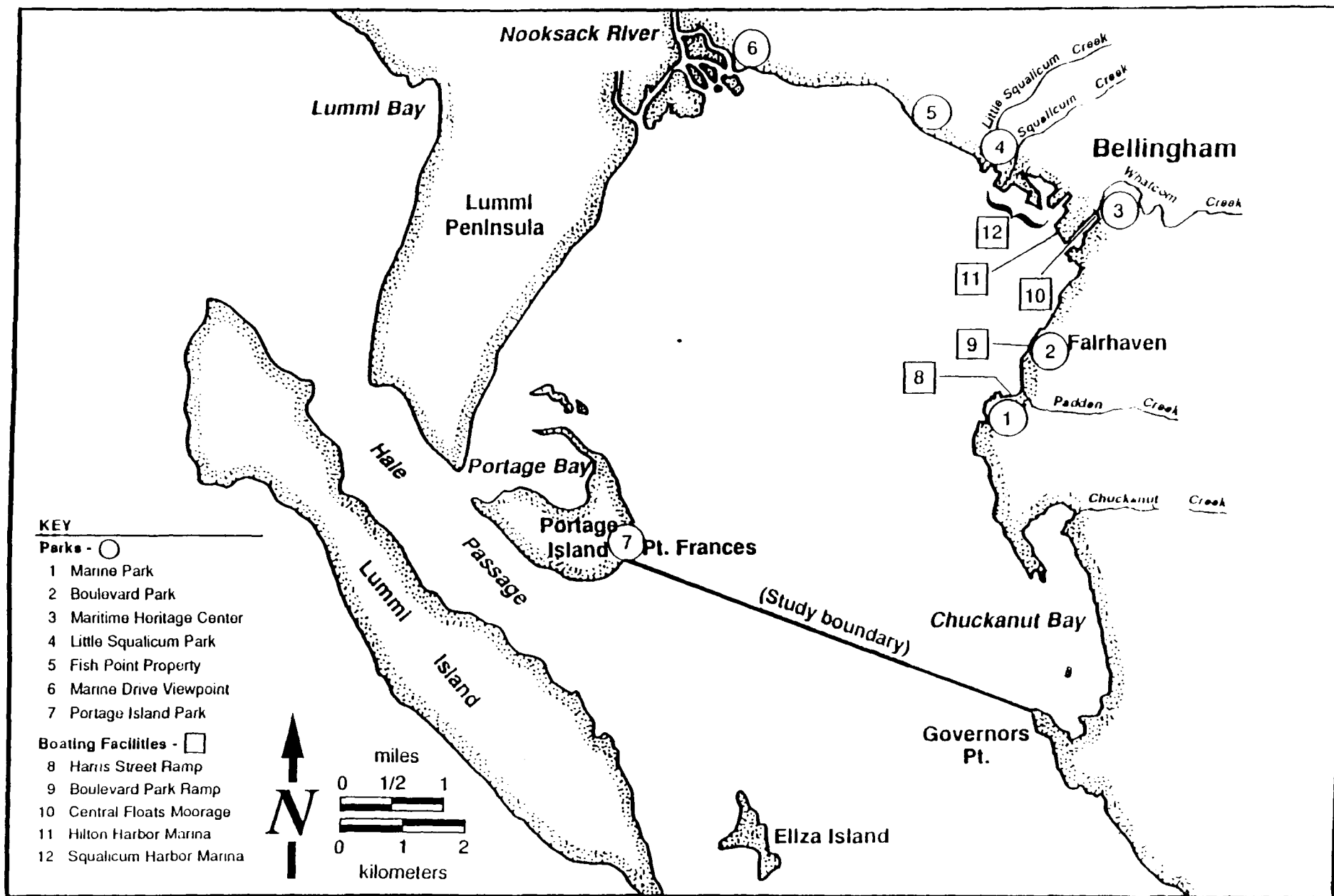


Figure 5. Locations of major recreational facilities in Bellingham Bay

## DATA SUMMARY: CONTAMINANT SOURCES

The variables used to evaluate the degree of environmental degradation in Bellingham Bay were toxic chemical contamination of the water column, sediments, and biota; microbial contamination; and eutrophication. Information on potential sources of pollutants that may be contributing to these problems was compiled. Potential pollutant sources were evaluated and mapped (Figure 6). In general, potential sources consisted of the following six major categories:

- Wastewater treatment plants (WWTPs)
- Combined sewer overflows (CSOs)
- Surface water runoff
- Groundwater
- Industrial sources
- Accidental spills.

The findings of the potential source evaluations for each of the six major categories are presented below.

### WASTEWATER TREATMENT PLANTS

The city of Bellingham's Post Point WWTP has a National Pollutant Discharge Elimination System (NPDES) permit to discharge primary wastewater into Bellingham Bay. In addition, the secondary WWTPs of the cities of Ferndale, Lynden, and Everson have NPDES permits to discharge into the Nooksack River. Permit limitations for these facilities are listed in Table 2.

#### Post Point WWTP

The city of Bellingham's current WWTP began operations in 1974, and is located in southwest Bellingham just east of Post Point (Figure 6). The Post Point WWTP treats domestic sewage from approximately 80 percent of Bellingham's population of 60,000 (CH2M HILL 1984). Presently, the Post Point WWTP collection system is mostly separated from the storm sewer system, although some surface runoff (such as from roof drains and unauthorized hookups) still combines with the sanitary sewer system (McCourt, W., 22 February 1989, personal communication; Melcher, S., 13 March 1989, personal communication). The WWTP treats much of this surface water runoff during storm events. However, if flows exceed the hydraulic capacity of the system, direct discharges to Bellingham Bay can occur (e.g., through a CSO).

The Post Point WWTP was designed to provide primary treatment for an average flow of 18 million gallons per day (MGD) from July through December [canning season (i.e., when seafood and vegetable processors are operating)] and an average flow of 12 MGD from January through

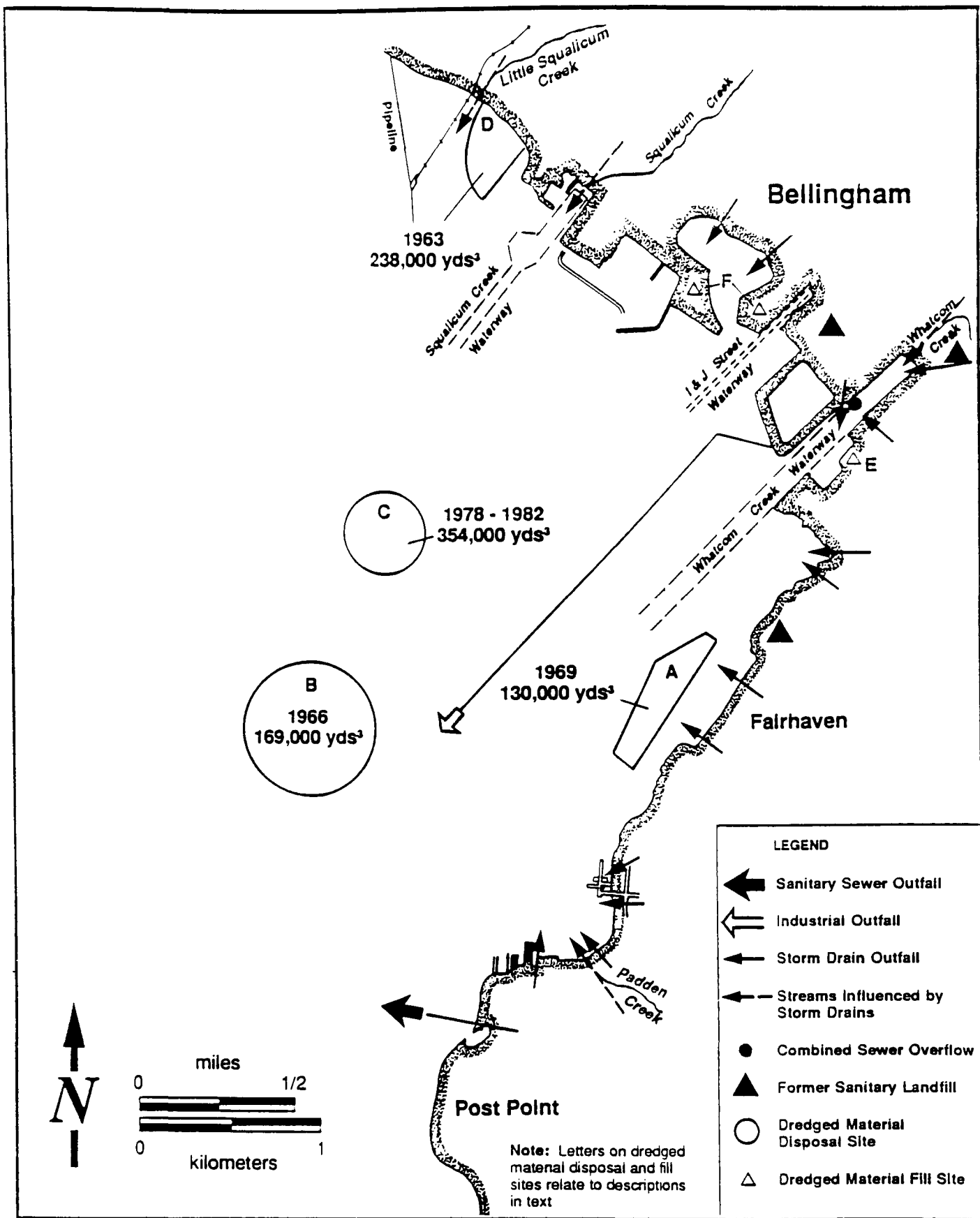


Figure 6. Major contaminant sources in inner Bellingham Bay

**TABLE 2. SUMMARY OF NPDES PERMIT LIMITATIONS  
FOR THE BELLINGHAM, FERNDAL, LYNDEN, AND  
EVERSON WASTEWATER TREATMENT PLANTS<sup>a,b</sup>**

Facility	BOD <sup>c</sup>		TSS <sup>d</sup>		Fecal Coliform Bacteria	
	Weekly Average	Monthly Average	Weekly Average	Monthly Average	Weekly Average	Monthly Average
City of Bellingham, Post Point WWTP	45 mg/L 3,340 kg/day	30 mg/L 2,225 kg/day	45 mg/L 3,340 kg/day	30 mg/L 2,225 kg/day	400 organisms/100 mL	200 organisms/100 mL
City of Ferndale WWTP	45 mg/L 85 kg/day	30 mg/L 57 kg/day	110 mg/L 210 kg/day	75 mg/L 143 kg/day	400 organisms/100 mL	200 organisms/100 mL
City of Lynden WWTP	45 mg/L 200 kg/day	30 mg/L 135 kg/day	45 mg/L 200 kg/day	30 mg/L 135 kg/day	500 organisms/100 mL	200 organisms/100 mL
City of Everson WWTP	45 mg/L 22 kg/day	30 mg/L 15 kg/day	45 mg/L 22 kg/day	30 mg/L 15 kg/day	400 organisms/100 mL	200 organisms/100 mL

<sup>a</sup> Each NPDES permit is included in Appendix D.

<sup>b</sup> All discharges must have a pH within the range 6.0-9.0.

<sup>c</sup> 5-day biochemical oxygen demand.

<sup>d</sup> Total suspended solids.

June (non-canning season) (CH2M HILL 1984). The plant is designed to reduce canning and non-canning season biochemical oxygen demand (BOD) effluent to less than 613 mg/L and 200 mg/L, respectively, and canning and non-canning season total suspended solids (TSS) effluent to less than 240 mg/L and 200 mg/L, respectively. The maximum hydraulic capacity of the treatment plant is 55 MGD (i.e., to accommodate high-flow periods), although the plant has handled flows up to 63 MGD (McCourt, W., 22 February 1989, personal communication). Presently, the average canning and non-canning season flows are estimated at 9.8 MGD and 11.7 MGD, respectively. The primary-treated effluent is discharged into Bellingham Bay via a 1.5-meter diameter outfall, which terminates 610 meters west of the shoreline at a water depth of 25 meters. The final 130 meters of the outfall line is a diffuser section with thirty-five 15-cm ports (CH2M HILL 1984). The city of Bellingham Department of Public Works is planning to upgrade the Post Point WWTP's facilities by 1993 to comply with the State Environmental Policy Act (SEPA) of 1971 (RCW 43.21C). These upgraded facilities will be designed to provide secondary treatment at an average flow of 10 MGD. The maximum hydraulic capacity of the secondary treatment system will be 37 MGD. Flows in excess of 37 MGD and up to 60 MGD will be treated by the primary process only (McCourt, W., 22 February 1989, personal communication).

Effluent from the Post Point WWTP was sampled for inorganic and organic chemical contaminants (Table 3) (CH2M HILL 1984). The wet weather (November–April) effluent samples contained two organic contaminants and six metals above their respective method detection limits. Seven organic compounds and all nine metals were detected in the dry weather (May–October) effluent samples.

Based on the effluent limitations specified in the NPDES permit, the weekly average BOD and TSS loading from the Post Point discharge cannot exceed 45 mg/L and 3,340 kg/day, respectively. The monthly and weekly average fecal coliform counts cannot exceed 200/100 mL and 400/100 mL, respectively, and pH for this discharge must be within the limits of 6.0 to 9.0. In August 1987, Ecology conducted a Class II inspection at the Post Point WWTP (Reif 1988). Analyses of the effluent for BOD, TSS, fecal coliform bacteria, and pH indicated the facility was in compliance with the NPDES permit limitations for all variables. Post Point WWTP operating records from October 1982 through September 1984 revealed average dry weather and wet weather TSS emissions of 1,690 kg/day and 1,871 kg/day, respectively. Average dry weather and wet weather BOD emissions were reported at 4,527 kg/day and 3,126 kg/day, respectively. Average daily pH values for this discharge period ranged from 6.3 to 7.3. The minimum pH value reported was 4.3 (CH2M HILL 1984).

**Industrial Discharges to the Post Point WWTP**—The Georgia-Pacific pulp mill diverts all of its domestic sewage to the Post Point WWTP. All of the industrial process waste from this facility is treated and discharged through its own secondary treatment lagoon and deep-water discharge (see Georgia-Pacific discussion **Industrial Sources**).

The Post Point WWTP treats wastes from various NPDES-permitted industrial discharges, primarily from vegetable and fish processing facilities located along the Bellingham waterfront. Prior to 1973, these industries discharged directly into the bay, but were hooked up to the sanitary sewer when a shoreline interceptor was installed in 1973. In 1984, the city of Bellingham conducted a survey of industrial operations having NPDES-permitted discharges of process wastewaters to the Bellingham sanitary sewer (CH2M HILL 1984). At the time of the survey, the list included 11 operations. All but Mt. Baker Plywood were fish or vegetable processing operations. Currently, there are nine NPDES-permitted industrial discharges to the Post Point

TABLE 3. TOXIC CHEMICALS DETECTED IN WET WEATHER AND DRY WEATHER 24-HOUR COMPOSITE SAMPLES OF THE EFFLUENT FROM THE POST POINT POLLUTION CONTROL FACILITY<sup>a</sup>

Chemical	Wet Weather Effluent	Dry Weather Effluent
Organic compounds ( $\mu\text{g/L}$ )		
Bis(2-ethylhexyl)phthalate	12	21
Chloroform	7	6
Tetrachloroethene	<5	4
Toluene	<5	9
Pentachlorophenol	<10	14
Hexachlorocyclohexane	<0.1	0.04
PCB-1260	<2	0.53
Metals <sup>b</sup> (mg/L)		
Antimony	0.001	<0.001
Arsenic	<0.005	<0.005
Beryllium	<0.02	<0.001
Cadmium	<0.01	0.01
Chromium	0.012	0.01
Copper	0.37	1.4
Lead	0.01	0.005
Mercury	<0.0002	0.0006
Nickel	<0.04	0.08
Selenium	0.002	<0.005
Silver	<0.001	0.004
Thallium	<0.005	0.01
Zinc	0.08	0.09

<sup>a</sup> Wet weather period = November-April; dry weather period = May-October.

<sup>b</sup> Metals analyzed by the total metals digestion method.

WWTP on file with Ecology. These industries include Bellingham Cold Storage, Bellingham Frozen Foods, Sea-Pac Company, Inc., Seawest Industries, Schenk Seafood Sales, Dahl Fish Company, Inc., Brooks Manufacturing Company, the Oeser Company, and Mt. Baker Plywood. All permits on file with Ecology expired in 1988, with the exception of permits from the two wood treatment facilities: Brooks Manufacturing and the Oeser Company. Bellingham Frozen Foods has indicated it will withdraw from the city's sanitary sewer system once secondary treatment begins in 1993. A summary of the NPDES permit effluent limitations for these industries is presented in Table 4.

**Stormwater Discharges to the Post Point WWTP**—The volume of stormwater discharge to the Post Point WWTP has been greatly reduced in recent years (Melcher 1987). These reductions have been a result of major storm sewer separation projects in Bellingham's central business district, northwestern residential core, and southern residential/commercial areas. These separation projects were completed in the fall of 1986 (Melcher 1987). It is estimated that surface water runoff presently accounts for 1-5 percent of the total wet-weather input to the Post Point WWTP (Melcher, S., 13 March 1989, personal communication). The majority of this stormwater inflow is believed to be from three major sources:

- Roof drains and catch basins in the central business district that are still connected to the sanitary sewer
- A relatively small residential area in north Bellingham where several cross-connections remain
- Unauthorized hookups to the sanitary sewer.

These sources contribute an estimated 10.7 MGD to the sanitary sewer for a 10-year storm (Melcher 1987). In addition, runoff from the treatment plant at Brooks Manufacturing is permitted under NPDES for discharge to the sanitary sewer. A summary of contaminant limitations for this runoff is presented in Table 4.

### **Former Whatcom Creek Waterway WWTP**

In 1882, the first sewers were installed throughout the developed areas of Bellingham. Most of these sewers discharged directly into Bellingham Bay or into the Whatcom Creek Waterway. The first primary treatment of these wastes began in 1947 with the construction of Bellingham's first WWTP. This plant was located near the mouth of the Whatcom Creek Waterway and provided primary treatment of sewage and urban runoff. The plant discharged into the shallow waters of inner Bellingham Bay. Initially, the plant's capacity was 4.5 MGD, but was expanded in 1960 to accommodate 11 MGD. This plant was abandoned in 1974, when its waste stream was diverted to the Post Point WWTP (CH2M HILL 1984).

### **WWTPs in the Nooksack Drainage**

Three secondary WWTPs discharge into the Nooksack River, which eventually flows into Bellingham Bay.

**TABLE 4. NPDES-PERMITTED DISCHARGES TO THE  
BELLINGHAM SANITARY SEWER<sup>a</sup>**

Facility	Waste Description	Effluent Limitations <sup>b</sup>
Bellingham Cold Storage	Screened process wastewater from fish processing	10,000 gpd <sup>c</sup>
Bellingham Frozen Foods	Screened process wastewater from vegetable processing	2.0 MGD
Sea-Pac Co., Inc.	Screened process wastewater from fish processing	3,000 gpd
Seawest Industries	Screened process wastewater from fish processing	70,000 gpd
Schenk Seafood Sales	Screened process wastewater from fish processing	8,500 gpd <sup>c</sup>
Dahl Fish Co., Inc.	Screened process wastewater from fish processing	60,000 gpd
Mt. Baker Plywood, Inc.	Press pit oil/water subnatant wastewater and boiler blow-down	3,000 gpd 100 mg/L total oils <sup>c</sup> 1.0 mg/L total phenolics <sup>c</sup>
The Oeser Company	Sump drainage, cooling water from wood treating operations	100 mg/L total oil <sup>c</sup>
	Steam condensate and blow-down	10 mg/L total oil <0.1 µg/L PCP <sup>c</sup>
Brooks Manufacturing Co.	Treating plant runoff	100 mg/L total oil <sup>c</sup>
	Sump drainage, cooling water from wood treating operations	<0.1 µg/L PCP <sup>c</sup>

<sup>a</sup> Each NPDES permit is included in Appendix D.

<sup>b</sup> Effluent limitations are listed as daily averages. All discharges to the Post Point WWTP must be pH 6.0-9.0. PCP = pentachlorophenol.

<sup>c</sup> Effluent limitation is listed as a daily maximum.



**Ferndale WWTP**—The Ferndale WWTP discharges an average of 0.6 MGD of secondary-treated effluent into the Nooksack River. The NPDES permit limitations of this discharge are summarized in Table 2. The Ferndale municipal sewer serves a population of approximately 5,000 in and around the city of Ferndale. A majority of the storm sewers in Ferndale discharge directly into the Nooksack River, although in some town segments the surface runoff is combined with the sanitary sewer system. There are no NPDES-permitted discharges to the Ferndale WWTP on file with Ecology. However, leachate from the Thermal Reduction Corporation incinerator facilities and from the nearby Cedarville landfill is reportedly discharged to the Ferndale Sanitary Sewer (Eley, J., 27 February 1989, personal communication).

**Lynden WWTP**—The Lynden WWTP discharges an average of 1.3 MGD of secondary-treated effluent to the Nooksack River. The NPDES permit discharge limitations for this facility are presented in Table 2. The Lynden sanitary sewer serves almost all of Lynden's population of approximately 5,000. The storm sewer system in Lynden is separated from the sanitary sewer system. Surface water runoff is discharged untreated to the Nooksack River. Shuksan Frozen Foods, Inc. is the only NPDES-permitted discharge to the Lynden sanitary sewer. NPDES daily maximum limitations for this discharge are 0.5 MGD, 4,080 kg/day BOD, 1,360 kg/day TSS, and pH within the range of 6.0-9.0. Surface water runoff from these facilities has been found to contain no detectable levels of ethylene dibromide (EDB), although EDB contamination in groundwater is considered a problem in this area (Klimple, T., 27 February 1989, personal communication; McKeon 1985). Considerable sanitary and process sewage from dairy farms is also treated at the Lynden WWTP (Klimple, T., 27 February 1989, personal communication).

**Everson WWTP**—The Everson WWTP discharges an average of 0.2 MGD of secondary-treated effluent to the Nooksack River. A summary of the NPDES permit discharge limitations is presented in Table 2. The Everson sanitary sewer system serves a population of approximately 1,100 in Everson and, as a result of a recent plant upgrade, has expanded to include a portion of the population of Nooksack. The storm sewer system in Everson is separated from the sanitary sewer system and discharges directly into the Nooksack River. There are no known industrial discharges to the Everson sanitary sewer system (Bowman, S., 28 February 1989, personal communication).

### **Areas Not Served by WWTPs**

Two major areas in the city of Bellingham are not part of the city's municipal sewer system. Residential areas around north Chuckanut Bay and south of the lower Birchwood neighborhood along Marine Drive (west of Squalicum Creek) are served primarily by septic systems. In 1980-1981, the Whatcom County Department of Health conducted a septic survey of the residential district just beyond the Bellingham city limits along Marine Drive in response to complaints of numerous septic system failures in that area (Kloc, B., 1 March 1989, personal communication). Surface water from this area drains to the south onto the beach and into Bellingham Bay. At one time, three out of four septic systems were contributing to high fecal coliform bacterial counts in the area. Reportedly, sewage from these septic system failures was seeping onto the beaches and into Little Squalicum Creek. Fecal coliform bacterial counts from drainage ditches in this area were recorded in excess of 20,000 organisms/100 mL on several occasions. According to the Whatcom County Department of Health, most of these problems have been corrected (Kloc, B., 1 March 1989, personal communication).

## COMBINED SEWER OVERFLOWS AND EMERGENCY OVERFLOWS

Discharges through CSOs generally occur during heavy rainstorms, when runoff exceeds the hydraulic capacity of the combined sanitary and storm sewer system. When capacity is exceeded, the excess flow is discharged to adjacent surface water bodies. This excess flow is often a mixture of stormwater and untreated sewage. NPDES permits recently issued by Ecology require permittees to use all reasonable measures to prevent or moderate CSO discharges and to submit a plan for reducing CSO discharges by the greatest amount reasonable in the least amount of time.

In October 1987, the city of Bellingham Public Works Department submitted a review of CSO discharges for the Bellingham sanitary sewer system in compliance with the requirements of Washington Administrative Code (WAC) Chapter 173-245. Historically, overflows have occurred at four locations in Bellingham: the "C" Street interceptor, the Oak Street pump station, the lower Cornwall pump station, and the Post Point WWTP (Figure 6). Because of major storm sewer separation projects in the central business district and in the northwestern residential and southern residential/commercial areas of the city, overflows have not occurred at the Post Point WWTP since 1982 and at the Oak Street and lower Cornwall pump stations since 1984. The only remaining CSO in Bellingham is at the "C" Street interceptor. The outfall for this CSO is at the same location as the outfall from the old Whatcom Creek Waterway WWTP (Figure 6). In early 1987, a measuring weir and level recorder were installed at the "C" Street CSO to measure flows. No overflows had occurred by October 1987. However, four overflows have occurred since 1987: three in 1988 and one in 1989 (as of 16 February 1989). The most recent documented overflow at the "C" Street CSO occurred on 23 November 1986. This overflow lasted over 5 hours, discharging approximately 1.9 million gallons of combined sewage. Samples of this flow contained an average of 53 mg/L TSS and 30 mg/L BOD for a total discharge of approximately 390 kg TSS and approximately 220 kg BOD into Bellingham Bay. Overflows at the "C" Street CSO have occurred at an average rate of two per year since 1984 (Melcher 1987).

The sanitary sewage that flows through the "C" Street CSO contains virtually no industrial wastes. Industrial wastes enter the sewer collection system's main line at the Oak Street pump station, which is downgradient from the "C" Street CSO. As a result, industrial wastes could overflow at the "C" Street CSO in only two situations: complete failure of the Oak Street pump station or overflow of the Champion trunk. According to the Bellingham Department of Public Works, these situations are highly unlikely and unprecedented, as two of the total of four pumps are always in operation at Oak Street during periods of high flow, and the maximum expected flow rate in the Champion trunk during storm events is less than half of its capacity (Melcher 1987).

Untreated sanitary sewage can also bypass the Post Point WWTP and discharge directly to Bellingham Bay via emergency overflows (EOF). These overflows commonly occur as a result of pump failures or power failures at pump or lift stations and generally are not a result of excess stormwater runoff. These overflows have occurred at the Edgemoor, Flynn Street, and Birch Street pump stations in the past. The Edgemoor EOF event was a result of a pump failure. There are now two pumps at this station. The Birch Street EOF event was the result of a power failure, and the Flynn Street EOF event was the result of vandalism. Historically, there have been problems with overflows into Padden Creek and Whatcom Creek. The sources of these discharges have since been eliminated (McCourt, W., 22 February 1989, personal communication).

## SURFACE WATER RUNOFF

Major sources of surface water runoff into Bellingham Bay are described in this section.

### City of Bellingham

Surface water runoff in the Bellingham area from Little Squalicum Creek to Post Point is collected by Bellingham's storm sewer system, which is almost entirely separated from the sanitary sewer system. In 1978, the city of Bellingham conducted a survey of surface drainage patterns in the area. This survey mapped the locations of storm drain lines and discharges within the city, and revealed the locations of storm sewer outfalls discharging directly into Bellingham Bay. The locations of these outfalls are indicated in Figure 6 (City of Bellingham 1978).

In addition, these maps revealed the presence of storm drain outfalls to the four creeks flowing through the city of Bellingham. Two storm drains discharge to Little Squalicum Creek. One drains the streets adjacent to the Oeser Company wood treatment facilities. Four storm drains discharge to Squalicum Creek. These storm sewers primarily drain residential areas in Birchwood, Columbia, and Cornwall Park residential areas. Forty-two storm drains discharge to Whatcom Creek. These storm sewers drain the central business district, and the Sunnyland, Roosevelt, and Alabama Hill residential areas. Two storm drains discharge to Fever Creek (a tributary of Whatcom Creek) from streets adjacent to the Brooks Manufacturing Company wood treating facilities. No storm drains discharge to Lake Whatcom. Thirteen storm drains discharge to Padden Creek. These storm sewers drain the Fairhaven central business district and the Happy Valley, South, and Samish residential areas. Storm drains discharging to Lake Padden and Chuckanut Creek were not surveyed. The majority of the residential neighborhoods around Chuckanut Creek are drained by shallow ditches (McCourt, W., 22 February 1989, personal communication).

### Nooksack River Watershed

The Nooksack River Watershed drains approximately 1,500 km<sup>2</sup> of primarily forested and agricultural lands. Major nonpoint sources of contaminants to the river include agricultural and urban runoff, failing septic systems, illegal dumpsites, runoff from logged areas, and leachate from the Cedarville landfill. The major point sources to the Nooksack River are the Ferndale, Lynden, and Everson WWTPs, discussed in the **Wastewater Treatment Plants** section. The monthly average flow rate of the Nooksack River between July 1972 and September 1975 ranged from 1,500 to 8,000 ft<sup>3</sup>/sec. Mean low flow for the Nooksack is 2,400 ft<sup>3</sup>/sec. Mean high flows from storms and snowmelt are 5,600 and 4,800 ft<sup>3</sup>/sec, respectively (U.S. COE 1979). The average discharge of sediment at the mouth of the Nooksack has been estimated at 850,000 yd<sup>3</sup>/yr (Kramer, Chin and Mayo 1977). The total sediment loading from the Nooksack River is expected to increase in the future due to increased siltation from logged areas. In 1973, mercury concentrations measured from various stream sediment sampling locations throughout the Nooksack drainage ranged from 0.03 to 0.84 mg/kg with a mean of 0.14 mg/kg (Babcock and Kolby 1973).

Agricultural runoff into the Nooksack River is primarily from dairy and berry farming operations. Runoff from dairy farms is expected to contribute to the nutrient loading and fecal coliform counts in the river at points downstream. Fecal coliform bacterial counts performed at the mouth of the Nooksack River at Marine Drive from October 1983 through September 1984 ranged from 33 to 310 organisms/100 mL with a mean of 145 organisms/100 mL (CH2M HILL

1984). Runoff from berry farming in Whatcom County has historically been implicated as contributing low levels of EDB contamination into the Nooksack River. In addition, seepage of EDB from contaminated groundwater to the river is a potential source of contamination. In a groundwater survey conducted from June through October 1984, five of 35 public wells in Whatcom County exhibited EDB contamination. Use of EDB as a soil fumigant was banned in 1983 (McKeon 1985).

### **Little Squalicum Creek Watershed**

The Little Squalicum Creek Watershed includes areas that are primarily forested and residential, with some industrial areas near the mouth of Little Squalicum Creek. The only documented point sources to Little Squalicum Creek are two storm drain outfalls located just beyond the Bellingham city limits. One of these sewers drain areas immediately adjacent to the Oeser Cedar Company's wood treatment facilities. In addition, a small unnamed seasonal creek runs adjacent to and receives considerable groundwater seepage from the Oeser Company's property. Water samples taken by Ecology upstream and downstream of Oeser Cedar in 1978 indicated the facility's influence on creek water quality is minimal (Prescott 1978). The Oeser Cedar Company has an NPDES permit for discharge of plant runoff to Little Squalicum Creek. According to the permit limitations, concentrations of total oil cannot exceed 15 mg/L and no detectable levels of pentachlorophenol (PCP) can be present in this discharge. Current nonpoint sources of contamination to Little Squalicum Creek include logging, residential, and industrial runoff, and frequent septic tank failures along Marine Drive. A sample collected in 1980 from the Marine Drive storm sewer where it enters Little Squalicum Creek revealed fecal coliform levels as high as 55,000 organisms/100 mL. A sample collected on the same day at the mouth of Little Squalicum Creek exhibited a fecal coliform count of 5,600 organisms/100 mL. Incidences of septic tank failures in this area have reportedly been reduced by 90 percent since 1980 (Kloc, B., 1 March 1989, personal communication).

### **Squalicum Creek Watershed**

The Squalicum Creek Watershed covers a total of 65 km<sup>2</sup>. These lands are primarily forested, but contain agricultural, residential, commercial, and industrial areas near the mouth of Squalicum Creek. The only point sources to Squalicum Creek are four storm drain outfalls located within the city of Bellingham. These outfalls drain primarily residential areas. Current nonpoint sources to Squalicum Creek include urban and industrial runoff and septic tank failures. Monthly water samples taken at the head of the Squalicum Creek Waterway from October 1983 through September 1984 revealed fecal coliform counts ranging from 11 to 1,300 organisms/100 mL with a mean of 285 organisms/100 mL (CH2M HILL 1984).

### **Whatcom Creek Watershed**

The Whatcom Creek/Lake Whatcom Watershed covers an area of approximately 293 km<sup>2</sup>. Approximately 109 km<sup>2</sup> of this area are forested, with the remainder in urban, residential, commercial, and industrial development. Primary point sources to Whatcom Creek include 42 storm drain outfalls draining residential and some commercial and industrial areas. Primary nonpoint sources in the Whatcom Creek Watershed include urban, industrial, and logging runoff; powerboats; marinas; septic tank failures; and runoff and leachate from several abandoned landfills near the

mouth of Whatcom Creek (Creahan 1988). Surface water runoff from the Brooks Manufacturing Company's wood treating facilities drains to storm drains discharging to Whatcom Creek and directly into Fever Creek, a small tributary of Whatcom Creek. The Brooks Manufacturing Company has an NPDES permit for discharge of storage area runoff directly to Whatcom Creek. According to the permit limitations, concentrations of total oil cannot exceed 15 mg/L and no detectable levels of PCP can be present in this discharge. Monthly water samples taken at the head of the Whatcom Creek Waterway between October 1983 and September 1984 revealed fecal coliform bacterial counts ranging from 11 to 2,200 organisms/100 mL with a mean of 660 organisms/100 mL (CH2M HILL 1984).

### **Padden Creek Watershed**

The Padden Creek Watershed occupies an area of approximately 16 km<sup>2</sup>. The area is primarily residential, with some small commercial, agricultural, and forested areas. The only point sources known to discharge to Padden Creek are 13 storm drain outfalls within the city of Bellingham. These outfalls primarily drain residential and commercial areas. Current nonpoint sources to Padden Creek include urban, industrial, and commercial runoff and septic tank failures (Creahan 1988). Monthly water samples taken from Padden Creek near the Post Point WWTP between October 1983 and September 1984 revealed fecal coliform bacterial counts ranging from 33 to 1,300 organisms/100 mL with a mean of 471 organisms/100 mL (CH2M HILL 1984).

### **Chuckanut Creek Watershed**

The Chuckanut Creek Watershed occupies an area of approximately 34 km<sup>2</sup>. This area is primarily forested, with some smaller residential and commercial areas. There are no known point sources to Chuckanut Creek. Current nonpoint contaminant sources include runoff from logged areas, runoff from Interstate 5, residential runoff, and septic tank failures (Creahan 1988). Monthly water samples taken at the mouth of Chuckanut Creek from October 1983 through September 1986 revealed fecal coliform bacterial counts ranging from 17 to 3,000 organisms/100 mL with a mean of 558 organisms/100 mL (CH2M HILL 1984).

### **Bellingham Bay Watershed**

The Bellingham Bay Watershed consists largely of shoreline areas extending from the Nooksack River to Little Squalicum Creek (including Bellingham International Airport), from Whatcom Creek to Padden Creek, and from Padden Creek to Chuckanut Creek. These areas cover a total of 16 km<sup>2</sup> of commercial, industrial, forested, and agricultural land. Point sources to Bellingham Bay from these areas include the Georgia-Pacific and Post Point outfalls, the "C" Street CSO, and storm drains. Current nonpoint sources of contaminants to Bellingham Bay from the watershed area include urban and industrial runoff, railroad runoff (creosote pilings), oil leakage, septic tank failures along the north shore area (between the Nooksack River and Little Squalicum Creek), and runoff from a slag pile at the Taylor Avenue dock (Creahan 1988). Water samples taken in 1980 from outfalls in Bellingham Bay from the Columbia Cement Corporation and from residential storm sewers along Marine Drive exhibited fecal coliform bacterial counts as high as 4,000 organisms/100 mL. A standing surface water sample taken on the same date along the railroad tracks exhibited a fecal coliform bacterial count of 9,000 organisms/100 mL. At that time, 75 percent of

the septic systems in the Marine Drive area were contributing to these high coliform counts (Kloc, B., 1 March 1989, personal communication).

### **Chuckanut Bay Watershed**

The Chuckanut Bay Watershed covers all nearshore areas from Chuckanut Creek to Governor's Point. These areas are primarily forested with some residential development. There are no known point sources of contaminants to Chuckanut Bay from this area. Current nonpoint sources to Chuckanut Bay include residential runoff and runoff from Chuckanut Drive.

### **Lummi Peninsula Watershed**

The Lummi Peninsula Watershed to Bellingham Bay includes all nearshore areas from the Nooksack River to Point Frances, including Portage Island. These areas are primarily forested with some residential development. The only documented source of contaminants to Bellingham Bay from the Lummi Peninsula and Portage Island is storm drain outfalls from the Lummi Indian reservation. Current nonpoint sources include residential runoff and septic tank failures (Creahan 1988). Most sewage in this area is treated by the secondary system of the Lummi Tribe and discharged to Hale Passage, outside the study area (MacKay, M., 12 July 1989, personal communication).

### **Private Drains**

There are numerous private drains that discharge into Bellingham Bay from residential areas and businesses located along the shoreline. These outfalls may drain parking lots, storage yards, tank farms, and piers. All properties owned by the Port of Bellingham have private storm drain systems discharging to the bay. Reportedly, these sewers drain port parking lots, piers, and rooftops (Ellis, D., 22 February 1989, personal communication). No storm sewers drain the Georgia-Pacific plant site; runoff from the site is treated in the secondary treatment lagoon prior to discharge into the bay.

Numerous private storm drains have been observed draining onto the beach and into Bellingham Bay along the shoreline north of the city of Bellingham. These storm sewers primarily drain the residential areas along Marine Drive from Little Squalicum Creek to the Nooksack River. Samples taken from these outfalls in 1980 and 1981 by the Whatcom County Department of Health revealed fecal coliform counts up to 20,000 organisms/100 mL. Since 1980, problems with septic tank failures in this area have been largely eliminated (Kloc, B., 1 March 1989, personal communication). Because of a lack of documentation, private discharges to Bellingham Bay from other portions of the study area were not characterized in this study.

### **GROUNDWATER**

No studies defining groundwater characteristics in the study area have been identified to date. As a result, the impact of groundwater discharge on Bellingham Bay's water quality is unknown. However, with the prevalence of fill areas containing unknown materials, sanitary landfill materials,

and contaminated dredge spoils on the Bellingham waterfront, groundwater seepage from these areas may impact water quality in the inner harbor.

## INDUSTRIAL SOURCES

The industrial sources of contaminants to Bellingham Bay discussed in this section are divided into two categories: point and nonpoint sources. Point sources in the study area consist primarily of NPDES-permitted outfall discharges and some unpermitted storm drains from private industrial properties along the Bellingham shoreline. Nonpoint industrial contamination results from improper contaminant handling, treatment, storage, and disposal practices. Locations of potential contaminant sources in the study area are shown in Figure 6.

### Point Sources

**Georgia-Pacific Corporation**—In 1925, Pacific Coast Paper Mills began manufacturing tissue paper in Bellingham. In 1928, Puget Sound Pulp and Timber Company began pulping operations in this area. The facilities were located at the entrance to the Whatcom Creek Waterway, along what is now Burlington Northern Railroad. This location provided access to sea and land transportation and was adjacent to a large sawmill, which provided raw materials. During World War II, the federal government constructed a plant to produce alcohol in support of the war effort. This plant was purchased in 1947 by Puget Sound Pulp and Timber Company, and byproduct recovery operations were initiated. By the 1960s, the company produced ethyl alcohol, animal feed ingredients, adhesives, pharmaceutical raw materials, building compounds, and tanning chemicals. Approximately 50 products were produced from the process waste at that time.

In 1963, Georgia Pacific purchased Puget Sound Pulp and Timber Company, which had previously combined tissue and pulp manufacturing. At that time, the operation included calcium-based sulfite pulping, semi-chemical pulping (i.e., a partial pulping process that does not remove all lignin), by-product manufacture, paperboard production, and tissue production. In 1965, Georgia-Pacific established a chlor-alkali plant that used salt and a mercury cell system to produce chlorine (sodium hypochlorite) and caustic soda (sodium chlorate). A sodium chlorate facility was also established on the plant site.

Currently, the mill produces two types of pulp: calcium-base sulfite and sodium-base semi-chemical pump. The calcium sulfite uses an acidic sulfite liquor, and the semi-chemical process uses a neutral sulfite liquor to convert wood chips into the pulp fiber used in the paper-making process. In addition to these products, Georgia-Pacific produces a large number of by-products from spent pulping liquor, including alcohol and lignin products. In addition, a small sulfuric acid plant is located on the site.

Beginning in 1944, cooling water and wastewater from the alcohol plant were discharged via the municipal storm sewer line. This discharge configuration was retained until 1973 (Shea et al. 1981). In 1963, Georgia-Pacific discharged process wastes through a single outfall into a log pond and through five outfalls into Whatcom Creek Waterway. In 1964, the chlor-alkali plant began discharging into the log pond via a new outfall.

From 1956 to 1973, Georgia-Pacific operated under the Washington state Water Pollution Control Commission (WPCC) permits governing discharge from the sulfite and semi-chemical pulping processes, the tissue products plant, the paperboard mill, the sulfuric acid plant, and the chlor-alkali plant. In 1968, these permits were extended until 1973 for all discharges excluding that of the chlor-alkali plant. This permit was the first issued to Georgia-Pacific to require the installation of primary treatment facilities and improved liquor recovery. This permit required that a primary treatment system be in operation by September 1970 and required improvements in liquor collection, dredging, and chip-barge unloading procedures, and the design of an outfall (Shea et al. 1981).

In 1975, Georgia-Pacific was issued its first NPDES discharge permit. This permit called for progressive reductions of BOD to 14,000 kg/day by 30 June 1978. This permit was later appealed to the Pollution Control Hearing Board, resulting in a reissuance of the permit by Ecology with new effluent limitations and compliance dates. EPA rejected this reissued permit and Georgia-Pacific was ordered to comply with its original permit limitations. A compliance schedule issued by the U.S. Department of Justice required installation of secondary treatment facilities and an improved diffuser outfall by 15 May 1979. Secondary treatment and the outfall were operative by 8 May 1979.

Georgia-Pacific's chlor-alkali plant received its first discharge permit in 1964. The original permit limited total waste flow to 5.3 MGD and chlorine content to 5.0 ppm. The subsequent permits contained additional permit limitations, including maximum daily mercury discharge. In 1970, the total allowable mercury discharge was 0.5 pounds/day. By 1977, this limitation was reduced to 0.1 pounds/day averaged over a calendar month (Shea et al. 1981).

From 1966 to April 1973, monthly averages for suspended combustible solids (SCS) and total solids (TS) averaged 31,220 pounds/day and 834,234 pounds/day, respectively. After installation of primary treatment facilities designed to remove all floating and settleable solids, these monthly averages decreased to 16,470 pounds/day SCS and 580,833 pounds/day TSS from May 1973 to May 1975. During the period from 1 July 1978 to June 1979, BOD waste loads in Georgia-Pacific effluent averaged 79,500 pounds/day. After startup of the aerated stabilization lagoon for secondary treatment in 1979, BOD waste loads were brought within the 31,000 pounds/day effluent limitations (Shea et al. 1981).

Since 1979, all of Georgia-Pacific's eight former outfalls have been combined and rerouted across the Whatcom Creek Waterway into the aerated stabilization (secondary treatment) lagoon. The discharge from the lagoon is released to inner Bellingham Bay through a deepwater outfall (Figure 6). In August 1979, 4 months after the secondary treatment lagoon became operational, Ecology conducted a Class II inspection at Georgia-Pacific's pulp and chlor-alkali facilities (Yake 1979). At that time, NPDES permit limitations for BOD, TSS, and pH were 22,500 pounds/day, 35,300 pounds/day and between 5.0 and 9.0, respectively. Georgia-Pacific facilities were well within compliance of these limitations. However, leakage was observed in the lagoon retaining walls, particularly around the discharge line. At that time, Georgia-Pacific's daily average mercury discharge limitation was 0.07 pounds/day. Mercury discharge from the chlor-alkali facility was measured at 0.05 pounds/day. However, mercury loading in the total plant effluent was measured at 0.82 pounds/day. The source of this additional mercury was assumed to be partially a result of the use of mercury-contaminated sodium hydroxide in the pulping process. In addition, a small unidentified discharge in the log pond area was noted during low tide. A sample from this discharge was found to contain 71 µg/L mercury (Yake 1979).



Presently, Georgia-Pacific's NPDES effluent limitations for BOD, TSS, pH, and total mercury are 41,300 pounds/day, 62,600 pounds/day, between 5.0 and 9.0, and 0.05 pounds/day, respectively. During a March 1988 Class II inspection of Georgia-Pacific's facilities, BOD and TSS effluent loadings were measured at 17,477 pounds/day and 45,103 pounds/day, well within permit guidelines. The effluent pH was well within the range specified, and total mercury discharge was measured at 0.016 pounds/day, also well in compliance (Ecology 1988).

Georgia-Pacific's chlor-alkali plant began operation in 1965, using a mercury-cell process to produce chlorine and caustic soda from sodium chloride. Process wastewater from this plant was contaminated with mercury from the mercury-cell process. Until March 1973, the chlor-alkali plant discharge was not routinely monitored. A recovery and recycle system was installed in 1970 and upgraded in subsequent years. A permit issued on 16 March 1973 limited mercury discharges to 0.2 pounds/day on a monthly average. Monitoring data demonstrated compliance with this limitation (Dahlgren, E., 30 June 1989, personal communication). A new permit issued on 16 February 1977 limited mercury discharge to 0.1 pounds/day until 30 June 1977, when the limitation was reduced to 0.07 pounds/day on a monthly average. From January 1976 to May 1979, only two violations of the limitation occurred. A new permit issued on 27 June 1985 limited mercury discharge to 0.05 pounds/day on a monthly average. No violations of that limitation have occurred since permit issuance (Dahlgren, E., 30 June 1989, personal communication). The current discharges average 0.01 pounds/day.

**Other Discharges**—A summary of NPDES-permitted discharges to Bellingham Bay and streams that flow into the bay is presented in Table 5. In the past, a number of small industries in Bellingham, primarily fish and food processors, have discharged untreated process wastewater directly into inner Bellingham Bay. In 1974, a minimum of 23 industrial facilities was discharging wastewaters to Bellingham Bay (Shea et al. 1981). By 1981, diversions of process wastes to the Post Point WWTP and the Lynden WWTP reduced the number of industries discharging directly to Bellingham Bay to 15 (not including Georgia-Pacific). Of these, 12 were industries related to food processing. These discharges were primarily process wastes from the food processing operations. From the late 1960s until hookup with the Post Point WWTP, both the vegetable- and fish-processing industries used a 0.25-inch mesh screen for solids removal before discharging into the bay (Shea et al. 1981).

By 1981, only five fish processors in Bellingham continued to discharge noncontact cooling water into the bay. They include Sea-Pac Company, Inc., Dahl Fish Company, Bumble Bee, Bernstein, and Bellingham Cold Storage. To date, only two food processors, Dahl Fish Company and Bellingham Cold Storage, have NPDES permits on file with Ecology for discharge of noncontact cooling water directly into Bellingham Bay (Shea et al. 1981).

The remaining three industrial discharges were from the R.G. Haley Company (wood processing, now defunct), the Columbia Cement Corporation, and the Olivine Corporation. R.G. Haley's discharges were strictly noncontact cooling water. Prior to 1975, the Oeser Company discharged industrial wastewater containing phenol and oils up to the allowable maximum concentration of 5 mg/L and 10 mg/L, respectively. Currently, Oeser's wastewaters are diverted to the Post Point WWTP. From 1970 through 1975, Mount Baker Plywood discharged process wastewater to Bellingham Bay through a lagoon and seepage pond for settling of solids and glue wastes. Seep samples taken in 1971 opposite the dike separating the seepage pond from Bellingham Bay exhibited total oils up to 1 mg/L phenols to 0.30 mg/L and pH up to 9.0 (Baumer 1971). During a 1973 Ecology inspection, the pH of this effluent was measured at 10.3, with 1 mg/L total

**TABLE 5. NPDES-PERMITTED DISCHARGES  
TO BELLINGHAM BAY AND STREAMS THAT  
FLOW INTO THE BAY<sup>a</sup>**

Permit Holder	Permit Expiration Date	Waste Description	Permit Limitations
Bellingham Cold Storage	12 August 1988	Cooling water	58,000 gpd, 30° C
Sea-Pac Co., Inc.	22 July 1988	Cooling water	5,000 gpd
Dahl Fish Co., Inc. <sup>b</sup>	22 July 1988	Cooling water	24,000 gpd
Columbia Cement Corp.	2 March 1988	Process wastewater	130,000 gpd, 0.005 lb TSS pH 6-9
The Oeser Company <sup>c</sup>	20 June 1989	Plant runoff	15 mg/L total oil pentachlorophenol undetected
Brooks Manufacturing Co. <sup>d</sup>	20 June 1989	Storage area runoff	15 mg/L total oil pentachlorophenol undetected
Public Utility District #1 <sup>e</sup>	26 June 1992	Decant water	2.4 MGD 0.01 mL/L settleable solids pH 6-9
Bellingham Hatchery <sup>d</sup>	30 June 1981	Hatchery effluent	679 lb/day TSS pH 6-9
Nooksack State Salmon Hatchery <sup>f</sup>	17 May 1988	Tailings water	27.4 MGD 15 mg/L TSS or 4,408 lb/day TSS

<sup>a</sup> Each NPDES permit is presented in Appendix D.

<sup>b</sup> Discharge is to Whatcom Creek Waterway.

<sup>c</sup> Discharge is to Little Squalicum Creek.

<sup>d</sup> Discharge is to Whatcom Creek.

<sup>e</sup> Discharge is to the Nooksack River.

<sup>f</sup> Discharge is to Kendall Creek, a tributary to the Nooksack River.

oils and 0.024 mg/L phenols. The effect of this highly basic discharge on the receiving water was considerable, as elevated pH values were still found at distances greater than 40 meters from the point of discharge (Devitt 1973). In 1976, these process wastes were diverted to the Post Point WWTP.

Currently, four private discharges into Bellingham Bay are registered with NPDES permits: Dahl Fish Company Inc., Sea-Pac Company, Inc., Bellingham Cold Storage, and the Columbia Cement Corporation. The three fish processing companies discharge noncontact cooling water to the bay. The total permitted combined flow rate from these discharges is 138,000 gallons/day. According to the permits, the maximum temperature of these discharges cannot exceed 30° C. The Columbia Cement Corporation discharges process wastewater to Bellingham Bay with NPDES permit limitations of 130,000 gallons/day flow, 0.005 pounds TSS, and pH between 6.0 and 9.0. All four NPDES permits expired in 1988.

Dahl Fish Company, Bellingham Cold Storage, and Columbia Cement Corporation have re-applied for their NPDES permits to Ecology (Kantz, M., 4 August 1989, personal communication). This procedure extends the coverage of the existing permit until a new permit is issued. Sea-Pac Company has not been operating since March 1989 and may not re-open.

## Nonpoint Sources

Major potential nonpoint sources of contamination to Bellingham Bay are described in this section.

**Landfills**—Landfills, both active and abandoned, in the Bellingham Bay drainage can be sources of contaminants, either through surface water runoff or through leaching into the groundwater flow. The Whatcom County Department of Health (Bader, D., 3 April 1989, personal communication) identified five major solid waste sites that may be historical or ongoing sources of contamination to Bellingham Bay. Only one of these sites is still active. Three of the sites are former sanitary landfills located within the Bellingham city limits (Figure 6).

The Whatcom County courthouse is located on top of a former sanitary landfill. Leachate from this landfill may be entering Whatcom Creek or Bellingham Bay through groundwater flow. A city of Bellingham sanitary landfill was located within the Georgia-Pacific secondary treatment lagoon at the intersection of F Street and Roeder Avenue. After this landfill was closed, Georgia-Pacific sprinkled water on the logs stored on this site. Much of this water leached through the fill materials. Leachate from the landfill was collected in a pipe and discharged into Bellingham Bay. A summary of the characteristics of the leachate is presented in Table 6. Reportedly, this pipe was later diverted to the Bellingham sanitary sewer. The third former landfill site was located along the shoreline just south of Georgia-Pacific and north of Boulevard Park. Leachate from this site may enter Bellingham Bay. The dates of operation of these facilities were not available (Bader, D., 3 April 1989, personal communication).

Two sanitary landfills in the Nooksack drainage were identified as having potentially deleterious effects on Bellingham Bay via the Nooksack River. The former Lynden sanitary landfill may be contributing contaminants to the Nooksack River via leachate flow. The Cedarville landfill located just south of Deming is currently active, and may be contributing contaminants to the Nooksack River via surface water runoff or leachate entering the groundwater (Bader, D., 3 April

**TABLE 6. TOXIC CHEMICALS DETECTED IN THE LEACHATE  
FROM THE OLD BELLINGHAM SANITARY LANDFILL  
14 MAY 1980**

<b>Organic compounds (<math>\mu\text{g/L}</math>)</b>	
Chloroform	10
Phenols	30
Toluene	10
Diethylphthalate	10
Methylene chloride	10
Bis(2-ethylhexyl)phthalate	38
Vinyl chloride	0.1
<b>Metals (mg/L)</b>	
Arsenic	6.0
Cadmium	1.9
Chromium	6.0
Copper	6.0
Lead	6.0
Nickel	36
Zinc	240
Mercury	0.87

Reference: U.S. EPA (1989)

1989, personal communication). In addition, the Whatcom County Department of Health reported a history of indiscriminant dumping in numerous small landfills on the Lummi Peninsula. These landfills have since closed. Dates of operation and locations of these fills were not available (Bader, D., 3 April 1989, personal communication).

**Commercial and Recreational Marinas**—The locations of recreational boating facilities in Bellingham Bay are presented in Figure 5. In addition to these recreational facilities, a commercial facility, Maritime Contractors Incorporated, is located west of the Harris Street boat ramp on Post Point. Although these facilities are potential sources of contaminants, little information was found that addresses these potential sources. Chemical contaminants (e.g., copper, tributyltin) could be released when vessels are sandblasted and painted or from spills or leakage of fuel and oil. Microbial contamination could arise from leaking holding tanks on the vessels or from unauthorized releases of sewage. The only wet marina in the Bellingham Bay study area is the Squalicum Harbor marina. This is a full-service marina that provides haulout, repair, painting, and sewage pumpout facilities. There are live-aboards (people who occupy a boat as a residence) in this marina. The Hilton Harbor marina provides haulout facilities, and only dry storage is offered at this location. Boat owners are allowed to conduct repairs or paint their vessels on the marina property. There is a gasoline dock at this marina. Maritime Contractors Incorporated is a commercial facility specializing in the repair and conversion of ships and fishing boats. There are two drydocks and a marine raise (a type of haulout device) at this facility.

**Port of Bellingham**—The Port of Bellingham owns and operates two dock facilities. One is located just south of Georgia-Pacific, and the other is located at the Port of Bellingham Marine Park near Fairhaven.

A new terminal is being built by the port to accommodate the Alaska State Ferry System. This terminal is located on approximately 5 acres of land immediately west of the mouth of Padden Creek near Post Point (Figure 1). Concern has been expressed that the construction of the facility and operation of the ferries could expose and resuspend contaminated sediment as a result of pile driving and sediment scouring by currents created as the ferries maneuver.

To address this concern, Landau Associates (1989) evaluated chemical concentrations in the sediments near the ferry terminal. Samples were collected on 23 March 1989 at four sites in the immediate vicinity of the ferry terminal that have the greatest susceptibility to sediment scouring. Sediments were also sampled at two intertidal stations near the mouth of Padden Creek, in an area that also may be influenced by sediment disturbance. At each station near the ferry terminal, a diver collected a 3-inch core sample to a depth of 5 feet below the sediment surface. Three core horizons (top 6 inches, bottom 6 inches, middle 4 feet) were composited across all four stations for chemical analysis. At the two stations near the mouth of Padden Creek, the top 6 inches of sediment was collected using a 2.5-inch diameter soil sampler. Samples from both of these stations were composited for chemical analysis. All sediment samples were analyzed for 13 metals and a variety of organic compounds, including polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), phenols, total petroleum hydrocarbons (TPH), and total organic halides (TOX).

Results of the chemical analyses conducted by Landau Associates (1989) showed that contamination was generally greatest in the top 6 inches of each sediment core. To determine whether the observed concentrations might result in adverse biological effects, the authors compared the observed values to the lowest apparent effects threshold (LAET) for each chemical. Briefly,

the LAET is the concentration of each chemical above which adverse biological effects have always been found in sediment samples collected from Puget Sound (for a more detailed explanation of LAET, see section entitled **Data Summary: Chemical Contamination of the Water Column, Sediments, and Biota**). LAET were available for all chemicals except beryllium, selenium, thallium, TPH, and TOX. Because the detection limit for PCB (400  $\mu\text{g/kg}$ ) was higher than the LAET for this chemical (130  $\mu\text{g/kg}$ ), comparisons to LAET could not be made for this chemical. None of the chemical concentrations found in any horizon exceeded its corresponding LAET. The only chemical concentrations that approached LAET were those for copper (31-269 mg/kg vs. an LAET of 390 mg/kg) and mercury (0.20-0.30 mg/kg vs. an LAET of 0.41 mg/kg). The authors concluded that there was no evidence that sediment contamination at the sampling sites was high enough to justify sediment-specific mitigation during construction or operation of the ferry terminal.

### **Dredged Material Disposal Sites**

Since the turn of the century, extensive dredging and filling of the Whatcom and Squalicum Creek tidelands has occurred almost continuously. As a result, over 200 acres of land have been created for industrial and commercial activity along the Bellingham waterfront (Webber 1977). Although the fill materials used in many of these areas are unknown, some areas have been documented as dredged material fills and are shown in Figure 6.

Currently, the U.S. COE Bellingham Harbor navigation project is designed to maintain the Squalicum Creek, I&J Street, and Whatcom Creek waterways to the project depths specified in Table 7. Periodic dredging of these areas is necessary because of continual siltation of the waterways. Historically, the primary source of sedimentation in the Whatcom Creek Waterway was Georgia-Pacific. The estimated dredging frequency presented in Table 7 is based on the rate of sedimentation from Georgia-Pacific prior to the implementation of secondary treatment/diffuser outfall facilities. As a result of Georgia-Pacific's effective cessation of discharge to Whatcom Creek Waterway, the actual dredging frequency in this area has been reduced (Arden, H., 27 February 1989, personal communication). The U.S. COE has no plans to dredge Whatcom Creek Waterway in the near future.

The Whatcom Creek Waterway was first dredged in 1935, when 57,000 yd<sup>3</sup> of material were removed. Subsequent maintenance dredging occurred in 1940, 1942, 1949, 1953, and 1957. The total material removed in these operations ranged from 5,200 to 92,000 yd<sup>3</sup>. In 1961, a major "new work" dredging of 157,000 yd<sup>3</sup> of material expanded the Whatcom Creek Waterway. The waterway was again maintenance-dredged in 1966, when 24,000 yd<sup>3</sup> of material was removed. The disposal sites used for these operations are not known.

The latest U.S. COE dredging of Whatcom Creek Waterway occurred in 1969. This operation used a submerged pipe dredge and disposed of 130,042 yd<sup>3</sup> of dredged material in disposal site A (Figure 6). These materials contained a large proportion of wood fibers and organic material. Because of the contaminated nature of these dredged spoils, the U.S. COE has cancelled future dredging in the Whatcom Creek Waterway (Arden, H., 27 February 1989, personal communication). Georgia-Pacific dredged the inner waterway in 1974. Contaminated dredge spoils from this effort were disposed of in a diked-off area (Site E, Figure 6) of the Georgia-Pacific log pond, aerated, and then covered with an impervious asphalt cap (Arden, H., 27 February 1989, personal communication). Due to the contaminated nature of these sediments, Georgia-Pacific is required in their NPDES permit limitations to maintain the impervious covering.

**TABLE 7. BELLINGHAM HARBOR NAVIGATION PROJECT  
ANTICIPATED DREDGING REQUIREMENTS**

Waterway	Project Depth	Dredging Frequency	Average Amount of Material Removed for Dredging
Whatcom Creek	30 feet MLLW	10 years	110,000 yd <sup>3</sup>
I&J Street	18 feet MLLW	10 years	50,000 yd <sup>3</sup>
Squalicum Creek	26 feet MLLW	10 years	170,000 yd <sup>3</sup>

The primary source of siltation in the I&J Street and Squalicum Creek waterways is from the Nooksack River. The majority of the Nooksack's sediment load is believed to be related to agricultural and logging practices. Siltation from the Nooksack River is so rapid that current theory is the delta is advancing at a rate of 1.6 km every 50 years. As a result, the U.S. COE anticipates that the I&J Street and Squalicum Creek waterways will need periodic maintenance dredging every 10 years. The average amount of materials needed to be dredged from the I&J Street and Squalicum Creek waterways is anticipated to be 38,000 m<sup>3</sup> and 130,000 m<sup>3</sup>, respectively (U.S. COE 1979).

The I&J Street Waterway was first dredged by the U.S. COE in 1966. A total of 147,800 yd<sup>3</sup> of material was removed via clamshell dredge (U.S. COE 1979). The disposal site used for these materials was Site B (Figure 6). Some materials were disposed of on mudflats north of Squalicum Creek (Arden, H., 27 February 1989, personal communication).

The U.S. COE began its maintenance dredging program in the Squalicum Creek Waterway in 1931. The only other reported dredging performed in this area was in 1963. The amount of material removed in these operations was 113,400 yd<sup>3</sup> and 248,700 yd<sup>3</sup>, respectively. Dredge spoils from the 1963 operations were disposed of in Site D (Figure 6).

In 1981, the U.S. COE diverted the mouth of Squalicum Creek from the inner tidal flats area back to its original location in the Squalicum Creek Waterway. The tidal flats area was then dredged to form the new small boat marina. Materials from this excavation were deposited in Site F (Figure 6) to form a parking area for the new marina facilities.

A summary of past and proposed dredged material disposal sites in Bellingham Bay is presented in Figure 6. Site A is the disposal site from the 1969 U.S. COE Whatcom Creek Waterway dredge. Site B is the disposal site for the 1966 I&J Street Waterway dredging. Site C is the disposal site from various maintenance dredging activities from all three waterways. Site D is the disposal site from the 1963 Squalicum Creek dredging. Site E is the disposal site from Georgia-Pacific's 1974 dredging of Whatcom Creek Waterway sludges. Site F is the disposal area from the 1981 dredging of the inner marina.

The Puget Sound Dredged Disposal Analysis (PSDDA) program is currently evaluating a new unconfined, open-water disposal site located west of Post Point in the central portion of Bellingham Bay. The coordinates of the midpoint of the site are 48°42'49.08" N (latitude) and 122°33'1.80" W (longitude). If the site is approved, dredged material that passes the PSDDA criteria for unconfined, open-water disposal will be deposited there.

## ACCIDENTAL SPILLS

Spills from vessels and facilities into Bellingham Bay reported to the U.S. Coast Guard between 1973 and 1988 are summarized in Appendix B. Although Ecology also maintains files of spills into Puget Sound, little information was available for Bellingham Bay.

Only one detailed account of an accidental spill was found during this study. A spill occurred on 1 January 1981 when a 10,000-gallon storage tank failed at the Brooks Manufacturing Company. Oil was spilled into Fever Creek, a tributary of Whatcom Creek. The oil, containing 5-10 percent PCB, discharged to Fever Creek via a storm drain. This oil was contained within Fever Creek with



a sorbent boom. However, lowering of the creek's water level by the city of Bellingham Department of Public Works allowed the oil spill to escape beneath the boom. This spill was estimated to be responsible for the loss of 210 coho salmon, 25,311 fall chinook salmon, 421 sea-run cutthroat trout, 18,817 juvenile steelhead, and 10 adult steelhead (Ecology 1981).

## **DATA SUMMARY: CHEMICAL CONTAMINATION OF THE WATER COLUMN, SEDIMENTS, AND BIOTA**

### **CHEMICAL CONTAMINATION OF THE WATER COLUMN**

In this section, information is presented on chemical contamination of the water column in Bellingham Bay.

#### **Data Synthesis**

No water quality data for chemical contaminants in Bellingham Bay were available for periods after 1979. From July 1972 through June 1975, CH2M HILL (1976) evaluated water quality at two-week (March-November) and monthly (December-February) intervals at eight stations near the Post Point WWTP outfall. Samples were analyzed for copper, lead, zinc, and mercury to evaluate the effects of the outfall discharge on these variables. Concentrations of these metals in water samples from this area were frequently below analytical detection limits. The detection limits for copper, lead, zinc, and mercury in these samples were 5, 10, 5, and 0.5  $\mu\text{g/L}$ , respectively. Copper, lead, and zinc concentrations generally exhibited seasonal fluctuations in surface waters, with slight increases found in early spring and again in the summer (CH2M HILL 1976).

Although the maximum concentration of copper detected in these samples was 20  $\mu\text{g/L}$ , concentrations of this metal were generally less than 10  $\mu\text{g/L}$ . Lead was detected at levels up to 100  $\mu\text{g/L}$  during summer, but concentrations were less than 10  $\mu\text{g/L}$  during fall and winter. Zinc concentrations were generally below 20  $\mu\text{g/L}$  during most of the year, but increased to as much as 90  $\mu\text{g/L}$  in spring. Mercury concentrations were generally below the detection limit throughout the year (CH2M HILL 1976).

The Washington state acute criteria (i.e., 1-hour average concentration) for copper, lead, zinc, and mercury are 2.9, 140, 95, and 2.1  $\mu\text{g/L}$ , respectively (WAC 173-201-047). The state chronic criteria (i.e., 4-day average concentration) for lead, zinc, and mercury are 5.6, 86, and 0.025  $\mu\text{g/L}$ , respectively. There is no chronic criterion for copper.

### **CHEMICAL CONTAMINATION OF SEDIMENTS**

Sediment conventional variables and chemical contamination of sediments in Bellingham Bay are evaluated in this section. The station names used in this report correspond to the names used by the original investigators in Appendix A, Table A-1. Station coordinates (if available) and depths are also presented in Table A-1.

#### **Data Synthesis of Conventional Sediment Variables**

Since 1981, three conventional sediment variables have been measured in sediment samples from Bellingham Bay: grain size, total volatile solids (TVS), and total organic carbon (TOC)

(Figures 7 and 8). Grain size and TVS analyses were conducted at 26 stations in July 1983 (Battelle 1986), 22 stations in October 1983 (Broad et al. 1983), and 14 stations in October 1983 (CH2M HILL 1984). TOC was evaluated at eight stations in May 1984 (Battelle 1986).

**Grain-Size Composition**—Sediment grain-size distribution as measured by the three 1983 studies (Table 8) is presented as percent fine-grained sediment (i.e., silt plus clay) in Figures 9 and 10. In general, percent fines in Bellingham Bay was greater than 90 percent throughout much of the bay. Percent fines generally decreased with increasing proximity to the Nooksack River delta. No samples were taken close to the delta in the studies evaluated for this report. However, Sternberg (1967) and Nelson et al. (1974) described the sediments in this area as delta platform sands. Percent fines in samples taken from the vicinity of the Post Point WWTP outfall were generally greater than 90 percent, with the exception of those samples taken within the zone of initial dilution (ZID). Sediments in this area exhibited values of percent fines as low as 39.8 percent, indicating that sediment scouring may be occurring as a result of the outfall discharge. The only other area to consistently show values of percent fines less than 80 percent was in the Whatcom Creek Waterway. Percent fines in the inner waterway was measured at 48.4 percent. The elevated sand content decreases with distance from the mouth of Whatcom Creek, and is interpreted as being the result of the input of sandy sediments from the creek.

**Total Volatile Solids**—TVS is a measure of the fraction of TS in sediments volatilized at a temperature of 550° C for 60 minutes, and is used as an indicator of the amount of organic material in the sediment. Typically, high values of TVS (e.g., >10 percent) can be indicative of anoxic sediments. A summary of TVS percentages measured in the study area is presented in Table 8 and Figures 11 and 12.

TVS values measured in Bellingham Bay sediments in 1983 ranged from 1.2 to 17.5 percent. In general, the highest TVS values were observed in and around the mouth of Whatcom Creek Waterway. TVS values measured in sediments in the vicinity of the Post Point WWTP diffuser outfall were not elevated over values observed in the inner-central bay. TVS values decreased with increasing proximity to the Nooksack River delta and, as might be expected, were generally lower in areas with coarser-grained sediments.

**Total Organic Carbon**—TOC analysis is a measure of the carbon remaining in a sediment sample after it has been stripped of carbonates by acid pretreatment. Following decarbonation, the sample is combusted in an induction furnace. The total amount of carbon dioxide evolved in the combustion process is measured and used to calculate percent TOC. Values of TOC are used to indicate the amount of organic material in a sediment sample. Values in most marine sediments are less than 5 percent.

Values of TOC at the eight stations sampled in Bellingham Bay ranged from 2.0 to 12.2 percent (Table 8; Figure 13). The highest TOC values were found at Stations BA03 (12.2 percent) and BA04 (4.8 percent) at the mouth of Whatcom Creek Waterway. TOC in sediments at the head of the I&J Street Waterway (Station BA12) was 3.7 percent. Sediment samples taken west of Boulevard Park (Station BA24) and north of the Port of Bellingham south terminal (Station BA23) exhibited TOC values of 2.1 percent and 2.0 percent, respectively.

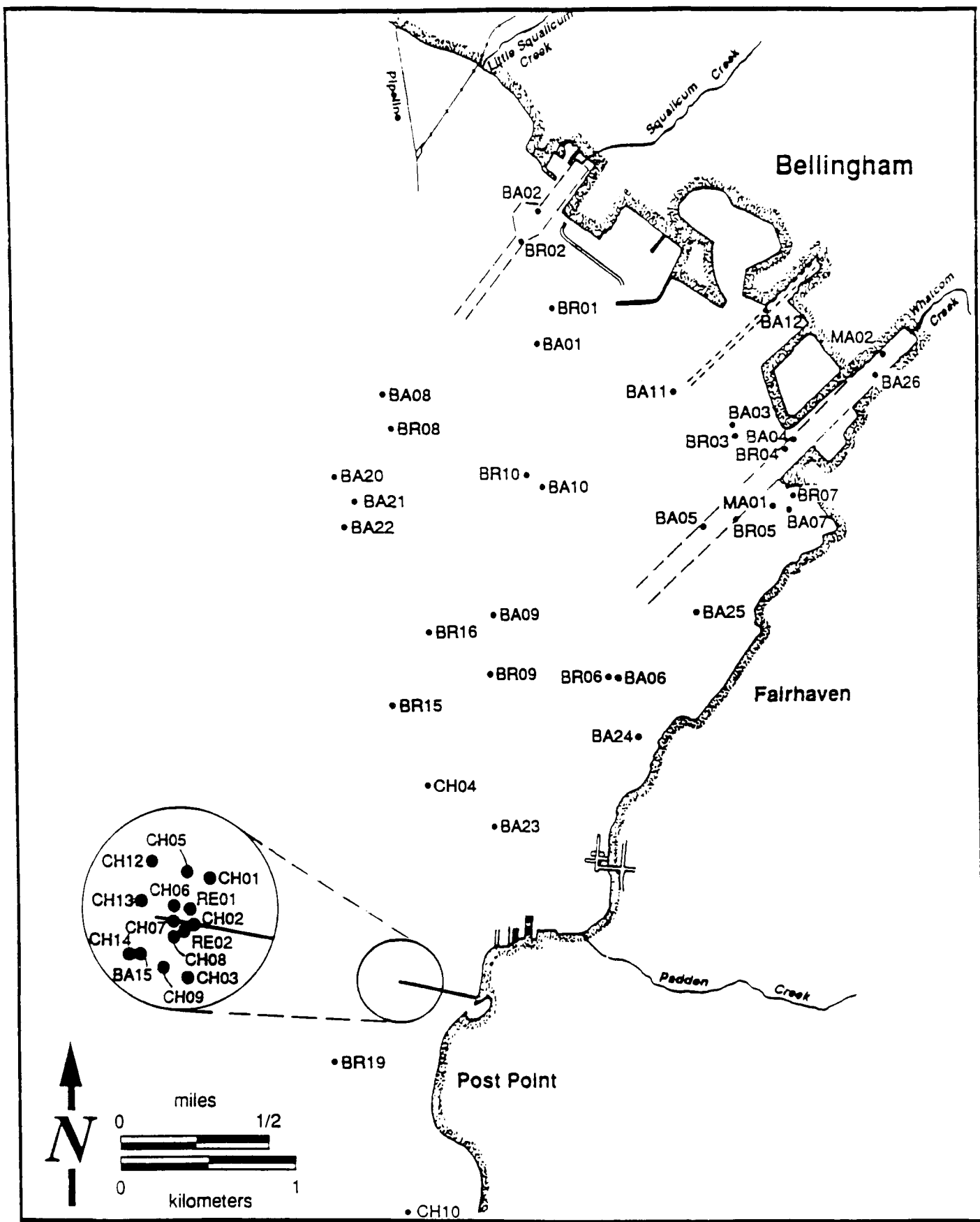


Figure 7. Stations sampled in inner Bellingham Bay for sediment conventional variables and chemical contaminants (All variables were not measured at every station)

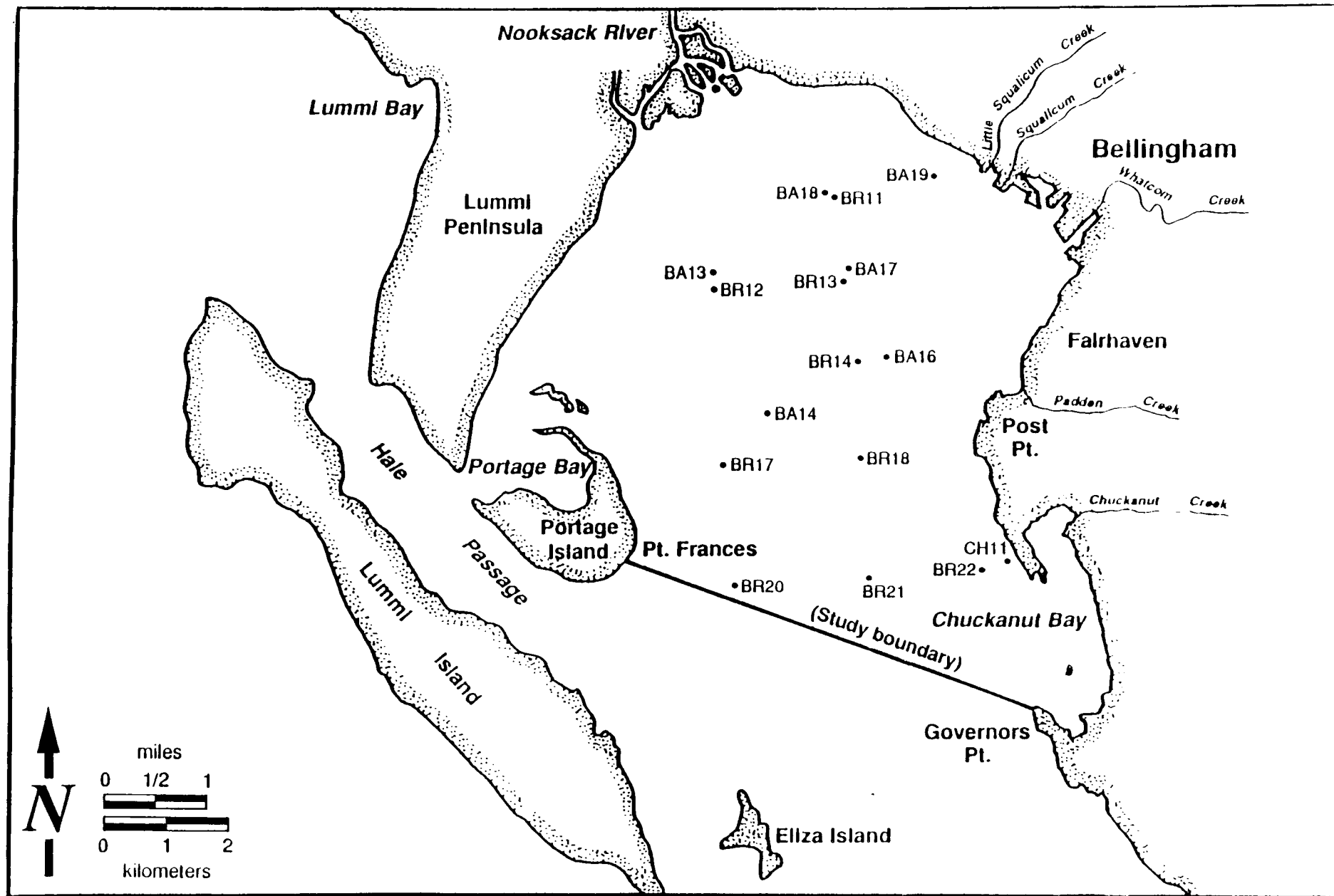


Figure 8. Stations sampled in outer Bellingham Bay for sediment conventional variables and chemical contaminants. (All variables were not measured at every station)

TABLE 8. SUMMARY OF SEDIMENT GRAIN SIZE  
AND VOLATILE SOLIDS DATA

Station No.	Gravel (wt %)	Sand (wt %)	Silt (wt %)	Clay (wt %)	Fines (wt %)	TVS (wt %)	TOC (wt %)
BA01	0.0	1.5	64.5	34.0	98.5	3.7	ND <sup>a</sup>
BA02	0.2	3.2	68.7	28.0	96.7	10.7	ND
BA03	6.2	26.4	43.5	23.9	67.4	6.0	12.2
BA04	3.1	18.6	53.2	25.2	78.4	7.1	4.8
BA05	0.0	3.4	55.3	41.3	96.0	7.5	2.3
BA06	0.0	2.4	65.3	32.4	97.7	9.9	ND
BA07	1.5	12.9	71.3	14.3	85.6	7.1	3.2
BA08	0.0	16.4	52.8	30.8	83.6	6.0	ND
BA09	0.0	7.9	68.8	23.3	92.1	11.8	ND
BA10	1.4	38.1	42.6	17.9	60.5	17.5	ND
BA11	0.0	1.1	61.4	37.6	99.0	3.2	2.1
BA12	0.0	9.9	51.7	38.4	90.1	8.7	3.7
BA13	19.2	24.5	37.4	18.9	56.3	4.2	ND
BA14	0.0	2.0	49.4	48.7	98.1	7.2	ND
BA15	1.2	1.9	77.7	19.2	96.9	7.8	ND
BA16	13.7	3.5	58.0	24.8	82.8	11.5	ND
BA17	0.0	1.1	56.4	42.6	99.0	5.9	ND
BA18	0.0	98.9	0.3	0.9	1.2	1.2	ND
BA19	0.3	37.1	50.6	12.0	62.6	2.8	ND
BA20	0.2	8.0	63.5	28.4	91.9	5.6	ND
BA21	26.5	35.5	28.2	9.8	38.0	2.6	ND
BA22	0.0	7.7	60.4	31.9	92.3	4.3	ND
BA23	0.0	26.2	18.6	55.2	73.8	6.4	2.0
BA24	0.0	5.0	63.5	31.6	95.1	7.8	2.1
BA25	0.2	6.4	72.5	20.9	93.4	7.2	ND
BA26	2.6	49.0	31.7	16.7	48.4	13.2	ND
BR01	0.0	1.7	53.6	44.7	98.3	5.9	ND
BR02	0.0	2.3	68.9	28.8	97.7	8.7	ND
BR03	3.5	18.1	44.3	34.1	78.4	14.8	ND
BR04	0.6	5.3	66.8	27.3	94.1	11.9	ND
BR05	0.0	3.0	49.8	47.2	97.0	8.1	ND
BR06	0.0	2.2	62.9	34.9	97.8	8.7	ND
BR07	0.1	7.2	48.4	44.4	92.8	9.8	ND
BR08	1.3	23.1	43.6	32.0	75.6	5.6	ND
BR09	0.0	5.5	49.1	45.4	94.5	7.6	ND
BR10	1.1	23.5	44.5	31.0	75.5	6.4	ND
BR11	0.0	32.6	21.7	45.7	67.4	5.5	ND
BR12	0.0	2.4	96.4	1.2	97.6	6.2	ND
BR13	0.0	2.6	81.4	16.0	97.4	7.1	ND
BR14	0.0	6.2	93.2	0.6	93.8	8.0	ND
BR15	0.0	5.0	91.3	3.7	95.0	7.8	ND
BR16	0.0	1.2	83.4	15.4	98.8	9.4	ND
BR17	0.0	3.1	94.3	2.6	96.9	9.0	ND
BR18	0.0	1.1	83.3	15.6	98.9	10.0	ND
BR19	0.0	0.0	68.4	31.6	100	9.5	ND
BR20	0.0	0.3	94.6	5.1	99.7	8.2	ND
BR21	0.0	4.4	86.7	8.9	95.6	7.8	ND
BR22	0.0	2.8	70.1	27.2	97.3	9.3	ND

TABLE 8. (Continued)

Station No.	Gravel (wt %)	Sand (wt %)	Silt (wt %)	Clay (wt %)	Fines (wt %)	TVS (wt %)	TOC (wt %)
CH01	0.2	25.9	45.6	28.3	73.9	7.5	ND
CH02	2.2	58.0	18.3	21.5	39.8	4.5	ND
CH03	0.2	2.4	56.2	41.2	97.4	9.1	ND
CH04	0.0	2.1	55.4	42.3	97.9	8.6	ND
CH05	0.1	1.2	68.8	29.9	98.7	8.9	ND
CH06	1.5	42.7	28.3	27.5	55.8	5.7	ND
CH07	2.4	35.5	30.6	31.5	62.1	6.2	ND
CH08	0.1	1.7	55.4	42.8	98.2	8.7	ND
CH09	1.9	0.7	59.1	38.3	97.4	8.6	ND
CH10	0.4	16.8	41.9	40.9	82.8	7.9	ND
CH11	0.1	0.7	55.9	43.3	99.2	8.6	ND
CH12	0.0	1.1	56.5	42.4	98.9	8.7	ND
CH13	1.0	0.6	64.2	34.2	98.4	8.4	ND
CH14	0.3	0.9	73.6	25.2	98.8	8.6	ND

<sup>1</sup> ND = total organic carbon content was not determined at these stations.

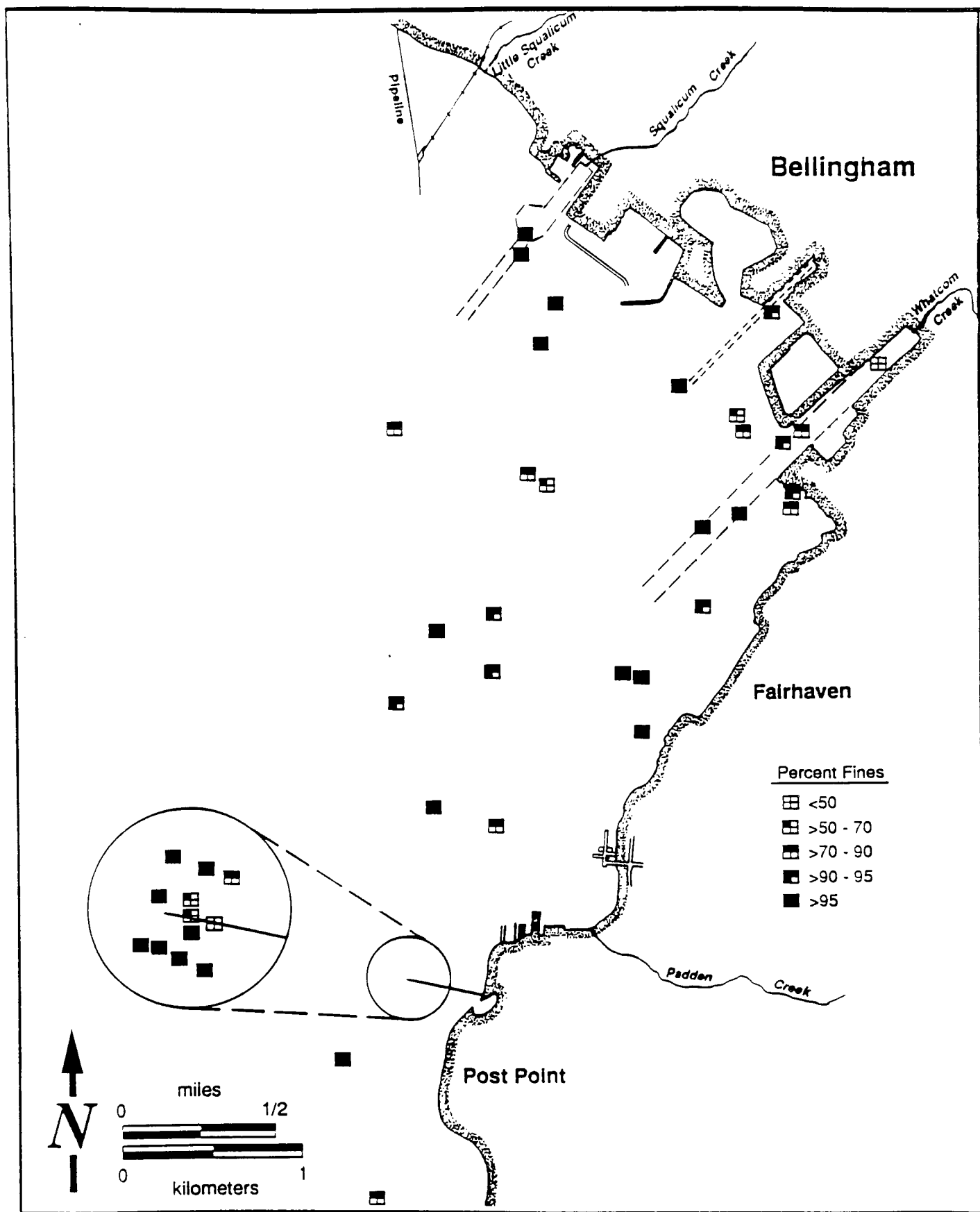


Figure 9. Distribution of percent fine-grained sediment in inner Bellingham Bay



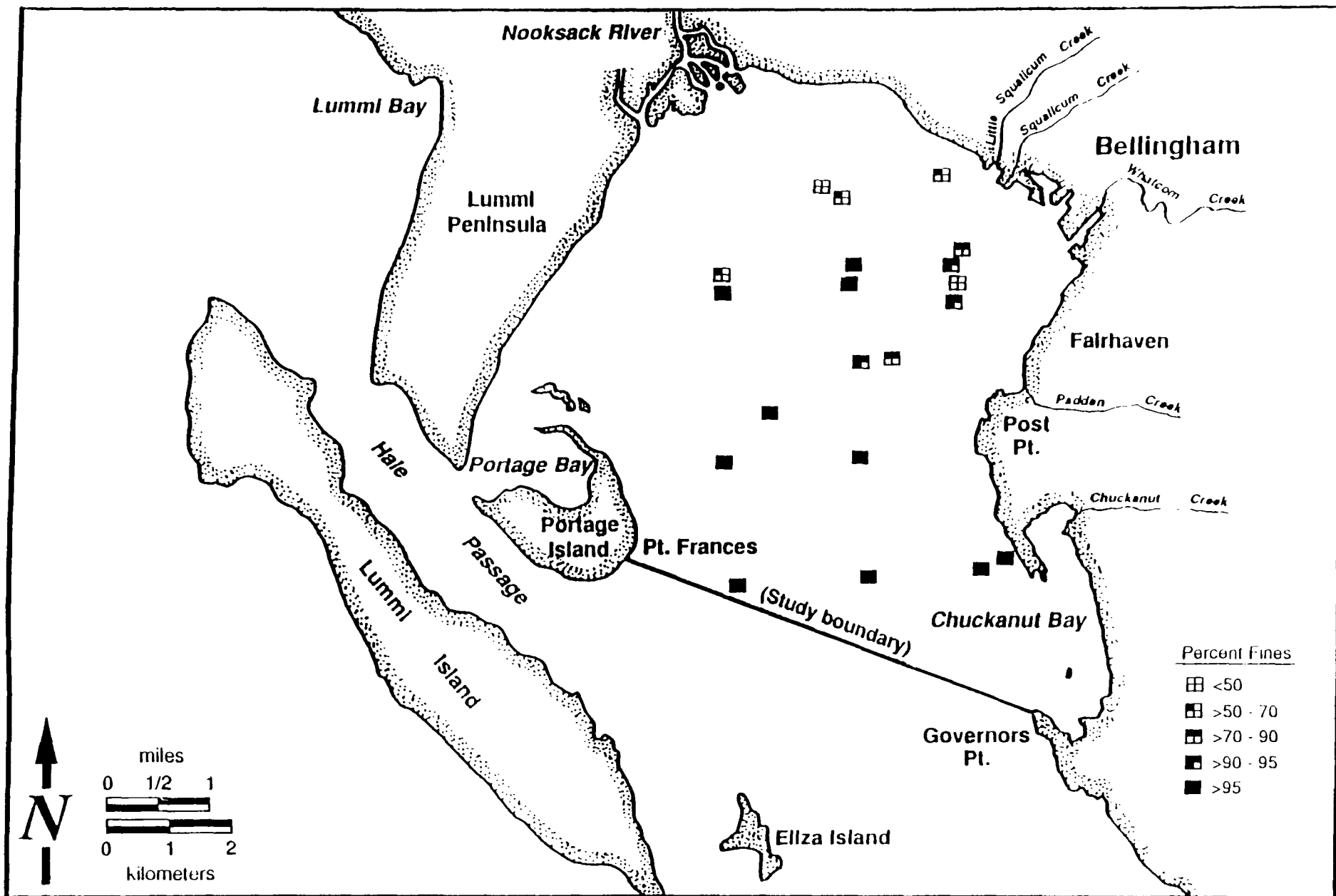


Figure 10. Distribution of percent fine-grained sediments in outer Bellingham Bay

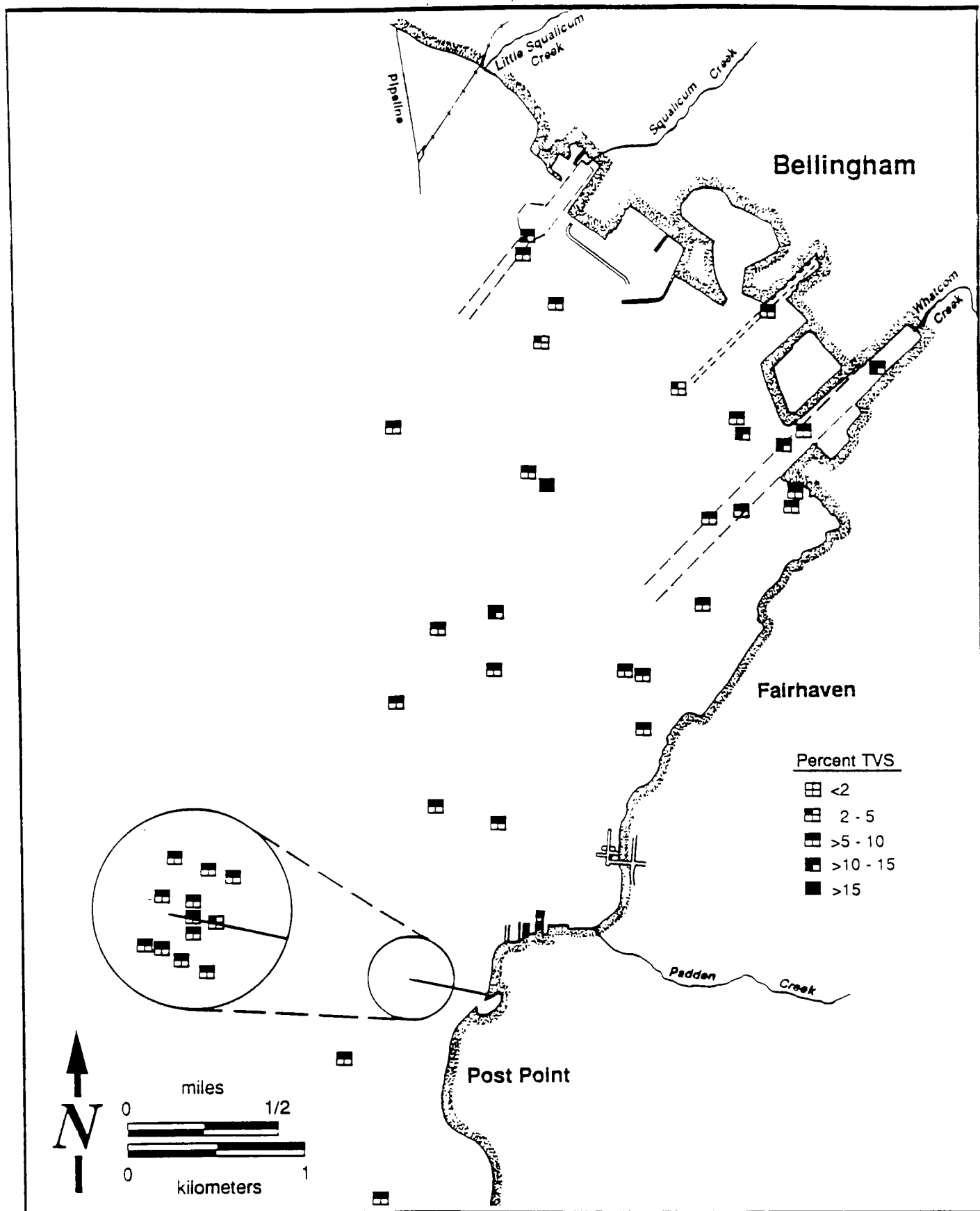


Figure 11. Distribution of percent TVS in inner Bellingham Bay

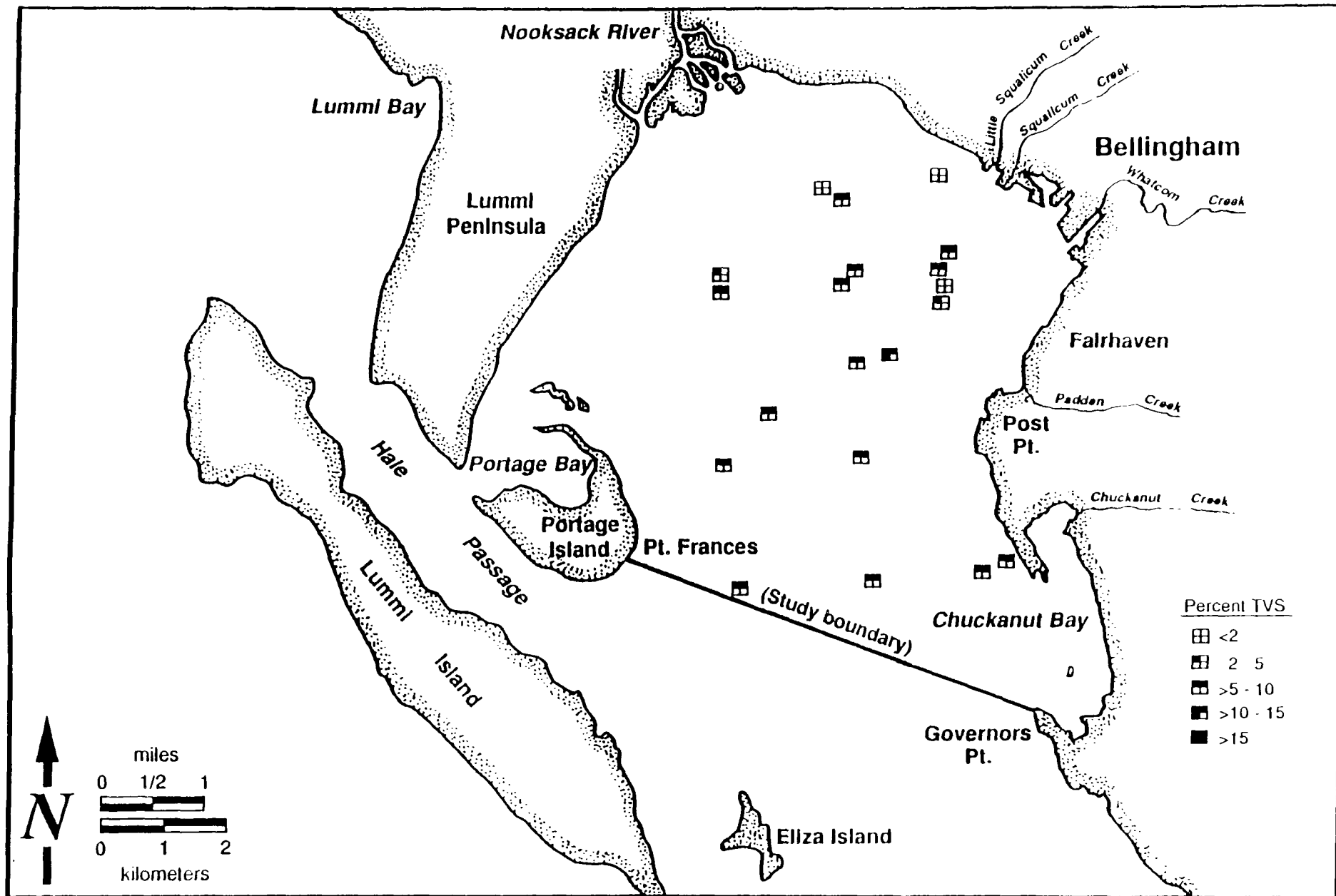


Figure 12. Distribution of percent TVS in outer Bellingham Bay

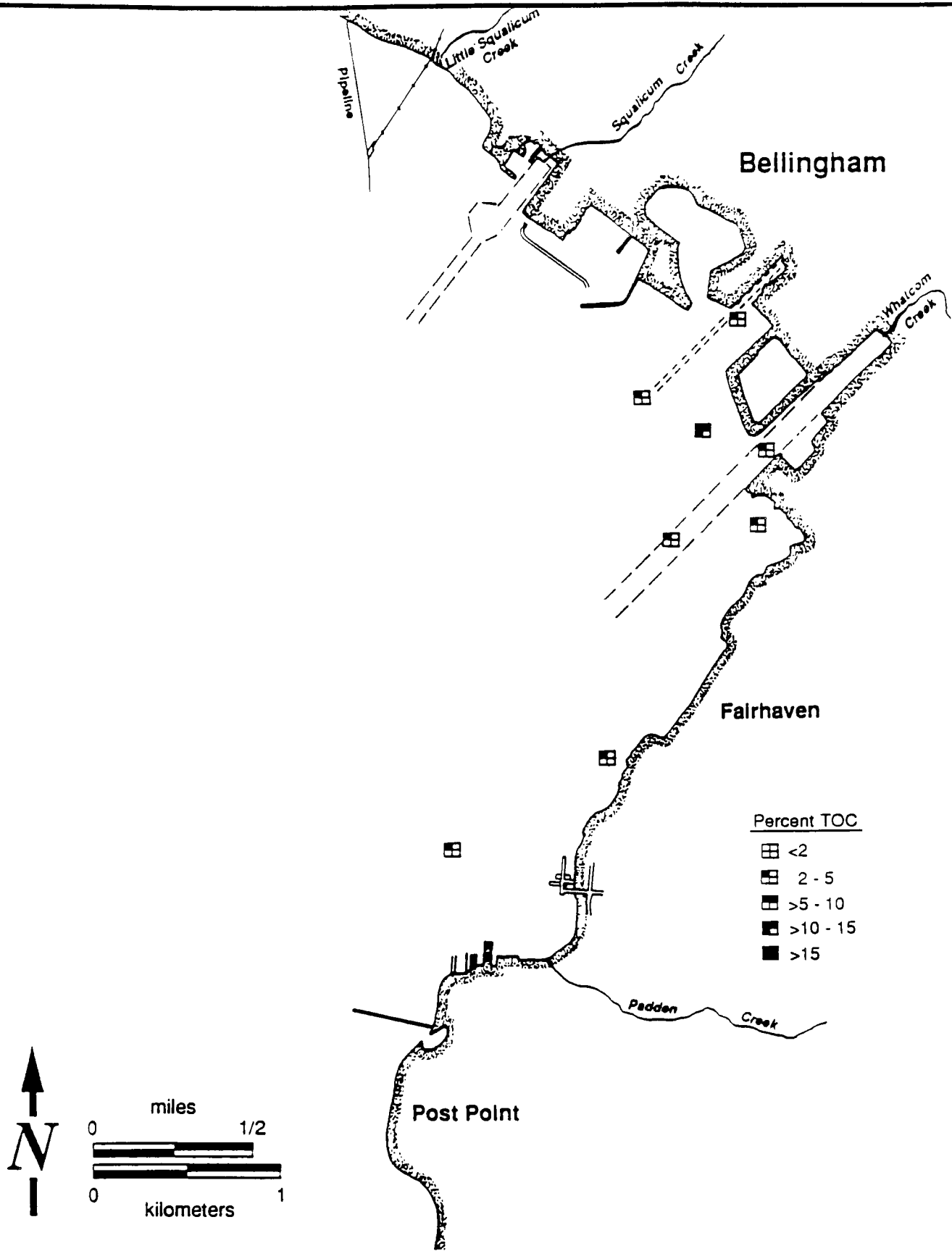


Figure 13. Distribution of percent TOC in inner Bellingham Bay

## Data Synthesis of Toxic Chemicals

For the data included in this study, 13 metals and 22 organic compounds were detected in sediments from various locations in Bellingham Bay. A summary of chemical concentrations in sediments from the bay is presented in Appendix A, Table A-2.

**Choice of Indicators**—Many of the chemicals analyzed in Bellingham Bay were detected below quantitation limits or were detected in very few sediment samples. In addition, some of these chemicals were found to covary in their spatial relationships with other toxic substances. As a result, a subset of indicator chemicals was selected for use in assessing the degree of sediment contamination in Bellingham Bay. Chemical indicators used to evaluate sediment contamination include:

- Sum of low molecular weight polycyclic aromatic hydrocarbons (LPAH)
- Sum of high molecular weight polycyclic aromatic hydrocarbons (HPAH)
- Total PCB
- Detected organic compounds
- Arsenic
- Copper
- Lead
- Mercury
- Silver
- Zinc.

The concentrations and spatial distributions of the selected indicator chemicals were found to be reasonable surrogates for the broader range of chemicals detected. However, this does not imply that all important contaminants have been considered in past studies. Important contaminants not analyzed for in most past studies are identified in the section entitled Identification of Data Gaps and Recommendations.

**Available Data and Station Locations**—Chemical contamination in Bellingham Bay sediments was assessed using data from four studies: Malins et al. (1982), CH2M HILL (1984), Battelle (1986), and Reif (1988). Data collected prior to 1980 were not included in this analysis, because those data may not reflect changes in sediment chemistry in Bellingham Bay resulting from the opening of the Georgia-Pacific secondary treatment system in 1979. The locations of sediment chemistry stations in Bellingham Bay from these studies are presented in Figures 7 and 8.

In April 1981, Malins et al. (1982) sampled two stations near the Georgia-Pacific facility for PCB, hexachlorobenzene, and four metals. All six chemicals were detected. Precise coordinates for these sampling stations were not recorded. However, because these stations were located near the Port of Bellingham and Georgia-Pacific facilities, their locations were depicted with reasonable accuracy on a map. In 1983, Battelle conducted a screening survey in Bellingham Bay by sampling

26 stations for three metals. All three metals were detected at all stations. Based on the 1983 results, eight stations were sampled again in 1984 for 26 organic compounds and 9 metals. Of these, 18 organic compounds and all 9 metals were detected. In 1984, CH2M HILL (1984) sampled two stations, one near the Post Point WWTP outfall and one south of the outfall. These samples were analyzed for 13 metals and 120 organic compounds. Of these, one organic compound and all 13 metals were detected. During a Class II inspection of the Post Point WWTP, Reif (1988) sampled two stations near the Post Point WWTP outfall. These samples were analyzed for 13 metals and 98 organic compounds. Of these, one organic compound and six metals were detected.

**Reference Area Data**—EAR values were calculated relative to the average chemical concentrations in Carr Inlet (Tetra Tech 1985a). Significant elevations of Bellingham Bay concentrations were determined by comparison with all Puget Sound reference values (Tables 9 and 10). The concentration of a specified contaminant was considered to be significantly elevated if it was greater than the highest value found in any Puget Sound reference area (described below).

**EAR Analysis**—To calculate the EAR value for a selected chemical indicator, the dry-weight concentration of that indicator at each station in Bellingham Bay was divided by the average dry-weight concentration of that indicator in Carr Inlet. For the studies used, many organic compounds were undetected. In those cases, the detection limits were used to calculate EAR values. In the Battelle (1986) study, a range of detection limits for samples from all eight bays was reported for each chemical. In this case, the highest detection limit reported was used to calculate EAR values. The detection limit for a given compound was not used if it was found to equal or exceed the LAET for that compound, because it was uncertain whether the actual concentration was above or below the level at which adverse biological effects would be expected.

EAR values were also used to identify concentrations of contaminants observed in the study area that were significantly elevated above the concentrations of that contaminant in Puget Sound reference areas. For this purpose, threshold EAR values for each chemical indicator were calculated as the ratio of the greatest Puget Sound reference value divided by the average Carr Inlet reference value. Because contaminant concentrations greater than the maximum Puget Sound reference value are considered significantly elevated, any EAR values greater than the threshold EAR value were considered significantly elevated (Tables 11, 12, and 13).

At several stations, EAR values for the summed indicator organic compounds (i.e., LPAH, HPAH, PCB) were influenced substantially by relatively high detection limits for undetected chemicals. In several cases, detection limits comprised all or most of the values incorporated into each sum. Because of the potential confounding influence of high detection limits on the summed indicators, a separate EAR evaluation was conducted for only those organic compounds that were detected at each station. Although EAR for metals were not influenced to the same degree by high detection limits as organic compounds, unusually high EAR values resulted from high detection limits in several cases. Those cases are described in the text when the spatial patterns of EAR values for each metal are described.

**LPAH:** Data on LPAH concentrations in sediments were available for 12 stations in Bellingham Bay. LPAH concentrations ranged from 640 to 2,400  $\mu\text{g/kg}$  dry weight (DW). The mean LPAH concentration in the Carr Inlet data set was 41  $\mu\text{g/kg}$  DW, and the maximum LPAH observed in all Puget Sound reference areas was 170  $\mu\text{g/kg}$  DW.

TABLE 9. SUMMARY OF ORGANIC COMPOUND CONCENTRATIONS  
IN SEDIMENTS FROM PUGET SOUND REFERENCE AREAS<sup>a</sup>

Chemical	Range ( $\mu\text{g/kg dry wt}$ ) <sup>b</sup>	Detection Frequency	Reference Sites <sup>c</sup>
Low molecular weight PAH	4-L71	13/13	1,8,9
naphthalene	U0.5-U40	12/27	1,2,3,4,5,6,8,9
acenaphthylene	U0.1-U40	2/27	1,2,3,4,5,6,8,9
acenaphthene	U0.1-U40	4/27	1,2,3,4,5,6,8,9
fluorene	U0.1-40	7/28	All
phenanthrene	4-170	18/24	1,2,3,6,7,8,9
anthracene	U0.5-U40	11/24	1,2,3,6,7,8,9
High molecular weight PAH	34-L100	13/13	1,8,9
fluoranthene	5-100	24/29	All
pyrene	5-120	23/29	All
benz(a)anthracene	2-U40	15/24	1,2,3,6,7,8,9
chrysene	4-U40	15/24	1,2,3,6,7,8,9
benzo(b)fluoranthene	U5-94	15/25	1,2,3,4,5,6,7,8
benzo(k)fluoranthene	E4.8-94	15/25	1,2,3,4,5,6,7,8
benzo(a)pyrene	U0.37-40	16/21	1,3,4,5,6,7,8,9
indeno(1,2,3-c,d)pyrene	U0.37-30	10/19	1,4,5,6,7,8,9
dibenzo(a,h)anthracene	U0.4-E10	3/12	1,8,9
benzo(g,h,i)perylene	E1.2-20	8/13	1,7,8,9
Total PCB	3.1-U50 <sup>d</sup>	7/22	1,2,3,4,6,7,9
Chlorinated benzenes			
1,4-dichlorobenzene	U0.06-U40 <sup>d</sup>	1/23	1,2,3,4,5,8,9
1,2,4-trichlorobenzene	U0.5-U16 <sup>d</sup>	0/9	1,9
Phthalate esters			
dimethyl phthalate	U0.5-U50	1/12	1,8,9
butyl benzyl phthalate	U0.5-U25	3/12	1,8,9
di-n-octyl phthalate	U0.5-E56	4/12	1,8,9
Pesticides <sup>e</sup>			
p,p'-DDE	U1.6-U10	0/8	1,8,9
p,p'-DDD	U1.9-U10	0/9	1,8,9
p,p'-DDT	U1.0-U10	0/8	1,8,9
aldrin	U0.5-U10	0/9	1,8,9
chlordane	U5-U50	0/13	1,8,9
endrin aldehyde	U2.3-U10	0/5	1,8
dieldrin	U1-U10	0/9	1,8,9
endrin	U1-U10	0/9	1,8,9
heptachlor	U0.5-U10	0/9	1,8,9

TABLE 9. (Continued)

Chemical	Range ( $\mu\text{g/kg dry wt}$ ) <sup>b</sup>	Detection Frequency	Reference Sites <sup>c</sup>
Phenols			
phenol	U0.5-62 <sup>f</sup>	5/17	1,2,3,8
2-methylphenol	U0.7-U50	0/11	--
4-methylphenol	U0.8-290	7/11	1,8,9
2,4-dimethylphenol	U1-U14	0/13	1,8,9
pentachlorophenol	0.1-U50 <sup>d</sup>	1/10	1,8,9
Miscellaneous Extractables			
2-methylnaphthalene	E0.3-U22	10/17	1,4,5,6,8,9
1-methylphenanthrene <sup>g</sup>	U <sup>h</sup> -E7.1	0/4	8
biphenyl <sup>g</sup>	U <sup>h</sup>	0/4	8
retene <sup>g</sup>	U <sup>h</sup> -E130	6/10	1,8

<sup>a</sup> This table includes only chemicals that were detected in the present study.

<sup>b</sup> L = The sum has incorporated detection limits for one or more PAH compounds and is considered a maximum estimate.

U = Undetected at the detection limit shown.

E = Estimated value.

<sup>c</sup> Reference sites:    1. Carr Inlet       4. Case Inlet       7. Nisqually Delta  
                          2. Samish Bay    5. Port Madison    8. Port Susan (1985)  
                          3. Dabob Bay    6. Port Susan       9. Port Susan (1986, this study)

Values from Port Susan Station PS-05, which were anomalously high, are not reflected in this table for reasons discussed in PTI and Tetra Tech (1988a).

<sup>d</sup> Detection limits for this chemical or chemical group that exceeded 50  $\mu\text{g/kg}$  have been excluded for the purpose of reference area comparisons; this is consistent with treatment of reference area data in Tetra Tech (1985a).

<sup>e</sup> Higher detection limits for single component pesticides (U25) were reported for Main Sediment Quality Survey samples from Carr Inlet in Tetra Tech (1985a). However, these detection limits were based on GC/MS analysis, which is less sensitive than GC/ECD and was considered undesirable for characterizing reference areas. GC/ECD analyses for Carr Inlet samples in the Preliminary Survey (Tetra Tech 1985a) resulted in the U10 values.

<sup>f</sup> An anomalously high phenol value of 1,800  $\mu\text{g/kg dry weight}$  was found at one Carr Inlet station (Tetra Tech 1985a). For the purpose of reference area comparison, this value has been excluded. Data from Site 9 were excluded because laboratory contamination of phenol was observed during analysis of these reference area samples.

<sup>g</sup> Tentatively identified compound.

<sup>h</sup> U - This tentatively identified compound was not found during a mass spectral search of reference sample extracts. Actual detection limits for tentatively identified compounds were not assigned in these cases.



TABLE 9. (Continued)

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References:

(Site 1)	Tetra Tech (1985a); Mowrer et al. (1977)
(Site 2)	Battelle (1986)
(Site 3)	Battelle (1986); Prah1 and Carpenter (1979)
(Site 4)	Malins et al. (1980); Mowrer et al. (1977)
(Site 5)	Malins et al. (1980)
(Site 6)	Malins et al. (1982)
(Site 7)	Barrick and Prah1 (1987); Mowrer et al. (1977)
(Site 8)	PTI and Tetra Tech (1988a)
(Site 9)	PTI and Tetra Tech (1988b)

**TABLE 10. SUMMARY OF METAL CONCENTRATIONS IN SEDIMENTS  
FROM PUGET SOUND REFERENCE AREAS**

Chemical	Range (mg/kg dry wt) <sup>a</sup>	Detection Frequency	Reference Sites <sup>b</sup>
Antimony	U0.1-2.76	19/39	1,2,3,4,7,8,9,10,11
Arsenic	1.9-17	41/41	1,2,3,4,7,8,9,10,11
Cadmium	0.047-1.9	31/31	1,2,3,4,6,9,10,11
Chromium	9.6-E255	45/45	1-11
Copper	5-74	35/35	1,2,3,4,5,6,9,10,11
Lead	U0.1-24	28/35	1,2,3,4,5,6,9,10,11
Mercury	0.01-0.28	45/45	1-11
Nickel	4-140	33/33	1,2,3,4,5,9,10,11
Silver	U0.02-3.3	31/33	1,2,3,4,5,9,10,11
Zinc	15-E102	33/33	1,2,3,4,5,9,10,11

<sup>a</sup> Undetected at the method detection limit shown.

<sup>b</sup> Reference sites:

1. Carr Inlet	5. Port Madison	9. Sequim Bay
2. Samish Bay	6. Port Susan	10. Port Susan (1985)
3. Dabob Bay	7. Nisqually Delta	11. Port Susan (1986)
4. Case Inlet	8. Hood Canal	

Values from Port Susan Station PS-05, which were anomalously high, were excluded from this table for reasons discussed in PTI and Tetra Tech (1988a).

**References:**

- (Site 1) Tetra Tech (1985a); Crecelius et al. (1975)
- (Site 2) Battelle (1986)
- (Site 3) Battelle (1986)
- (Site 4) Crecelius et al. (1975); Malins et al. (1980)
- (Site 5) Malins et al. (1980)
- (Site 6) Malins et al. (1982)
- (Site 7) Crecelius et al. (1975)
- (Site 8) Crecelius et al. (1975)
- (Site 9) Battelle (1985)
- (Site 10) PTI and Tetra Tech (1988a)
- (Site 11) PTI and Tetra Tech (1988b).

TABLE 11. INDICATORS OF SEDIMENT CHEMICAL CONTAMINATION  
FOR ORGANIC COMPOUNDS IN BELLINGHAM BAY RANKED BY EAR<sup>a</sup>

Station <sup>b</sup>	EAR <sup>c,d</sup>	Undetected Ratio <sup>e</sup>	Station <sup>b</sup>	EAR <sup>d</sup>	Undetected Ratio <sup>e</sup>
<b>LPAH</b>			<b>PCB</b>		
CH07	59*	7/7	MA01	17*	0/1
CH11	59*	7/7	BA03	16*	1/2
BA07	47*	1/6	BA04	12*	1/2
BA04	40*	1/6	BA11	12*	1/2
BA05	31*	4/6	BA12	12*	1/2
BA03	31*	4/6	BA07	8.5	1/2
BA24	29*	4/6	BA05	7.8	1/2
RE02	25*	6/6	BA24	6.7	2/2
BA23	25*	4/6	BA23	6.7	2/2
RE01	20*	6/6	CH11	3.3	2/2
BA12	19*	2/6	CH07	3.3	2/2
BA11	16*	1/6			
<b>HPAH</b>					
BA07	57*	0/5			
BA04	45*	1/5			
CH11	41*	7/7			
CH07	41*	7/7			
RE02	26*	8/8			
BA03	24*	1/5			
BA05	23*	2/5			
RE01	23*	8/8			
BA11	17*	1/5			
BA24	9.2*	4/5			
BA12	8.9*	1/5			
BA23	8.6*	3/5			

<sup>a</sup> EAR were determined relative to the mean values found in Carr Inlet, and were based on both detected and undetected values.

<sup>b</sup> All stations labeled with the prefix BA were sampled by Battelle (1986) in 1984.

<sup>c</sup> \* = Concentration exceeds maximum value observed in Puget Sound reference areas.

<sup>d</sup> No concentration exceeded the LAET or HAET for any of the groups of organic compounds.

<sup>e</sup> Undetected ratio = ratio of undetected to detected values that comprise a sum of compound concentrations.

TABLE 12. EAR VALUES FOR MAJOR DETECTED  
ORGANIC COMPOUNDS IN BELLINGHAM BAY<sup>a,b,c</sup>

	EAR by Station								
	MA01	BA03	BA04	BA05	BA07	BA11	BA12	BA23	BA24
Low molecular weight PAH									
Naphthalene		39*	65*	46*	51*	16*	18*	17*	25*
Acenaphthene			43*		31*				
Fluorene					37*	8	16*		
Phenanthrene		22*	53*	19*	81*	16	16	10	21*
Anthracene			14*		37*	17*	5		
High molecular weight PAH									
Fluoranthene		47*	93*	32*	100*	37*	13*	13*	
Pyrene		45*	80*	28*	94*	28*	17*	13*	13*
Benz(a)anthracene		42*	74*		121*	26*	14		
Chrysene		25*	55*		139*	17*	9*		
Benzofluoranthene				61*	15*	9*			
Phthalates									
Di-n-octyl phthalate					29*			15*	
Total PCB	17*	12*	9*	5	5	9*	9*		

<sup>a</sup> EAR were not calculated for undetected and estimated values.

<sup>b</sup> \* = Concentration exceeds maximum value observed in Puget Sound reference areas.

<sup>c</sup> No concentration exceeded the LAET or HAET for any individual organic compound.

**TABLE 13. INDICATORS OF SEDIMENT CHEMICAL CONTAMINATION  
FOR METALS IN BELLINGHAM BAY RANKED BY EAR<sup>a</sup>**

Station	EAR <sup>c</sup>	Station	EAR <sup>c</sup>	Station	EAR <sup>c</sup>	Station	EAR <sup>c</sup>
<b>Mercury</b>		<b>Lead</b>		<b>Silver</b>		<b>Arsenic</b>	
BA04	61***	BA26	17*	RE02	39*	RE02	10*
BA07	46**	MA01	10*	RE01	36	RE01	9.4*
BA03	45**	BA04	5.2*	BA26	5.8	CH11	6.4*
MA02	45**	BA03(84)	5.0*	BA04(84)	5.2	MA02	5.9*
BA26	42**	BA07	4.1*	BA04	4.2	CH07	4.1
BA04(84)	40**	BA04(84)	4.0*	BA07	3.4	BA05(84)	3.4
BA03(84)	32**	MA02	3.7*	BA03	3.3	MA01	3.2
BA07(84)	23**	BA03	3.1*	BA03(84)	3.2	BA11(84)	3.2
MA01	20**	BA23	2.7*	BA07(84)	3.2	BA23(84)	3.2
BA25	19**	BA05	2.6	BA15	2.9	BA07(84)	2.6
BA11	18**	BA15	2.6	BA23	2.7	BA03(84)	2.5
BA06	18**	BA14	2.5	BA05(84)	2.7	BA24(84)	2.5
BA05	17**	RE01	2.4	BA16	2.6	BA04(84)	2.3
BA12	16**	BA16	2.3	BA11	2.4	BA12(84)	2.0
BA09	16**	BA12	2.3	BA05	2.4	<b>Copper</b>	
RE01	15**	BA25	2.3	BA24	2.4	BA03(84)	63**
BA12(84)	15**	BA24	2.3	CH11	2.3	BA11(84)	12*
BA15	15**	BA11	2.3	BA12	2.3	BA07(84)	11
BA23	15**	BA06	2.2	BA14	2.2	BA04(84)	11
BA24	14**	BA09	2.2	BA06	2.2	BA05(84)	11
BA24(84)	14**	BA07(84)	2.0	BA25	2.1	BA24(84)	11
BA23(84)	13**	RE02	2.0	BA09	2.0	BA23(84)	9.7
BA11(84)	13**	BA22	1.8	BA22	1.8	BA12(84)	9.6
CH11	12**	BA17	1.8	BA17	1.7	RE02	8.6
BA16	11**	BA20	1.7	BA23(84)	1.7	RE01	8.5
BA14	10**	BA08	1.6	BA12(84)	1.4	CH11	7.2
RE02	8.9*	BA01	1.5	BA24(84)	1.4	CH07	2.8
BA10	7.4*	BA02	1.4	BA20	1.4	<b>Zinc</b>	
BA22	7.4*	BA11(84)	1.4	BA01	1.4	BA04(84)	7.1*
BA17	7.2*	BA05(84)	1.4	BA02	1.4	RE02	6.6*
BA01	6.6*	CH11	1.3	BA08	1.3	RE01	6.5*
BA08	6.3	BA10	1.3	BA10	1.2	BA07(84)	6.2*
BA13	4.0	BA12(84)	1.2	CH07	1.2	BA24(84)	6.1*
BA20	3.9	BA21	1.2	BA11(84)	1.0	BA23(84)	6.0*
BA02	2.9	BA13	1.1	BA13	0.84	BA11(84)	6.0*
CH07	2.3	BA23(84)	1.1	BA21	0.71	BA05(84)	5.8*
BA21	2.3	BA24(84)	0.87	BA19	0.47	CH11	5.8*
BA05(84)	1.9	BA19	0.73	BA18	0.16	BA03(84)	5.4*
BA19	1.3	CH07	0.35			BA12(84)	5.1
BA18	0.53	BA18	0.29			CH07	2.3

<sup>a</sup> EAR were determined relative to the mean values found in Carr Inlet.

<sup>b</sup> Stations followed by (84) were sampled by Battelle (1986) 1984; all other stations with the prefix BA were sampled in 1983.

<sup>c</sup> \* = Concentration exceeds maximum value observed in Puget Sound reference areas.

\*\* = Concentration exceeds LAET and maximum Puget Sound reference value.

\*\*\* = Concentration exceeds HAET, LAET, and maximum Puget Sound reference value.

All stations in Bellingham Bay had significant elevations of LPAH concentrations. The two highest concentrations of LPAH were found near the Post Point WWTP outfall (Station CH07; Figure 7) and south of the outfall (Station CH11). However, these elevated concentrations were a sum of unusually high detection limits for all six LPAH. The highest LPAH concentration based largely on detected values (1,900  $\mu\text{g/kg}$ , EAR=47) was found adjacent to the southern boundary of the Port of Bellingham facilities in the inner harbor (Station BA07). Stations with EAR values greater than 10 with greater than 50 percent detected values in the LPAH sum were detected in the I&J Street and Whatcom Creek waterways.

**HPAH:** Data on HPAH concentrations in sediments were available at 12 stations in Bellingham Bay. HPAH concentrations ranged from 700 to 4,500  $\mu\text{g/kg}$  DW. The mean HPAH concentration in the Carr Inlet data set used as a reference was 79  $\mu\text{g/kg}$  DW, and the maximum HPAH concentration observed in all Puget Sound reference areas was 120  $\mu\text{g/kg}$  DW.

All stations in Bellingham Bay had significant elevations of HPAH concentrations. The maximum concentration of HPAH (4,500  $\mu\text{g/kg}$ , EAR=57) was detected adjacent to and south of the Port of Bellingham's inner terminal (Station BA07; Figure 7). This station also exhibited the highest detected LPAH concentration. The second highest concentration (3,600  $\mu\text{g/kg}$ , EAR=45) was observed at a station located at the mouth of the Whatcom Creek Waterway (Station BA04).

**PCB:** Data on PCB concentrations in sediments were available at 11 stations. PCB concentrations ranged from 20 to 100  $\mu\text{g/kg}$  DW. The mean total PCB concentration from the Carr Inlet reference area data set was 6  $\mu\text{g/kg}$  DW while the maximum Puget Sound reference area value was 50  $\mu\text{g/kg}$  DW.

Six of the 11 stations in Bellingham Bay exhibited significantly elevated PCB concentrations. The highest PCB concentration detected was located in the inner reach of the Whatcom Creek Waterway at Station MA01 (Figure 7) (100  $\mu\text{g/kg}$  DW, EAR=17). The next highest value was detected near the mouth of the Whatcom Creek Waterway at Station BA03 (94  $\mu\text{g/kg}$  DW, EAR=16). PCB were not detected near the Post Point WWTP outfall.

**Detected Organic Compounds:** EAR values were calculated for 12 detected organic compounds at nine stations in Bellingham Bay. EAR values were significantly higher than the maximum Puget Sound reference value in 54 of 62 cases (87 percent). The highest EAR value observed at each station is shown in Figure 14. The highest EAR values in the bay were found at three stations located near the mouth of Whatcom Creek Waterway. At Station BA07 (Figure 7), the three highest EAR values ranged from 100 to 139, and included the HPAH compounds fluoranthene, benz(a)-anthracene, and chrysene. At Station BA04, the highest three EAR values ranged from 74 to 93 and included the LPAH compound fluorene, and the HPAH compounds pyrene and benz(a)anthracene. At Station BA05, the three highest EAR values ranged from 32 to 61, and included the LPAH compound naphthalene and the HPAH compounds fluorene and benzo(a)fluoranthene.

**Mercury:** Data on mercury concentrations in sediments were available for 32 stations in Bellingham Bay, eight of which were sampled twice by Battelle (1986). Mercury concentrations ranged from 0.023 to 2.6 mg/kg DW. The mean mercury concentration observed in the Carr Inlet reference data set was 0.043 mg/kg DW, and the maximum mercury concentration in the Puget Sound reference area data set was 0.28 mg/kg DW.

Thirty-one of the 40 sediment samples (78 percent) in Bellingham Bay exhibited significantly elevated mercury concentrations (Figures 15 and 16). The highest concentrations were observed

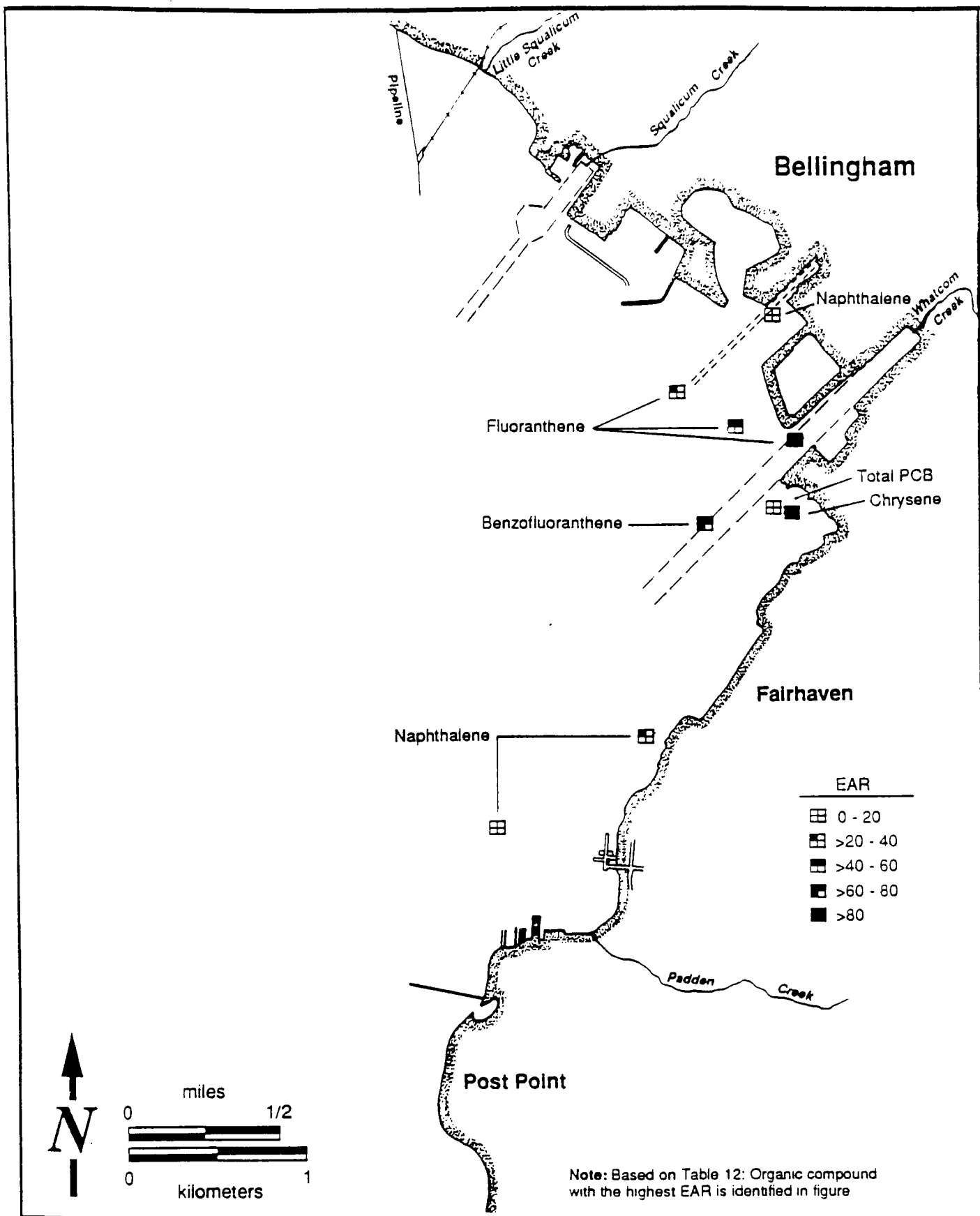


Figure 14. Maximum EAR for individual organic compounds in inner Bellingham Bay

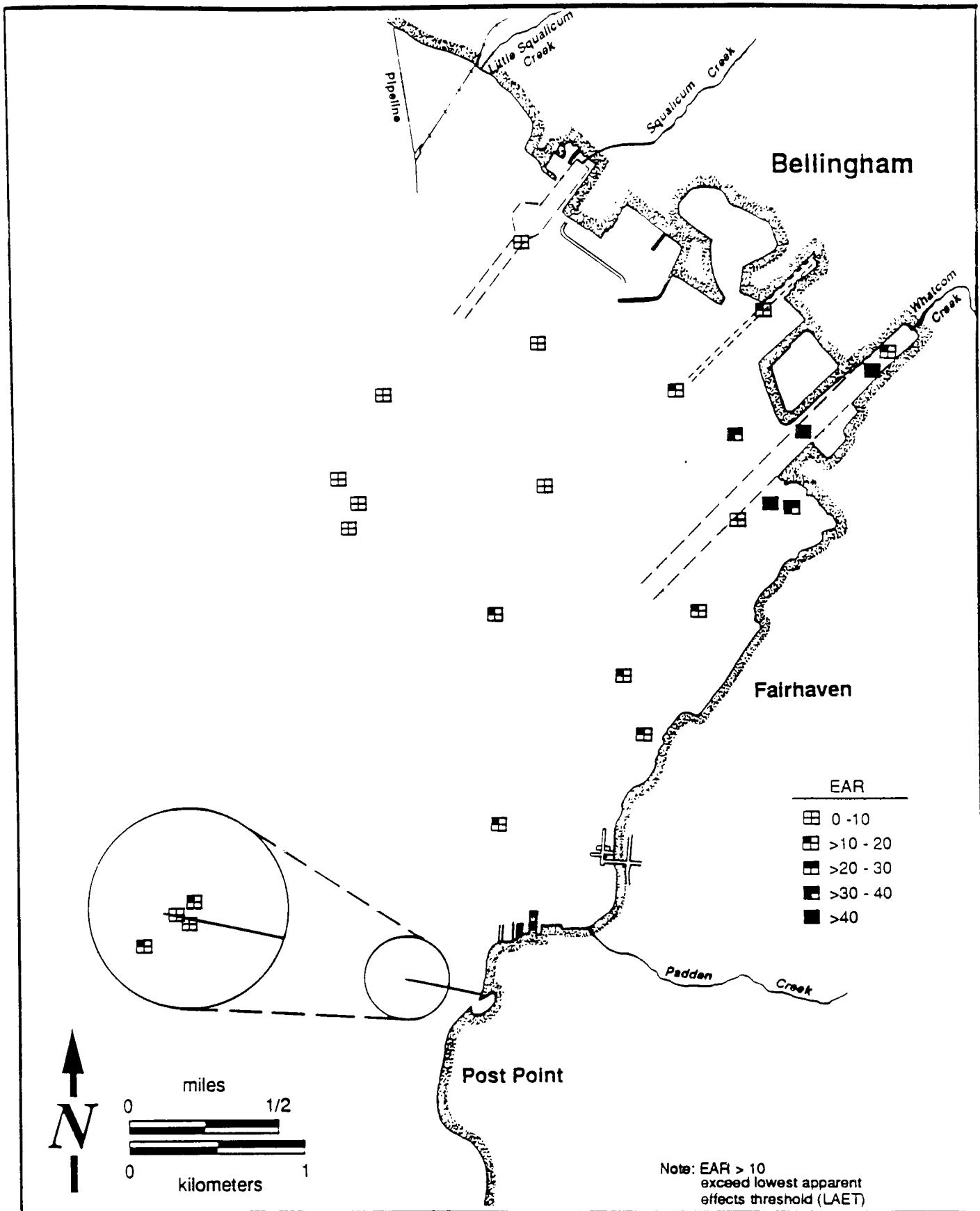


Figure 15. Distribution of mercury EAR in inner Bellingham Bay



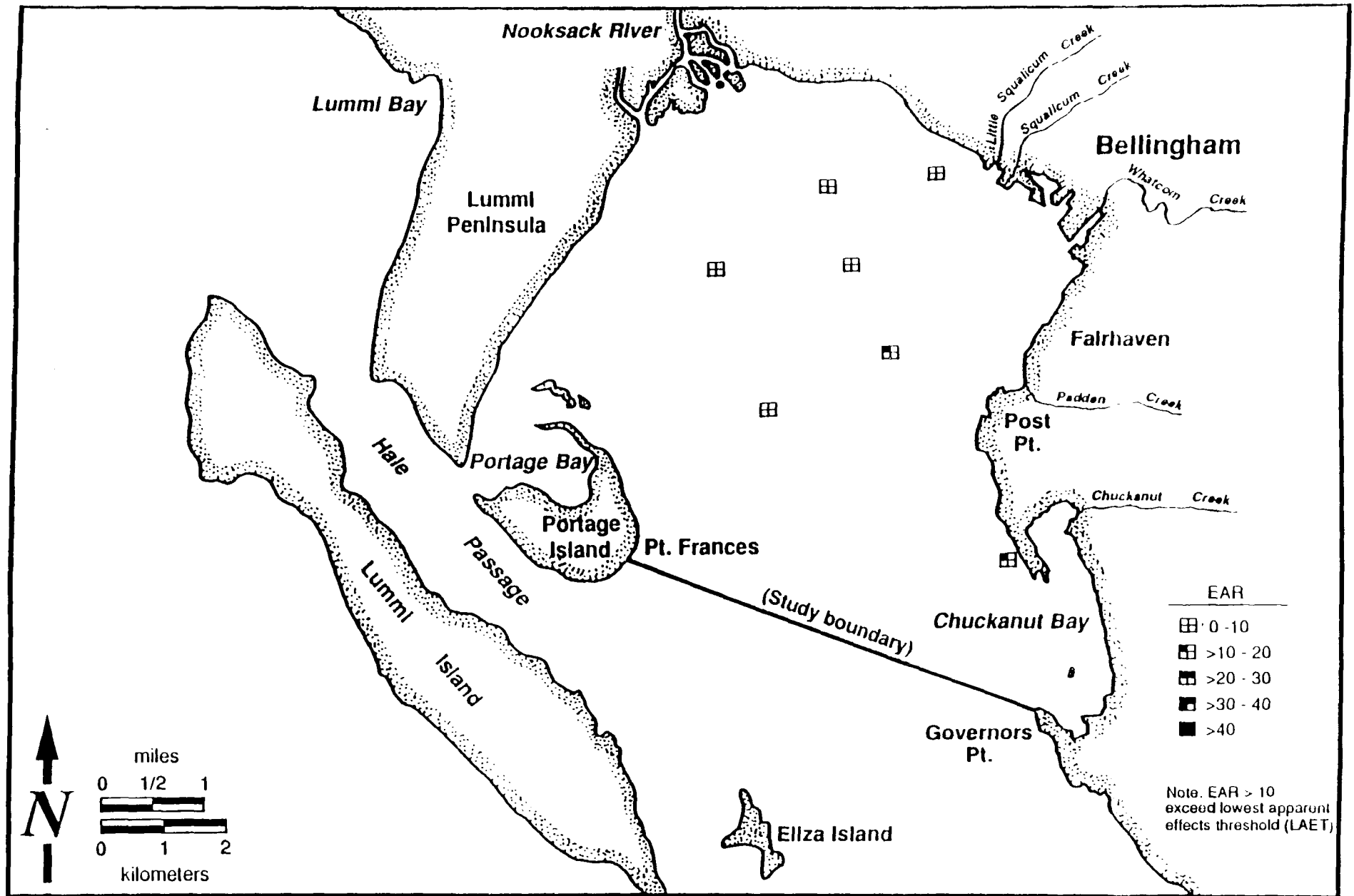


Figure 16. Distribution of mercury EAR in outer Bellingham Bay

at the mouth of the Whatcom Creek Waterway (Station BA04—2.6 mg/kg DW, EAR=61), in the inner reach of the Whatcom Creek Waterway (Station MA02—1.9 mg/kg DW, EAR=45; Station BA26—1.79 mg/kg DW, EAR=42), near the Port of Bellingham's inner pier (Station BA07—1.97 mg/kg DW, EAR=46), and offshore from Georgia-Pacific's secondary treatment lagoon (Station BA03—1.91 mg/kg DW, EAR=45). Three of the four stations sampled near the Post Point WWTP outfall exhibited significantly elevated mercury concentrations. The lowest mercury concentrations in the bay were found near the delta of the Nooksack River.

Mercury concentrations in sediments have declined substantially since 1970-1973, when they were evaluated by Bothner (1973). In that study, mercury concentrations as high as 11 mg/kg DW were found near Whatcom Creek Waterway, and a concentration of 20 mg/kg DW was found in the log pond that received the discharge from the Georgia-Pacific chlor-alkali plant. Bothner (1973) estimated that mercury concentrations in sediments were declining over time, and exhibited a half-life of 1.3 years.

**Lead:** Data on lead concentrations in sediments were available from 32 stations in Bellingham Bay, eight of which were sampled twice by Battelle (1986). Lead concentrations ranged from 3.2 to 154 mg/kg DW. The mean lead concentration observed in the Carr Inlet reference data set was 9.2 mg/kg DW, and the maximum lead concentration in the Puget Sound reference area data set was 24 mg/kg DW.

Nine of the 40 samples (23 percent) from Bellingham Bay exhibited significantly elevated lead concentrations. The highest lead concentrations were observed in the inner reach of the Whatcom Creek Waterway at Station BA26 (Figure 7) (158 mg/kg, EAR=17) and near the mouth of the waterway at Station MA01 (95 mg/kg DW, EAR=10). The next highest lead concentrations were observed near the mouth of the Whatcom Creek Waterway. Three of the four sediment samples taken near the Post Point WWTP outfall were elevated above reference but generally not above the values reported throughout the remainder of Bellingham Bay. The lowest lead concentrations in the bay were found near the delta of the Nooksack River.

**Silver:** Data on silver concentrations in sediments were available for 30 stations in Bellingham Bay, eight of which were sampled twice by Battelle (1986). Silver concentrations ranged from 0.014 to 3.5 mg/kg DW. The mean silver concentration observed in the Carr Inlet reference data set was 0.09 mg/kg DW, and the maximum silver concentration in the Puget Sound reference area data set was 3.3 mg/kg DW.

Only one (Station RE02; Figure 7) of the 30 stations (3 percent) sampled in Bellingham Bay exhibited a significantly elevated EAR value (39), and that value was based on a relatively high detection limit. The second highest EAR value (36) was observed at Station RE01 and was also based on a high detection limit. Both of these stations are located near the Post Point WWTP outfall. If those two stations were not considered, none of the EAR for silver was significant and none exceeded a value of 6.0.

**Arsenic:** Data on arsenic concentrations in sediments were available for 14 stations in Bellingham Bay. Arsenic concentrations ranged from 6.9 to 35 mg/kg DW. The mean arsenic concentration observed in the Carr Inlet reference data set was 3.4 mg/kg DW. The maximum arsenic concentration in the Puget Sound reference area data set was 17 mg/kg DW.

Four of the 14 stations (28 percent) in Bellingham Bay exhibited significantly elevated arsenic concentrations. The two highest concentrations were observed in the immediate vicinity of the Post

Point WWTP outfall (Station RE02—35 mg/kg DW, EAR=10; Station RE01—32 mg/kg DW, EAR=9.5; Figure 7), but they were both based on detection limits. The next highest concentration was found immediately south of Post Point (Station CH11—21.7 mg/kg DW, EAR=6.4). The fourth highest arsenic concentration was found near the Port of Bellingham's inner harbor pier (Station MA01—20 mg/kg DW, EAR=5.9).

**Zinc:** Data on zinc concentrations in sediments were available for 12 stations in Bellingham Bay. Zinc concentrations ranged from 43 to 135 mg/kg DW. The mean zinc concentration observed in the Carr Inlet reference data set was 18.5 mg/kg DW. The maximum zinc concentration in the Puget Sound reference area data set was 101 mg/kg DW.

Ten of the 12 stations (92 percent) in Bellingham Bay exhibited significantly elevated zinc concentrations. The highest concentrations were observed at the mouth of the Whatcom Creek Waterway (Station BA04—135 mg/kg DW, EAR=7.1). Significantly elevated zinc concentrations were observed throughout the inner harbor area, offshore of Fairhaven and near the Post Point WWTP outfall.

**Copper:** Data on copper concentrations in sediments were available for 12 stations in Bellingham Bay. Copper concentrations ranged from 18 to 400 mg/kg DW. The mean copper concentration observed in the Carr Inlet reference area data set was 6.4 mg/kg DW, and the maximum copper concentration in the Puget Sound reference area data set was 74 mg/kg DW.

Two of the 12 stations (17 percent) sampled in Bellingham Bay exhibited significantly elevated copper concentrations. The highest copper concentration was observed offshore from the Georgia-Pacific secondary treatment lagoon (Station BA03—400 mg/kg DW, EAR=63) (Figure 7). The other significantly elevated value was observed near the I&J Street Waterway (Station BA11—79 mg/kg DW, EAR=12). Samples taken from near the Post Point WWTP outfall exhibited copper concentrations ranging from 18 to 55 mg/kg DW (EAR=2.8–8.6).

**Comparison to AET Values—**AET values represent concentrations of specific sediment contaminants above which deleterious biological effects are expected to be observed. AET values are based on sediment chemistry data, toxicity data (amphipod, oyster larvae, and Microtox bioassays), and benthic infaunal abundance data. Given a specific chemical contaminant and a specific biological indicator, the AET is the concentration above which statistically significant biological effects occurred in all sediment samples analyzed. Contaminant concentrations in Bellingham Bay were compared to Puget Sound AET values to predict areas where significant biological effects would be expected to occur. The 1988 Puget Sound AET values for 56 chemicals are shown in Table 14. Four AET values are provided for each chemical. The minimum and maximum AET values for a given chemical are listed as the LAET and highest apparent effects threshold (HAET), respectively. Thus, the LAET is the concentration above which the most sensitive biological effect could occur, and as such is the most conservative prediction of potential significant biological effects. The HAET represents the concentration above which all of the four biological effects would be expected to occur.

An HAET was exceeded by only one chemical (mercury) at a single station (BA04) in Bellingham Bay (Table 13). The LAET for mercury was exceeded at 26 stations (Table 13; Figures 15 and 16), including Station BA04. Most of these stations were located in Whatcom Creek Waterway, along the Fairhaven shoreline, and near the Post Point WWTP outfall (Figures 15

TABLE 14. 1988 PUGET SOUND AET  
FOR SELECTED CHEMICALS<sup>a,b</sup>

Chemical	Amphipod AET	Oyster AET	Benthic AET	Microtox AET	1988 <sup>c</sup>	
					LAET	HAET
Metals (mg/kg dry weight; ppm)						
Antimony	200	--	150	--	150	200
Arsenic	93	700	57	700	57	700
Cadmium	6.7	9.6	5.1	9.6	5.1	9.6
Chromium	270	--	260	--	260	270
Copper	1,300	390	530	390	390	1,300
Lead	660	660	450	530	450	660
Mercury	2.1	0.59	2.1	0.41	0.41	2.1
Nickel	>140	--	>140	--	<sup>e</sup>	140 <sup>d</sup>
Silver	6.1	>0.56	>6.1	>0.56	6.1	6.1
Zinc	960	1,600	410	1,600	410	1,600
Organic Compounds (μg/kg dry weight; ppb)						
Low molecular weight PAH	24,000	5,200	13,000	5,200	5,200	24,000
Naphthalene	2,400	2,100	2,700	2,100	2,100	2,700
Acenaphthylene	1,300	>560	1,300	>560	1,300	1,300
Acenaphthene	2,000	500	730	500	500	2,000
Fluorene	3,600	540	1,000	540	540	3,600
Phenanthrene	6,900	1,500	5,400	1,500	1,500	6,900
Anthracene	13,000	960	4,400	960	960	13,000
2-Methylnaphthalene	1,900	670	670	1,900		
High molecular weight PAH	69,000	17,000	69,000	12,000	12,000	69,000
Fluoranthene	30,000	2,500	24,000	1,700	1,700	30,000
Pyrene	16,000	3,300	16,000	2,600	2,600	16,000
Benz(a)anthracene	5,100	1,600	5,100	1,300	1,300	5,100
Chrysene	9,200	2,800	9,200	1,400	1,400	9,200
Benzo(a)fluoranthene	7,800	3,600	9,900	3,200	3,200	9,900
Benzo(a)pyrene	3,000	1,600	3,600	1,600	1,600	3,600
Indeno(1,2,3-c,d)pyrene	1,800	690	2,600	600	600	2,600
Dibenzo(a,h)anthracene	540	230	970	230	230	970
Benzo(g,h,i)perylene	1,400	720	2,600	670	670	2,600
Chlorinated organic compounds						
1,3-Dichlorobenzene	>170	>170	>170	>170	<sup>e</sup>	<sup>e</sup>
1,4-Dichlorobenzene	120	120	110	110	110	120
1,2-Dichlorobenzene	>110	50	50	35	35	110 <sup>d</sup>
1,2,4-Trichlorobenzene	51	64		31	31	64
Hexachlorobenzene (HCB)	130	230	22	70	22	230
Total PCB	3,100	1,100	1,000	130	130	3,100

TABLE 14. (Continued)

Chemical	Amphipod AET	Oyster AET	Benthic AET	Microtox AET	1988 <sup>c</sup>	
					LAET	HAET
Phthalates						
Dimethyl phthalate	>1,400	160	>1,400	71	71	1,400 <sup>d</sup>
Diethyl phthalate	>1,200	>73	200	>48	200	1,200 <sup>d</sup>
Di-n-butyl phthalate	1,400	1,400	>5,100	1,400	1,400	5,100 <sup>d</sup>
Butyl benzyl phthalate	900	>470	900	63	63	900
Bis(2-ethylhexyl)phthalate	>3,100	1,900	1,300	1,900	1,300	3,100 <sup>d</sup>
Di-n-octyl phthalate	>2,100	>420	6,200	--	6,200	6,200
Phenols						
Phenol	1,200	420	1,200	1,200	420	1,200
2-Methylphenol	63	63	72	>72	63	72 <sup>d</sup>
4-Methylphenol	3,600	670	1,800	670	670	3,600
2,4-Dimethyl phenol	72	29	210	29	29	210
Pentachlorophenol	360	>140	690	>140	360	690
Miscellaneous Extractables						
Benzyl alcohol	870	73	870	57	57	870
Benzoic acid	760	650	650	650	650	760
Dibenzofuran	1,700	540	700	540	540	1,700
Hexachlorobutadiene	180	270	11	120	11	270
N-Nitrosodiphenylamine	48	130	28	40	50	130
Volatile Organics						
Tetrachloroethene	>210	140	57	140	57	210 <sup>d</sup>
Ethylbenzene	>50	37	10	33	10	50 <sup>d</sup>
Total xylenes	>160	120	40	100	40	160 <sup>d</sup>
Pesticides						
p,p'-DDE	15	--	9	--	9	15
p,p'-DDD	43	--	16	--	16	43
p,p'-DDT	>270	>6	34	--	34	270 <sup>d</sup>

Reference: Barrick et al. (1988)

<sup>a</sup> ">" indicates that a defined AET could not be established because there were no "effects" stations with chemical concentrations above the highest concentration among "no effects" stations. "--" indicates AET data not available.

<sup>b</sup> HAET = Highest AET for a range of biological indicators; LAET = lowest AET for a range of biological indicators; ">" indicates that for the AET and biological indicator establishing the LAET or HAET value, there were no "effects" stations with chemical concentrations above the highest concentration among "no effects" stations.

<sup>c</sup> 1988 LAET and HAET are the lowest and highest AET, respectively, established for four biological indicators in a 334-station database.

<sup>d</sup> The HAET for these chemicals were established using a "greater than" value (see footnote a); such values were only used for chemicals that had at least one defined AET at a lower concentration than the "greater than" value shown.

No defined AET are available for these chemicals (see footnote a).

and 16). The only other LAET exceeded in the bay was for copper at a single station (BA03) near the mouth of Whatcom Creek Waterway.

## BIOACCUMULATION

Bioaccumulation of chemical contaminants in marine organisms has been used as a key indicator of sediment chemical contamination in most previous urban bay action programs in Puget Sound. However, the amount of available information on bioaccumulation in Bellingham Bay since 1980 was relatively small for any particular species and was restricted to a limited number of locations in the bay. These data were therefore not used to identify problem stations in the bay. Instead, the available data is summarized in this section. Most of the information on bioaccumulation in the bay shows that mercury concentrations were elevated relative to reference areas. However, the highest concentrations were not always found near Whatcom Creek Waterway, the location of the major source of mercury contamination.

The FDA action level for mercury in tissue is 1.0 mg/kg wet weight (WW). Action levels developed by the FDA are intended to be used only for regulation of food products in interstate commerce. An action level is the minimum concentration of a chemical in food that may be a cause for the FDA to take enforcement action. Action levels are not designed for managing risks to individuals who consume unusually large amounts of foods not used in interstate commerce or foods harvested from locally contaminated areas. Quantitative risk assessments are often conducted to evaluate site-specific risks from consuming contaminated seafood.

Rasmussen and Williams (1975) evaluated tissue concentrations of mercury in intertidal organisms collected in 1973 at five stations located along the eastern shoreline of Bellingham Bay. An intertidal reference station was also sampled in Birch Bay to the north of Bellingham Bay. The species evaluated included polychaetes, molluscs, crustaceans, echinoderms, coelenterates, intertidal fishes, and algae. Dungeness crabs were also evaluated in subtidal areas of Bellingham Bay and in Samish Bay, a reference area located southeast of Bellingham Bay. For small organisms, the whole body was analyzed. For larger organisms individual organs were analyzed. The individual tissues evaluated included muscle, siphon, viscera, foot, gill, hepatopancreas, antennal gland, and heart.

Mercury concentrations in the tissues from organisms within Bellingham Bay ranged from 0.04 to 0.3 mg/kg WW. For intertidal organisms, mercury concentrations in organisms from Birch Bay were generally an order of magnitude less than the values observed for organisms in Bellingham Bay. The highest concentrations of mercury in intertidal organisms were found off Post Point. Mercury concentrations in the edible muscle tissue of Dungeness crabs were over 4.5 times higher than the values observed for crabs from Samish Bay. The corresponding tissue concentrations were 0.23 and 0.05 mg/kg WW, respectively. Mercury concentrations in other tissues of crabs from Bellingham Bay (i.e., antennal gland, hepatopancreas, gill, and heart) were higher than the values observed in crabs from Samish Bay by a factors of 1.5 to 2.4.

Nelson et al. (1974) evaluated tissue concentrations of mercury in small benthic macroinvertebrates collected in 1974 at 22 stations located throughout inner Bellingham Bay at increasing distances from the Whatcom Creek Waterway. Organisms were collected with a Peterson grab sampler and sieved using a 1.0-mm mesh screen. At each station, all species with biomass of at least 0.1 grams were analyzed for mercury. No species was common to all stations. Concentrations of mercury ranged from 0.1 to 2.6 mg/kg WW. No relationship with distance from the Whatcom Creek Waterway was found. The highest mercury concentrations (i.e., 1.2-2.6 mg/kg WW) were

found at three stations near Squalicum Waterway and the Squalicum Waterway marina. Concentrations throughout the remainder of inner Bellingham Bay generally were less than 0.3 mg/kg WW. Mercury concentrations ranged from 0.1-0.9 mg/kg WW in the vicinity of the Whatcom Creek Waterway.

Roesijadi et al. (1981) collected mussels in 1978 from four locations along the eastern shoreline of Bellingham Bay at increasing distances from the Whatcom Creek Waterway, from the mouth of the waterway to Post Point. Mercury concentrations were determined for whole organisms, gill tissue, and digestive glands. Results were compared with mercury concentrations in mussels collected from Sequim Bay. All concentrations measured in mussels from Bellingham Bay were higher (by a factor of 3-5) than values measured in organisms from Sequim Bay. Concentrations in Bellingham Bay did not show a relationship with distance from the Whatcom Creek Waterway.

CH2M HILL (1984) collected littleneck clams, English sole and flathead sole near the Post Point WWTP outfall in 1984, and analyzed tissues for metals and organic contaminants. Clams were collected at three stations and their whole bodies were analyzed. Fishes were collected at two stations and their muscle and liver tissues were analyzed. The authors concluded that none of the chemicals analyzed for was substantially elevated in any of the organisms evaluated. However, the maximum mercury concentration in clams was 0.28 mg/kg WW (minimum = <0.10 mg/kg WW). Mercury concentrations in muscle tissue of the fishes were <0.10 mg/kg WW. Mercury concentrations in fish liver tissue ranged from <0.10 to 0.24 mg/kg DW.

NOAA (1987) collected mussels (*Mytilus edulis*) from the jetty of Squalicum Harbor marina in 1986 and analyzed whole-body tissue for metals and organic contaminants. Mussels were also collected from Point Roberts, a relatively uncontaminated reference area located north of Bellingham Bay. The concentrations of several contaminants were elevated in organisms from Bellingham Bay relative to Point Roberts. Mercury concentrations in Bellingham Bay (0.28 mg/kg WW) were 2.8 times higher than the value observed for Point Roberts (0.10 mg/kg WW).

The information found on bioaccumulation in Bellingham Bay was not considered adequate for conducting a quantitative risk assessment with respect to consumption of contaminated seafood by humans. Although the maximum concentration of mercury found in recent evaluations of clams and mussels in Bellingham Bay (i.e., 0.28 mg/kg WW) was well below the FDA action level of 1.0 mg/kg WW, it was almost 3 times higher than the concentration observed in a nearby reference area. An elevated tissue concentration of that magnitude suggests that additional studies are warranted, particularly with the goal of providing data appropriate for a quantitative risk assessment.

## SEDIMENT TOXICITY

Two major studies of sediment toxicity have been conducted in inner Bellingham Bay (Chapman et al. 1984; Battelle 1986). In addition, Reif (1988) sampled two stations near the terminus of the Post Point WWTP outfall and one sample farther offshore from the outfall. These studies were conducted after 1979 (i.e., when the Georgia-Pacific secondary treatment system began operation), and are therefore considered representative of present conditions in the bay. No studies of sediment toxicity were found for the outer portions of Bellingham Bay and for time periods prior to 1979.

## Study Characteristics

Of the three studies of sediment toxicity in Bellingham Bay, only subsets of the data from Battelle (1986) and Reif (1988) were considered acceptable for use in the present report. The data collected by Chapman et al. (1984) were not used, because sediment collection and storage procedures did not conform to those recommended in the Puget Sound protocols (Tetra Tech 1986). Sediments in the latter study were sampled to a depth of 10 cm (rather than 2 cm) in each grab sample and were frozen (rather than held at 4° C) prior to laboratory analysis. Only data from one of the three stations sampled by Reif (1988) were used in the present report. Data from one station near the outfall were not used, because only three (rather than five) replicate measurements were made in the laboratory. Data from the offshore station were not used, because the location of the station was not described adequately. Only eight of the 26 stations sampled by Battelle were used in the present report, because only a single measurement (rather than five replicates) was made at the remaining 18 stations.

## Data Synthesis

**Choice of Indicators**—The amphipod mortality test using *Rhepoxynius abronius* was used as the key indicator of sediment toxicity in Bellingham Bay. This test was used for two reasons: 1) a standardized protocol is available for it (Swartz et al. 1985), and 2) it has been used as an indicator in most other urban bay action programs in Puget Sound.

**Available Data**—As mentioned previously, only a subset of the available information on sediment toxicity in Bellingham Bay was used in the present report. Battelle (1986) conducted the amphipod mortality test on sediments collected from eight stations in inner Bellingham Bay. Reif (1988) also conducted this bioassay on sediments collected at a station off Post Point. This information was generated using the methods recommended by Swartz et al. (1985).

**Station Locations**—The eight stations sampled by Battelle (1986) were located near the I&J and Whatcom Creek waterways and along the Fairhaven shoreline (Figure 17). The single station sampled by Reif (1988) was sampled near the terminus of the Post Point WWTP outfall (Figure 17). Station codes are defined in Appendix A, Table A-1.

**Reference Conditions**—Sequim Bay was used as the reference area for the amphipod mortality data from Bellingham Bay. This bay is relatively uncontaminated and has been used as a reference area by other investigators. In addition, Battelle (1986) evaluated sediments from four stations in Sequim Bay as part of the same study from which the Bellingham Bay information was obtained. The information used in this report was taken from the station exhibiting the lowest level of amphipod mortality in Sequim Bay (i.e., mean mortality=10 percent, standard deviation=7.9 percent).

**Elevation Above Reference Analysis**—EAR for amphipod mortality at Bellingham Bay stations were calculated relative to the 10 percent value observed in Sequim Bay (Table 15; Figure 18).



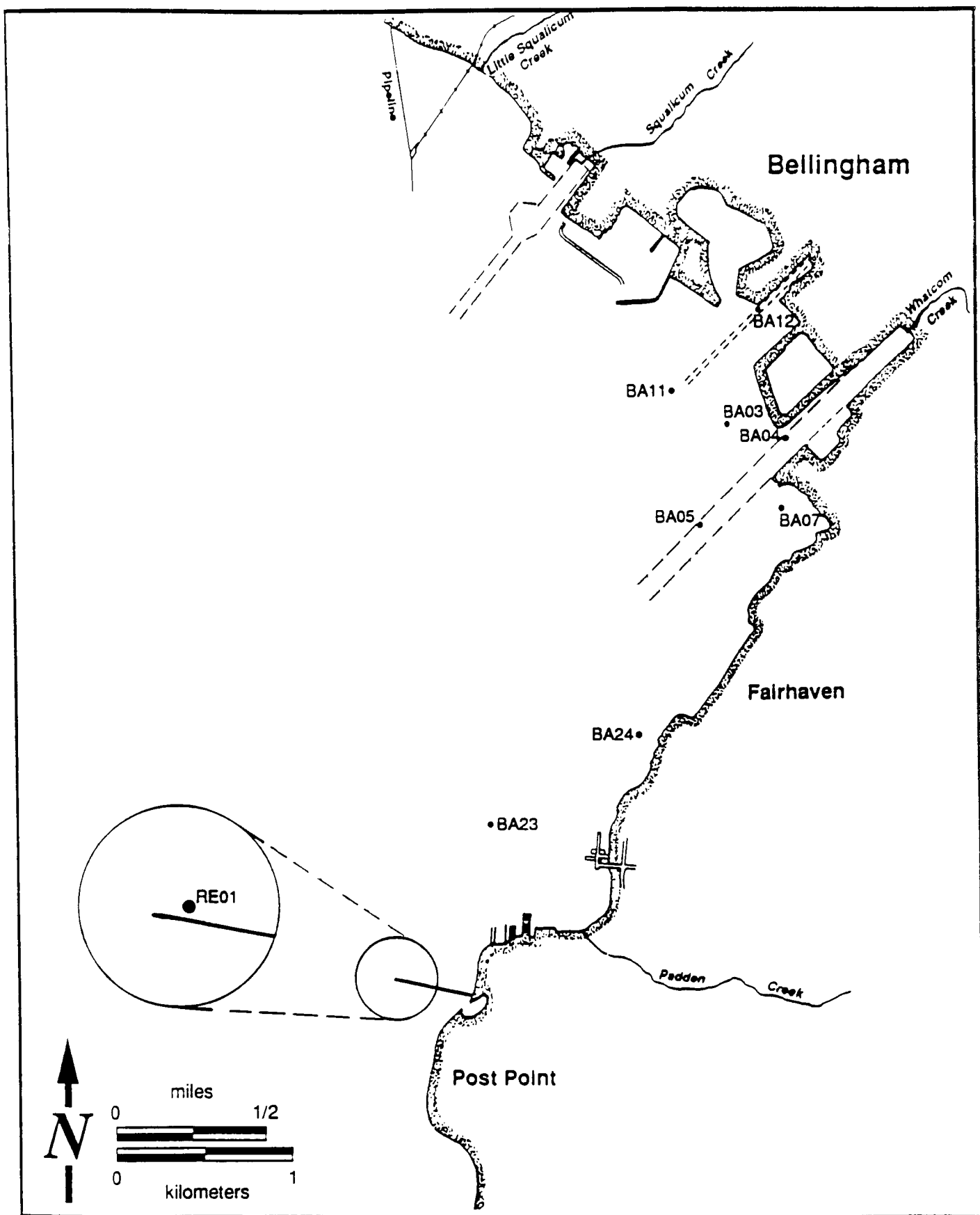


Figure 17. Locations of stations sampled for sediment toxicity in inner Bellingham Bay

TABLE 15. EAR VALUES  
FOR AMPHIPOD MORTALITY  
IN BELLINGHAM BAY

Station	EAR <sup>a,b</sup>
BA03	0.4
BA04	1.7
BA05	3.4*
BA07	0.5
BA11	1.7
BA12	1.1
BA23	5.8*
BA24	1.1
RE01	2.8*

<sup>a</sup> EAR are based on comparisons with the 10.0 percent mortality observed at the reference station in Sequim Bay (described in text).

<sup>b</sup> \* = Mortality at the test site is significantly different ( $P \leq 0.05$ ) than mortality at the reference station.

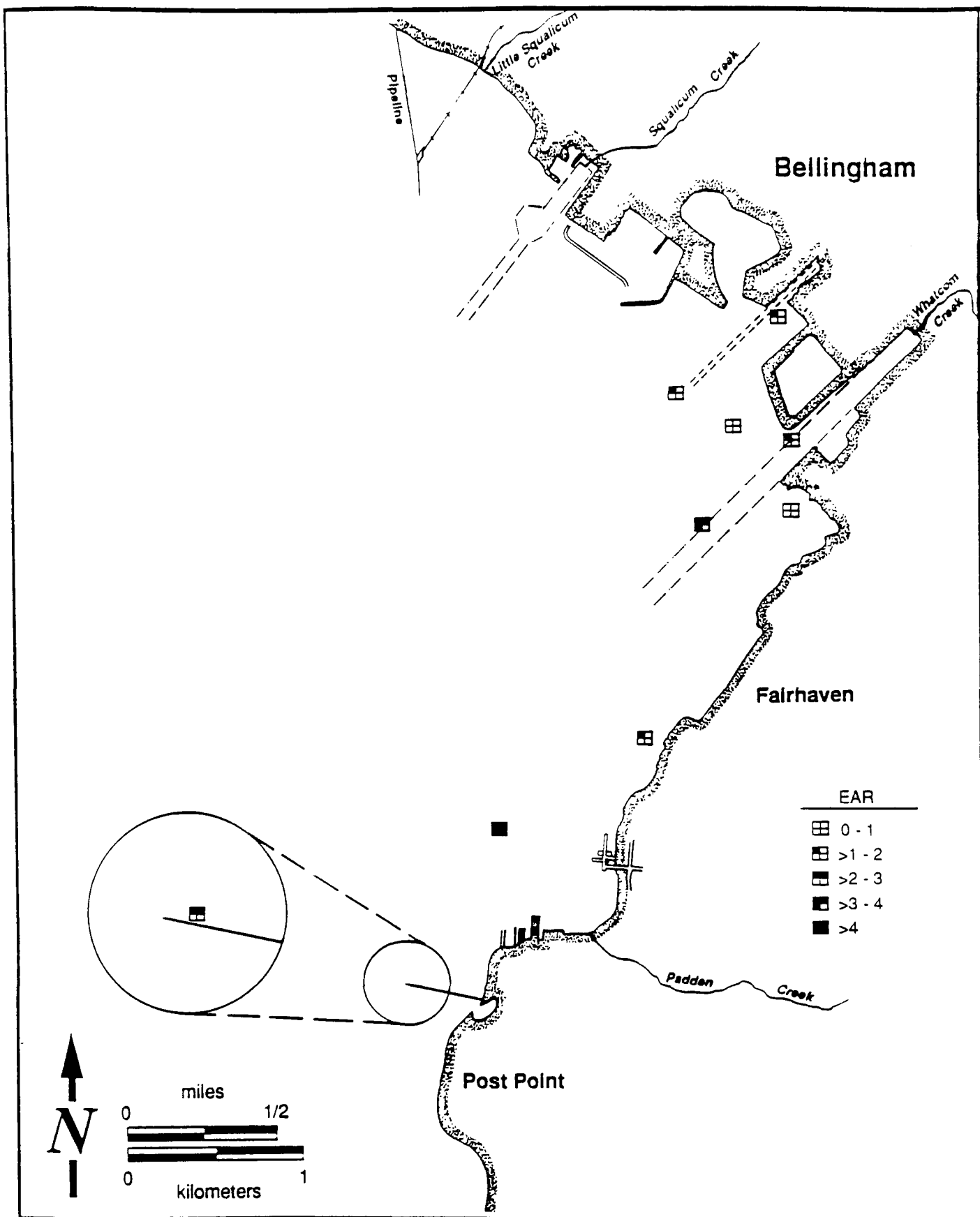


Figure 18. Distribution of EAR for amphipod mortality in inner Bellingham Bay

Significant EAR ( $P < 0.05$ ) were found at three of the nine stations evaluated. The highest significant EAR (5.8) was found at Station BA24 off the Fairhaven shoreline. The next highest significant EAR (3.4) was located near the mouth of the Whatcom Creek Waterway. The third highest significant EAR (2.8) was found near the Post Point WWTP outfall. EAR at all remaining stations were less than 2.0, and were not significant ( $P > 0.05$ ).

## BENTHIC MACROINVERTEBRATES

Six major quantitative surveys of benthic macroinvertebrate assemblages have been conducted in Bellingham Bay. However, four of these surveys were conducted prior to the date when the Georgia-Pacific secondary treatment system began operation (i.e., June 1979). Because the treatment system resulted in a major reduction in the amount of contaminants entering the bay, the four early studies were not considered representative of the conditions that have existed in the bay in recent years. In addition, the sampling methods varied among these early studies and are inconsistent with the methods currently used throughout Puget Sound. These methodological differences limit quantitative interpretations of the results of the earlier studies. The four early surveys were therefore not used in the present report to identify problem areas in Bellingham Bay. Instead, they were only reviewed to provide an historical perspective of benthic macroinvertebrate assemblages in the bay. Results of these studies have also been reviewed by Shea et al. (1981) and Broad et al. (1984).

In contrast to the four earlier studies of benthic macroinvertebrates in Bellingham Bay, the two studies conducted after 1979 were evaluated in detail to identify current problem areas in the bay. Both of these studies used the sampling methods currently employed throughout Puget Sound such as the use of a 0.1-m<sup>2</sup> van Veen bottom grab sampler and a sieve mesh size of 1.0 mm.

### Benthic Studies Prior to 1979

The four earlier studies of benthic macroinvertebrate assemblages in Bellingham Bay focused primarily on conditions in inner Bellingham Bay. These studies were designed to evaluate the effects of industrial and sewage discharges, and dredged material disposal in that area. Almost no information exists on benthic assemblages in other parts of the bay prior to 1979. For these earlier studies, benthic assemblages appeared to be degraded in sections of the three industrial waterways of inner Bellingham Bay (i.e., Whatcom Creek, I&J Street, and Squalicum Creek waterways), but did not appear to be substantially stressed in the remainder of this area. The benthic assemblages in the inner and central sections of Whatcom Creek Waterway were severely stressed, and, in some cases, completely absent. A brief review of each of the four studies is presented below.

**1964-66 Surveys**—The earliest quantitative studies of benthic macroinvertebrate assemblages in Bellingham Bay were conducted by the U.S. Department of the Interior (U.S. DOI 1967). Sixteen stations were sampled in August of 1964 throughout inner Bellingham Bay using a 0.25-ft<sup>3</sup> van Veen grab sampler. An additional 12 stations were sampled in May of 1966 in the immediate vicinity of the Whatcom Creek and I&J Street waterways using a 0.125-ft<sup>3</sup> Ekman dredge. Sieve mesh size was not identified for either sampling period. All organisms were identified at higher taxonomic levels.

In both surveys, benthic assemblages were dominated by polychaetes. Both the size and composition of the assemblages were found to be related to the organic content of the sediment, as estimated by TVS. Total number of organisms was consistently low in samples with a TVS content greater than 15 percent. In addition, the number of different organisms in each sample exhibited a significant ( $P < 0.01$ ) negative correlation with increasing values of TVS.

Areas with TVS values greater than 15 percent were confined to Whatcom Creek Waterway and the head of the I&J Street Waterway. Values of TVS greater than 25 percent were only found at stations at the head of the former waterway. The abundances of organisms at those stations ranged from 0 to 12 individuals per sample. By contrast, organism abundance at the remaining stations was as high as 2,900 individuals per sample. The authors concluded the waste solids discharged from the Georgia-Pacific facility caused substantial damage to nearby benthic macroinvertebrate assemblages.

**1973-75 Surveys**—CH2M HILL (1976) conducted quarterly surveys of benthic macroinvertebrate assemblages at stations near the outfall of the Post Point WWTP from September 1973 to August 1975 to evaluate the effects of primary-treated sewage discharged from the plant. The plant began operation in May 1974. Samples were collected using a van Veen grab sampler and sieved using a mesh size of 2.0 mm. Organisms were identified at the species level.

The authors found no consistent seasonal or spatial variations in total numbers of individuals. By contrast, species diversity (based on the Shannon-Wiener Index) varied seasonally, being highest in spring and lowest in autumn. The authors concluded that neither the construction nor operation of the WWTP appeared to substantially influence benthic assemblages. Observed changes in assemblages were attributed largely to differences in sediment character among stations.

**1974 Survey**—Nelson et al. (1974) conducted a survey of benthic macroinvertebrate assemblages throughout inner Bellingham Bay in August 1974 to evaluate the effects of mercury discharged from the Georgia-Pacific chlor-alkali plant. Samples were collected using a Peterson grab (size not specified) and sieved using a mesh size of 1.0 mm. Organisms were identified at the species level.

Species diversity (based on the Shannon-Wiener Index) of benthic assemblages ranged from 0 to 2.3. Stations with diversity values of 0 (i.e., only 0 or 1 species present) were located in the immediate vicinity of Whatcom Creek Waterway. Species diversity at the remaining stations generally increased with increasing distance from the waterway. Benthic assemblages at all of the stations in the immediate vicinity of the waterway were dominated by the pollution-tolerant polychaete *Capitella capitata*. Assemblages at the remaining stations were dominated by species less pollution-tolerant than *C. capitata*. Because species diversity did not correlate significantly ( $P > 0.05$ ) with the mercury content of the sediments, the authors concluded that it did not appear to be a limiting factor for benthic assemblages. The authors attributed the alterations of assemblages in the vicinity of Whatcom Creek Waterway primarily to the presence of sludge deposits in the sediment.

**1978 Survey**—Webber (1978) conducted four surveys of benthic macroinvertebrate assemblages throughout inner Bellingham Bay between May 1977 and April 1978 to evaluate candidate disposal sites for dredge spoils. Analyses were conducted on subsamples (i.e., 0.05 m<sup>2</sup> by 15-cm cores) from

the sediment collected by a 0.1-m<sup>2</sup> van Veen grab sampler. The subsamples were sieved using a mesh size of 1.0 mm, and organisms were identified at the species level.

Benthic assemblages at most stations were dominated numerically by polychaetes. Species richness of assemblages was relatively high at most stations, but generally lower at the inner sections of the Whatcom Creek, I&J Street, and Squalicum Creek waterways. Number of individuals per station was also relatively low in the three waterways.

### **Benthic Studies After 1979**

As mentioned previously, the two benthic studies conducted after 1979 were considered to be representative of current conditions in Bellingham Bay, and therefore were used to identify problem areas within the bay. Both surveys were conducted in 1983. Each of the two studies is briefly reviewed below.

**Survey 1**—Broad et al. (1984) conducted surveys of benthic macroinvertebrate assemblages at eight stations in inner Bellingham Bay in May 1983 and 12 stations in the remainder of the bay in October 1983. Two additional stations were sampled in Samish Bay in May to represent reference conditions. Two replicate samples were collected at each station using a 0.1-m<sup>2</sup> van Veen grab sampler and a sieve mesh size of 1.0 mm. Organisms were identified at the species level.

The authors found the species compositions of benthic macroinvertebrate assemblages similar to those found in the earlier benthic surveys. However, *Capitella capitata* was no longer a dominant member of any of the assemblages. In general, the abundances of organisms throughout Bellingham Bay were higher than the values reported in earlier studies, suggesting conditions in the bay were improving.

The authors identified four relatively discrete benthic assemblages. One assemblage was found near the delta of the Nooksack River. It was comprised of 60 species and was dominated by the polychaete *Owenia fusiformis*. A second assemblage was found in the inner harbor section of inner Bellingham Bay. It was comprised of only 40 species, dominated by the polychaete *Tharyx* sp., and characterized by low values of total abundance, total biomass, and species diversity. A third assemblage was found in the outer section of inner Bellingham Bay. It was comprised of 56 species, dominated by *Tharyx* sp., and characterized by higher values of total abundance and total biomass than the assemblage in the inner section. A fourth assemblage was found in the outer portions of Bellingham Bay. It was dominated by the bivalve mollusc *Axinopsida serricata* and characterized by more species and higher values of total abundance, total biomass, and species diversity than the assemblages in inner Bellingham Bay.

**Survey 2**—CH2M HILL (1984) conducted a survey of benthic macroinvertebrate assemblages at 14 stations near the Post Point WWTP in October 1983. Five replicate samples were collected at each station using a 0.1-m<sup>2</sup> van Veen grab sampler and a sieve mesh size of 1.0 mm. Organisms were identified at the species level. The authors found no evidence that discharges from the WWTP were substantially influencing the benthic assemblages.

## Data Synthesis

**Choice of Indicators**—Information on benthic macroinvertebrate assemblages in Bellingham Bay was summarized in the present study using abundances of the following four major taxonomic groups:

- Polychaeta
- Mollusca
- Amphipoda
- Other Crustacea (i.e., excluding amphipods).

All four major taxa have been used to identify problem areas in past studies of chemical contamination in Puget Sound urban embayments (e.g., Tetra Tech 1985a; PTI and Tetra Tech 1988a,b). As a group, the four taxa typically account for greater than 90 percent of the total abundance of benthic macroinvertebrate assemblages throughout Puget Sound. Although amphipods are crustaceans, they were considered separately because they are a group of organisms known to be particularly sensitive to contamination (Bellan-Santini 1980). In addition, Swartz et al. (1982) found a close inverse relationship between amphipod abundance and sediment toxicity (determined using the amphipod mortality bioassay) in Commencement Bay.

**Available Data**—As mentioned earlier, only two of the six major quantitative studies of benthic macroinvertebrate assemblages in Bellingham Bay were conducted after 1979 (i.e., Broad et al. 1984 and CH2M HILL 1984). The remaining four studies were not considered representative of current conditions in the bay because they were conducted prior to 1979, when water quality was improved through installation of a secondary treatment system at the Georgia-Pacific facility. Therefore, only the two most recent studies were used to characterize benthic assemblages in Bellingham Bay and to identify problem areas.

**Station Locations**—Broad et al. (1984) and CH2M HILL (1984) sampled 35 stations throughout Bellingham Bay (Figures 19 and 20). Twenty-five stations were located in inner Bellingham Bay and near the outfall of the Post Point WWTP. No stations were located in Chuckanut Bay or the nearshore areas of the Lummi Peninsula and Portage Island. Station codes are defined in Appendix A, Table A-1.

**Reference Conditions**—The characteristics of benthic macroinvertebrate assemblages can vary in relation to depth, sediment character, and season of sampling. If any of these natural variables exhibit substantial differences between test sites and reference areas, it is uncertain whether differences found between the benthic assemblages at the two kinds of sites are the result of these variables or chemical toxicity. Therefore, multiple reference areas were used in this study to ensure these natural variables were as similar as possible between each test site and its respective reference area (Table 16).

For the Broad et al. (1984) survey, two sets of reference conditions were used for stations sampled in May and October of 1983. A station sampled in Samish Bay, a nonurban embayment

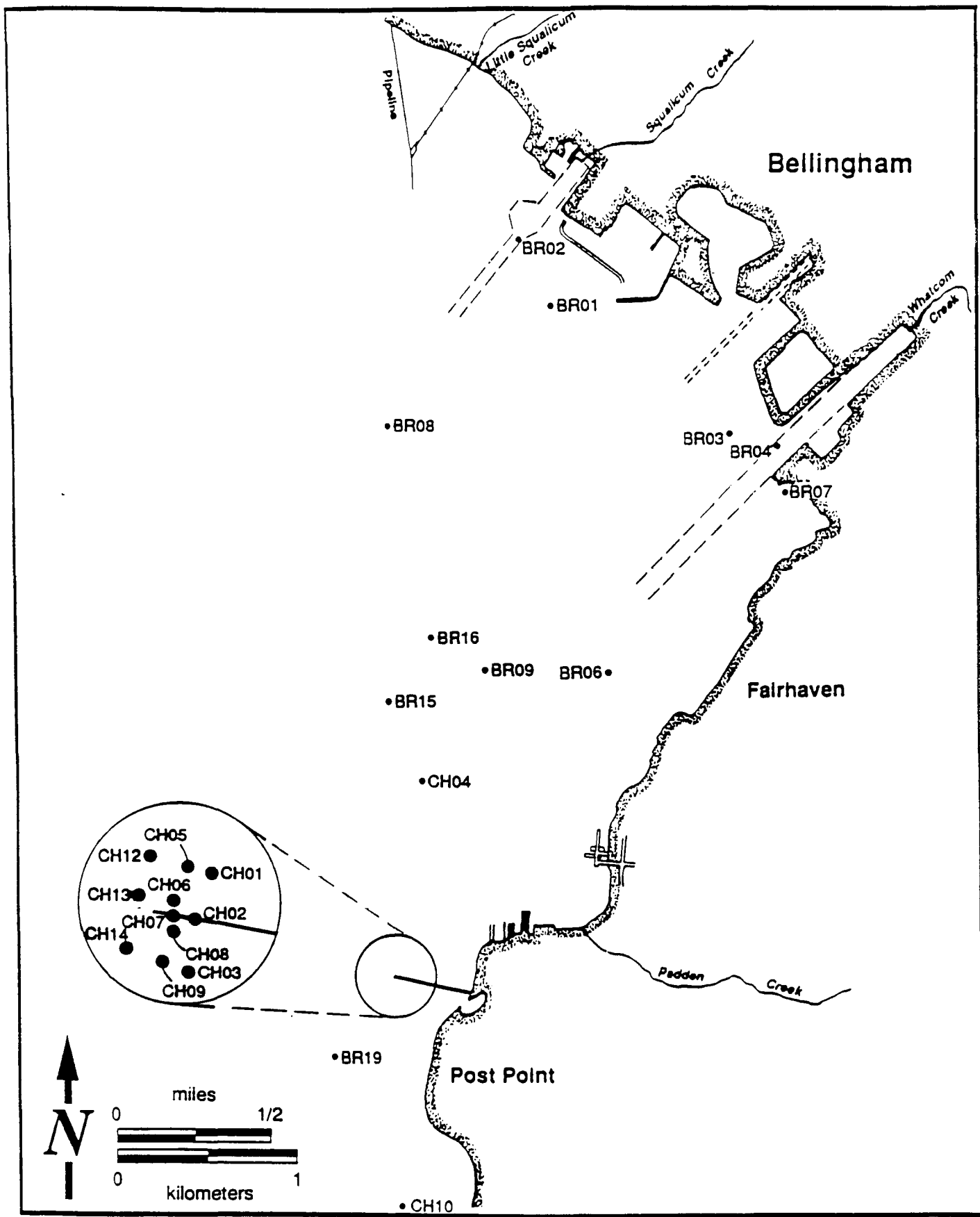


Figure 19. Locations of stations sampled for benthic macroinvertebrates in inner Bellingham Bay



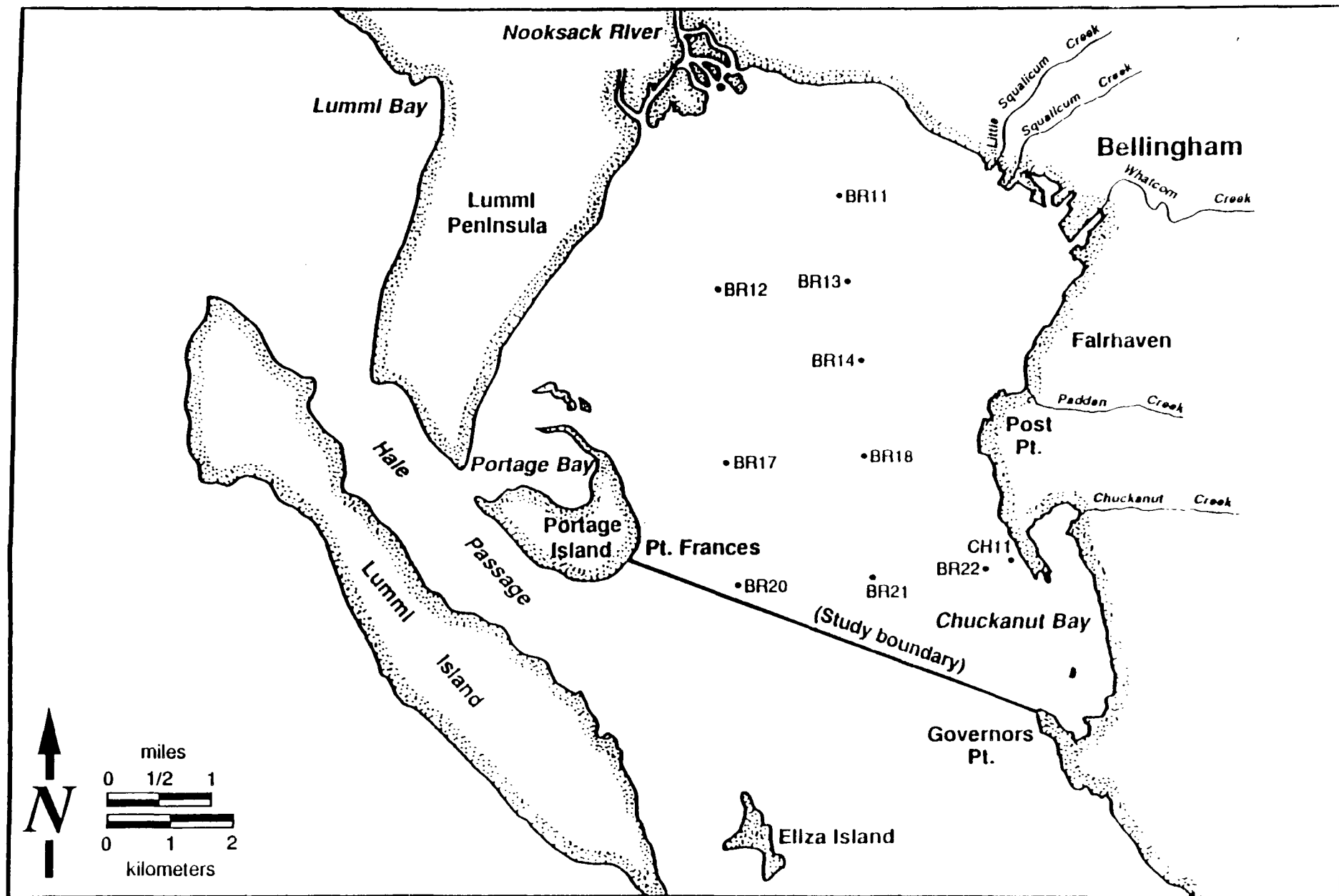


Figure 20. Locations of stations sampled for benthic macroinvertebrates in outer Bellingham Bay

**TABLE 16. CHARACTERISTICS OF REFERENCE AREAS FOR  
BENTHIC MACROINVERTEBRATE ASSEMBLAGES<sup>a</sup>**

Stations		Sampling Period		Depth (m)		Percent Fines <sup>b</sup>		TVS <sup>c</sup> (Percent)	
Reference	Test	Reference	Test	Reference	Test	Reference	Test	Reference	Test
Samish Bay (one station)	BR01-BR09	May 1983	May 1983	16	5-14	91	76-98	7.9	5.6-14.8
Bellingham Bay (BR22)	BR11-BR21	October 1983	October 1983	24	8-29	97	67-100	9.3	5.5-10.0
Bellingham Bay (CH10, CH11) <sup>d</sup>	CH01-CH09 CH12-CH14	October 1983	October 1983	23	20-28	91	40-99	8.3	4.5-9.1

<sup>a</sup> Characteristics are presented separately for reference and test sites. Ranges of values are presented for test sites.

<sup>b</sup> Percent fines = percent silt + clay.

<sup>c</sup> TVS = percent volatile solids.

<sup>d</sup> Characteristics were averaged for these two stations.

located immediately south of Bellingham Bay, was used as the reference area for the eight stations sampled in Bellingham Bay in May. For the 12 stations sampled in Bellingham Bay in October, the station located closest to Chuckanut Bay (i.e., BR22; Figure 20) was used as the reference area for the remaining 11 stations.

For the CH2M HILL (1984) survey, a single set of reference conditions was used for the 14 stations located in Bellingham Bay. It comprised the average conditions at the two stations located closest to Chuckanut Bay (i.e., CH10 and CH11; Figure 19). These two stations were also designated as reference stations by CH2M HILL. Chemical analyses were conducted only at Station CH11. Although most chemical concentrations were relatively low, the concentration of mercury (0.5 mg/kg) was elevated above the LAET (0.41 mg/kg).

**Elevation Above Reference Analysis**—EAR were calculated for the abundance of each major benthic taxon at each test site relative to the mean abundance observed at the respective reference area (Table 17; Figures 21 and 22). Significant EAR were found primarily for amphipods and other crustaceans (17 of 31 stations for each taxon). By contrast, significant EAR for molluscs were found at only two stations, and none of the EAR found for polychaetes was significant. The highest EAR for amphipods were found at the seven stations at which this taxon was absent (Stations BR07, BR15, BR16, CH01, CH03, CH08, and CH09). The highest EAR for other crustaceans (86) was found at Stations BR15 and BR16. A very high EAR for this taxon (48) was also found at Stations CH08 and CH09. These stations are located near the mouth of Whatcom Creek Waterway, the Georgia-Pacific deepwater outfall terminus, and the Post Point WWTP outfall terminus.

Values of EAR less than 1.0 indicate the abundance of a taxon at a test site was greater than the abundance observed at its respective reference site. Values of EAR less than 1.0 were found primarily for polychaetes (26 stations) and molluscs (14 stations), and less frequently for amphipods (9 stations) and other crustaceans (3 stations). In many cases, enhanced abundances of one taxon and depressed abundances of another taxon were found at the same stations. These different patterns of abundance are likely the result of different species exhibiting different sensitivities to chemical toxicity. These patterns could also be influenced by differential species response to conventional sediment variables such as the grain-size distribution and organic content of the sediments. However, it is unlikely that conventional sediment variables substantially influenced the observed abundance depressions, as these variables did not differ substantially between stations with and without depressions. For example, the mean values (and standard deviations) of percent fine-grained sediment at stations with and without depressions were 92 (12.2) and 88 (17.5) percent, respectively. Mean values of percent TVS were 9 (2.0) and 8 (1.4) percent, respectively. Neither variable differed significantly ( $P > 0.05$ ) between the two groups of stations.

## HISTOPATHOLOGY

Tissue abnormalities in marine organisms can be used as indicators of sediment chemical contamination. In most previous urban bay action programs in Puget Sound, the prevalence of microscopic liver lesions in English sole has been used as a key biological indicator. However, no information on microscopic liver lesions in fishes from Bellingham Bay was found. Malins et al. (1982) evaluated liver lesions in English sole off Eliza Island, which is approximately 2 km south of the study area boundary. They found no neoplasms (i.e., tumors) or preneoplasms in any of the fish examined.

**TABLE 17. EAR VALUES FOR  
BENTHIC MACROINVERTEBRATE TAXA  
IN BELLINGHAM BAY**

Station <sup>a</sup>	EAR <sup>b,c</sup>			
	Polychaetes	Molluscs	Amphipods	Other Crustaceans
Ref1	(30/0.1 m <sup>2</sup> )	(36/0.1 m <sup>2</sup> )	(45/0.1 m <sup>2</sup> )	(100/0.1 m <sup>2</sup> )
BR01	<0.1	18*	0.1	0.3
BR02	<0.1	0.4	0.2	0.9
BR03	<0.1	0.5	45*	2.1
BR04	<0.1	2.3	90*	18*
BR06	<0.1	0.2	2.4	1.3
BR07	0.2	14*	U*	50*
BR08	<0.1	0.4	0.6	1.4
BR09	0.5	0.3	9.0*	1.1
Ref2	(30/0.1 m <sup>2</sup> )	(59/0.1 m <sup>2</sup> )	(7.5/0.1 m <sup>2</sup> )	(43/0.1 m <sup>2</sup> )
BR11	<0.1	1.1	0.3	14*
BR12	<0.1	1.0	0.1	0.6
BR13	<0.1	0.4	5.0	3.4
BR14	0.3	1.5	7.5*	17*
BR15	0.6	3.2	U*	86*
BR16	1.7	3.0	U*	86*
BR17	0.6	0.4	1.3	1.6
BR18	1.5	0.6	1.7	14*
BR19	2.7	2.6	5.0	12*
BR20	0.6	0.4	0.6	1.2
BR21	0.5	0.5	0.7	2.3
Ref3	(27/0.1 m <sup>2</sup> )	(56/0.1 m <sup>2</sup> )	(6.2/0.1 m <sup>2</sup> )	(57/0.1 m <sup>2</sup> )
CH01	1.1	4.3	U*	12*
CH02	0.9	0.6	0.9	5.0
CH03	0.7	1.9	U*	14*
CH04	0.2	4.1	16*	32*
CH05	0.4	2.8	16*	15*
CH06	0.3	0.5	10*	3.3
CH07	0.3	0.6	0.6	3.0
CH08	0.9	0.7	U*	48*
CH09	1.0	1.5	U*	48*
CH12	0.8	1.2	6.2*	9.2*
CH13	0.9	1.5	5.2*	9.5*
CH14	0.9	2.1	7.8*	14*

<sup>a</sup> Stations denoted by the prefix "Ref" are the reference stations (described in text) with which each group of test stations were compared.

<sup>b</sup> Values in parentheses for the reference stations are numbers of individuals per 0.1m<sup>2</sup>. All other values are EAR derived from comparisons with respective reference stations.

<sup>c</sup> Asterisks denote significant EAR (i.e., >5.0). The qualifier U denotes an EAR was undefined because the value of the denominator was zero. All undefined EAR were considered significant.

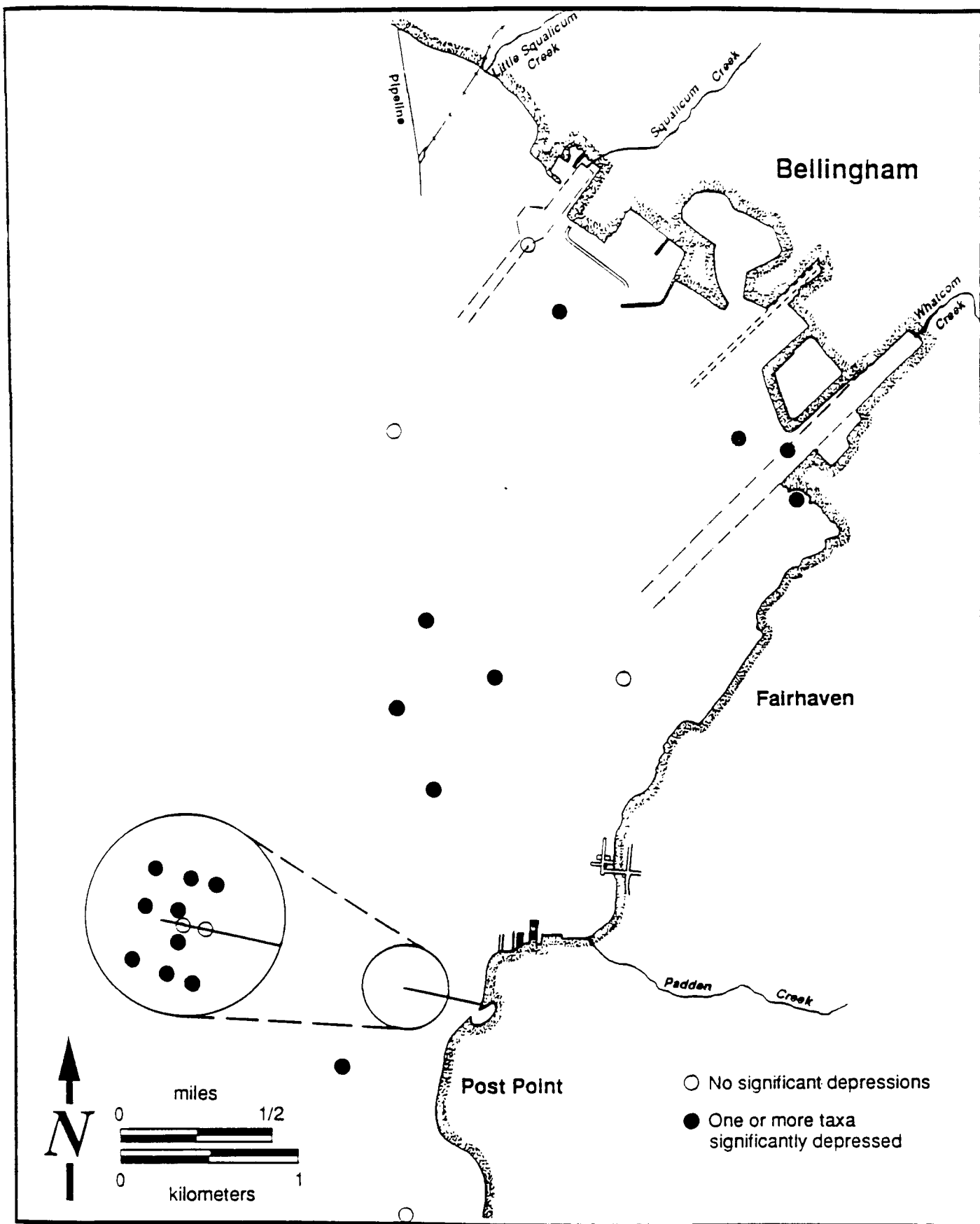


Figure 21. Distribution of significant benthic depressions in inner Bellingham Bay

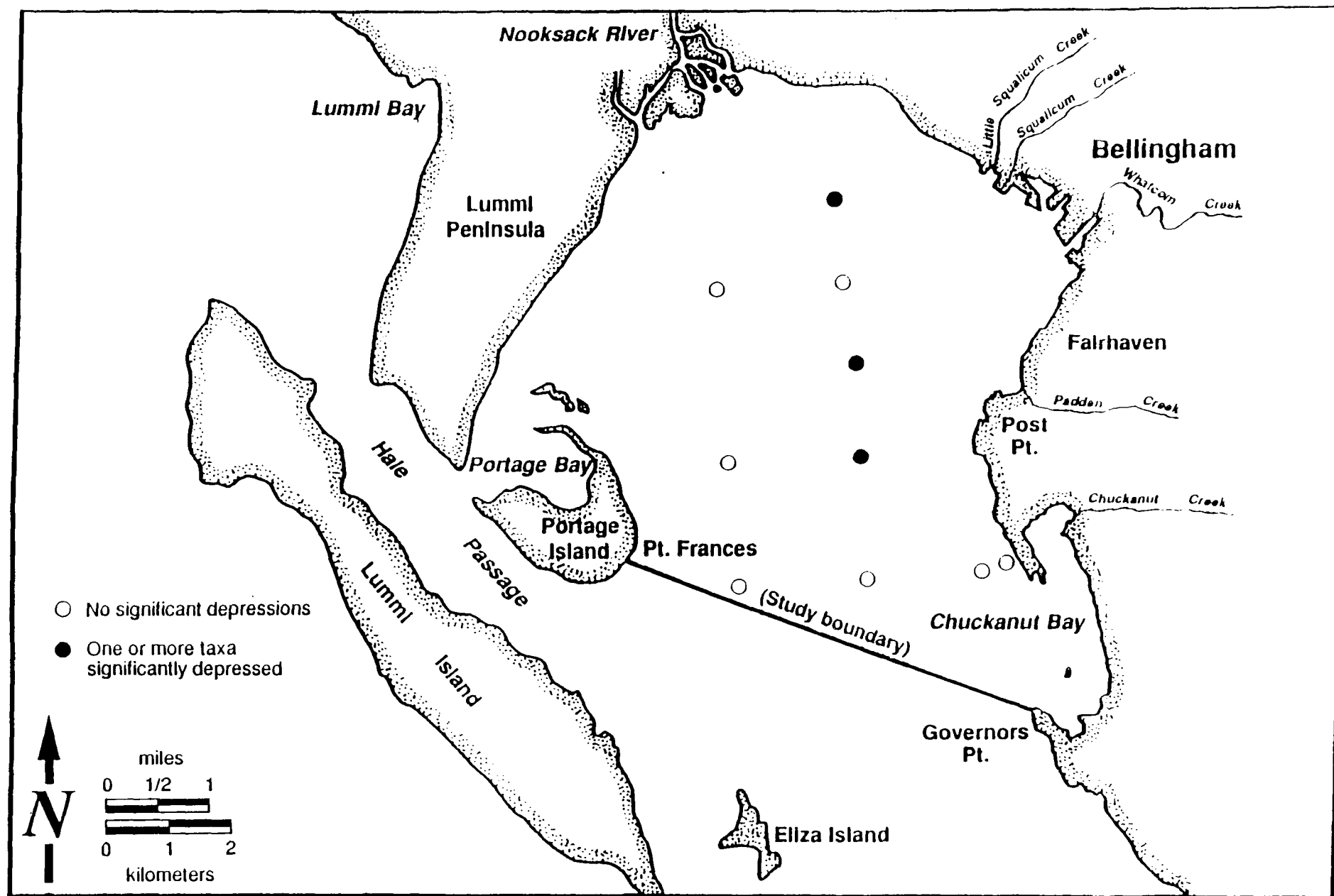


Figure 22. Distribution of significant benthic depressions in outer Bellingham Bay

Numerous investigators have sampled fishes and large macroinvertebrate populations throughout Bellingham Bay between 1934 and 1984 (review in CH2M HILL 1984), and none reported high prevalences of grossly visible external abnormalities or parasites in the organisms examined. More recently, fish populations have been sampled intensively in the central part of Bellingham Bay as part of the PSDDA evaluation of the proposed unconfined, open-water disposal site in the bay (Dinnel et al. 1988; Donnelly et al. 1988). No unusually high prevalences of grossly visible abnormalities were reported in either of those two studies.

## DATA SUMMARY: MICROBIAL CONTAMINATION

Water and shellfish contaminated with enteric bacteria and viruses present a risk to public health. Swimming in these waters or eating shellfish contaminated with these microorganisms can result in gastroenteritis, nausea, diarrhea, typhoid fever, cholera, and hepatitis. The organisms of primary concern are pathogenic enteric bacteria present in human and animal feces (e.g., *Salmonella* spp., *Yersinia enterocolitica*, *Campylobacter fetus*, *Vibrio parahaemolyticus*, and *Vibrio cholerae* (Munger et al. 1979). These microorganisms are often found in raw or inadequately treated sewage.

Washington state standards for commercial shellfish harvesting and recreational use of water bodies are based on the concentration of fecal coliform bacteria in water and shellfish tissue (WAC 173-201-045) (Lilja, J., 7 March 1989, personal communication). The National Shellfish Sanitation Program standard for approved shellfish-growing waters and the Washington state fecal coliform bacteria standard for Class A marine waters are the same (Cleland 1985). Because no record of human illness resulting from eating commercially harvested shellfish from Washington state waters exists, the state standards can be considered protective (Tetra Tech 1988b).

## DATA SYNTHESIS

### Choice of Indicators

Fecal coliform bacteria measurements have been traditionally used as a microbial indicator of water quality. The primary reason for using these organisms is they indicate the presence of human and animal fecal material that can contain pathogenic organisms. In addition, fecal coliform bacteria are generally present in large numbers in fecal discharges, and are relatively inexpensive and easy to identify and quantify (Faigenblum 1988).

The following analysis is based on available data for fecal coliform bacteria concentrations in marine and fresh waters and concentrations in shellfish from Bellingham Bay. Little information on discharges of untreated wastewater to Bellingham Bay (e.g., via CSOs, storm drains, and surface runoff) exists. No data were found on other microbial indicator organisms (e.g., enterococci bacteria) or on pathogens. Only data collected after 1979 were evaluated, because earlier data were not considered representative of present conditions in the bay.

### Available Data and Station Locations

Measurements of fecal coliform bacteria in marine waters were obtained from several sources (Table 18). Data were collected from the three Ecology ambient water quality monitoring stations at three locations in Bellingham Bay: the inner bay near the Starr Rock disposal area (Station EC02), Post Point (Station EC02), and Point Francis (Figures 23 and 24). Other stations in marine waters included seven stations sampled by DSHS in and around Portage Bay during 1984 and 1985 (Cook 1985; Cleland 1985) and seven stations sampled by CH2M HILL around the terminus of the Post Point sewage outfall (CH2M HILL 1984) (Figures 23 and 24). Fourteen stations were sampled



TABLE 18. FECAL COLIFORM DATA AND EAR VALUES  
BELLINGHAM BAY AND FRESHWATER TRIBUTARIES  
1980-1987

Area	Station Codes	No. of Samples	Fecal Coliform Bacteria <sup>a</sup>			
			Minimum	Maximum	Geometric Mean	EAR
Marine Stations <sup>b</sup>						
Point Francis <sup>c</sup>	EC03	41	<1	28	<1.4	<0.10
Post Point <sup>c</sup>	EC02	54	<1	77	<2.4	<0.17
Nun Buoy #4 <sup>c</sup>	EC01	59	<1	300	<7.6	<0.54
North control - surface <sup>d</sup>	CH04	12	<1.8	110	<6.0	<0.43
North control - middle (9 m) <sup>d</sup>	CH04	12	<1.8	13	<2.8	<0.20
North control - bottom (20 m) <sup>d</sup>	CH04	12	<1.8	49	<2.5	<0.18
ZID boundary, north - surface	CH05	12	<1.8	79	<3.1	<0.22
ZID boundary, north - middle (12 m) <sup>d</sup>	CH05	12	<1.8	33	<3.1	<0.22
ZID boundary, north - bottom (23 m) <sup>d</sup>	CH05	12	<1.8	23	<2.4	<0.17
ZID boundary, east - surface <sup>d</sup>	CH02	12	<1.8	33	<6.1	<0.43
ZID boundary, east - middle (9 m) <sup>d</sup>	CH02	12	<1.8	21	<2.8	<0.20
ZID boundary, east - bottom (18 m) <sup>d</sup>	CH02	12	<1.8	130	<2.8	<0.20
ZID - surface <sup>d</sup>	CH07	12	<1.8	22	<4.6	<0.33
ZID - middle (12 m) <sup>d</sup>	CH07	12	<1.8	4.5	<2.1	<0.15
ZID - bottom (19 m) <sup>d</sup>	CH07	12	<1.8	5	<2.2	<0.16
ZID boundary, 25 m south - surface <sup>d</sup>	CH08	12	<1.8	33	<3.4	<0.24
ZID boundary, 25 m south - middle <sup>d</sup>	CH08	12	<1.8	23	<2.4	<0.17
ZID boundary, 25 m south - bottom <sup>d</sup>	CH08	12	<1.8	2	<1.9	<0.14
ZID boundary, 200 m south - surface <sup>d</sup>	CH09	12	<1.8	11	<4.1	<0.29
ZID boundary, 200 m south - middle <sup>d</sup>	CH09	12	<1.8	79	<3.3	<0.24
ZID boundary, 200 m south - bottom <sup>d</sup>	CH09	12	<1.8	7	<2.5	<0.18
South control - surface <sup>d</sup>	CH11	12	<1.8	33	<2.8	<0.20
South control - middle (12 m) <sup>d</sup>	CH11	12	<1.8	2	<1.9	<0.14
South control - bottom (24 m) <sup>d</sup>	CH11	12	<1.8	2	<2.0	<0.14
W. Portage Bay <sup>e</sup>	CL01	14	<1.8	350	<3.7	<0.26
N.W. Portage Bay <sup>e</sup>	CL02	6	<1.8	240	<7.4	<0.53
N.E. Portage Bay <sup>e</sup>	CL03	14	<1.8	220	<3.9	<0.28
E. Portage Bay <sup>e</sup>	CL04	5	<1.8	33	<4.9	<0.35
Central Portage Bay <sup>e</sup>	CL05	14	<1.8	49	<2.9	<0.21
Inner Portage Bay <sup>e</sup>	CL06	14	<1.8	240	<3.6	<0.26
S.W. Portage Bay <sup>e</sup>	CL07	13	<1.8	22	<3.6	<0.26
Ecology 1980 <sup>1g</sup> surface	ST01	1	—	—	80	0.80
Ecology 1980 <sup>1g</sup> surface	ST02	1	—	—	68	0.68
Ecology 1980 <sup>1g</sup> surface	ST03	1	—	—	29	0.29
Ecology 1980 <sup>1g</sup> middle	ST03	1	—	—	17	0.17
Ecology 1980 <sup>1g</sup> surface	ST04	1	—	—	23	0.23
Ecology 1980 <sup>1g</sup> middle	ST04	1	—	—	2	0.02
Ecology 1980 <sup>1g</sup> surface	ST05	1	—	—	5	0.36
Ecology 1980 <sup>1g</sup> middle	ST05	1	—	—	1	0.07
Ecology 1980 <sup>1g</sup> surface	ST06	1	—	—	5	0.36
Ecology 1980 <sup>1g</sup> middle	ST06	1	—	—	<1	<0.07
Ecology 1980 <sup>1g</sup> bottom	ST06	1	—	—	<1	<0.07
Ecology 1980 <sup>1f</sup> surface	ST07	1	—	—	<1	<0.07
Ecology 1980 <sup>1f</sup> middle	ST07	1	—	—	9	0.64
Ecology 1980 <sup>1f</sup> bottom	ST07	1	—	—	1	0.07
Ecology 1980 <sup>1f</sup> surface	ST08	1	—	—	1	0.07
Ecology 1980 <sup>1f</sup> middle	ST08	1	—	—	<1	<0.07
Ecology 1980 <sup>1f</sup> surface	ST09	1	—	—	1	0.07
Ecology 1980 <sup>1f</sup> middle	ST09	1	—	—	3	0.21
Ecology 1980 <sup>1f</sup> surface	ST10	1	—	—	12	0.86
Ecology 1980 <sup>1f</sup> middle	ST10	1	—	—	<1	<0.07
Ecology 1980 <sup>1f</sup> surface	ST11	1	—	—	3	0.21
Ecology 1980 <sup>1f</sup> middle	ST11	1	—	—	3	0.21

TABLE 18. (Continued)

Area	Station Codes	No. of Samples	Fecal Coliform Bacteria <sup>a</sup>			
			Minimum	Maximum	Geometric Mean	EAR
Marine Stations (continued)						
Ecology 1980 <sup>f</sup> surface	ST12	1	—	—	65	4.64
Ecology 1980 <sup>f</sup> surface	ST13	1	—	—	4	0.29
Ecology 1980 <sup>f</sup> middle	ST13	1	—	—	56	4.00
Ecology 1980 <sup>f</sup> bottom	ST13	1	—	—	4	0.29
Ecology 1980 <sup>f</sup> surface	ST14	1	—	—	< 1	< 0.07
Ecology 1980 <sup>f</sup> middle	ST14	1	—	—	8	0.57
Ecology 1980 <sup>f</sup> bottom	ST14	1	—	—	1	0.07
Freshwater Stations <sup>b</sup>						
Chuckanut Creek <sup>d</sup>	CH15	12	17	3,000	263.6	2.64
Padden Creek <sup>d</sup>	CH16	12	33	1,300	331.1	3.31
Whatcom Creek <sup>d</sup>	CH17	12	11	2,200	291.1	2.91
Squalicum Creek <sup>d</sup>	CH18	12	11	1,300	120.8	1.21
Nooksack River <sup>d</sup>	CH19	12	33	310	115.1	1.51
Shellfish Stations <sup>i</sup>						
Portage Bay west <sup>e</sup>	CO01	2	130	330	207	0.90
Portage Bay southwest <sup>e</sup>	CO02	1	—	—	20	0.09
Portage Bay east <sup>e</sup>	CO03	1	—	—	790	3.43
Post Point <sup>l</sup>	FA01	7	< 20	490	< 130	< 0.57

<sup>a</sup> Concentrations for marine and freshwater samples are organisms/100 mL water. Concentrations for shellfish samples are organisms/100 grams tissue. Values denoted as "<" reflect one or more undetected values. In calculating geometric means, detection limits were used for undetected values. An EAR > 1.0 was considered significant (i.e., the applicable water quality standard or tissue guideline was exceeded).

<sup>b</sup> Class A marine water quality standard: geometric mean concentration of fecal coliform shall not exceed 14 organisms/100 mL (WAC 173-201-045). This standard applies to all stations except Stations ST01 to ST06, and was used to calculate EAR.

<sup>c</sup> Ecology ambient monitoring program (data from EPA and Ecology); data were averaged for all measurements made during all years between 1980 and 1987.

<sup>d</sup> CH<sub>2</sub>M Hill (1984).

<sup>e</sup> Cook (1985); Cleland (1985).

<sup>f</sup> Stanley (1980).

<sup>g</sup> Class B marine water quality standards: geometric mean concentration of fecal coliform shall not exceed 100 organisms/100 mL (WAC 173-201-045). This standard applies only to Stations ST01 to ST06 and was used to calculate EAR at those stations.

<sup>h</sup> Class A freshwater quality standard: geometric mean concentration of fecal coliform bacteria shall not exceed 100 organisms/100 mL (WAC 173-201-045).

<sup>i</sup> FDA commercial shellfish guideline: geometric mean concentration of fecal coliform bacteria shall not exceed 230 organisms/100 grams tissue.

<sup>j</sup> Faigenblum (1988).

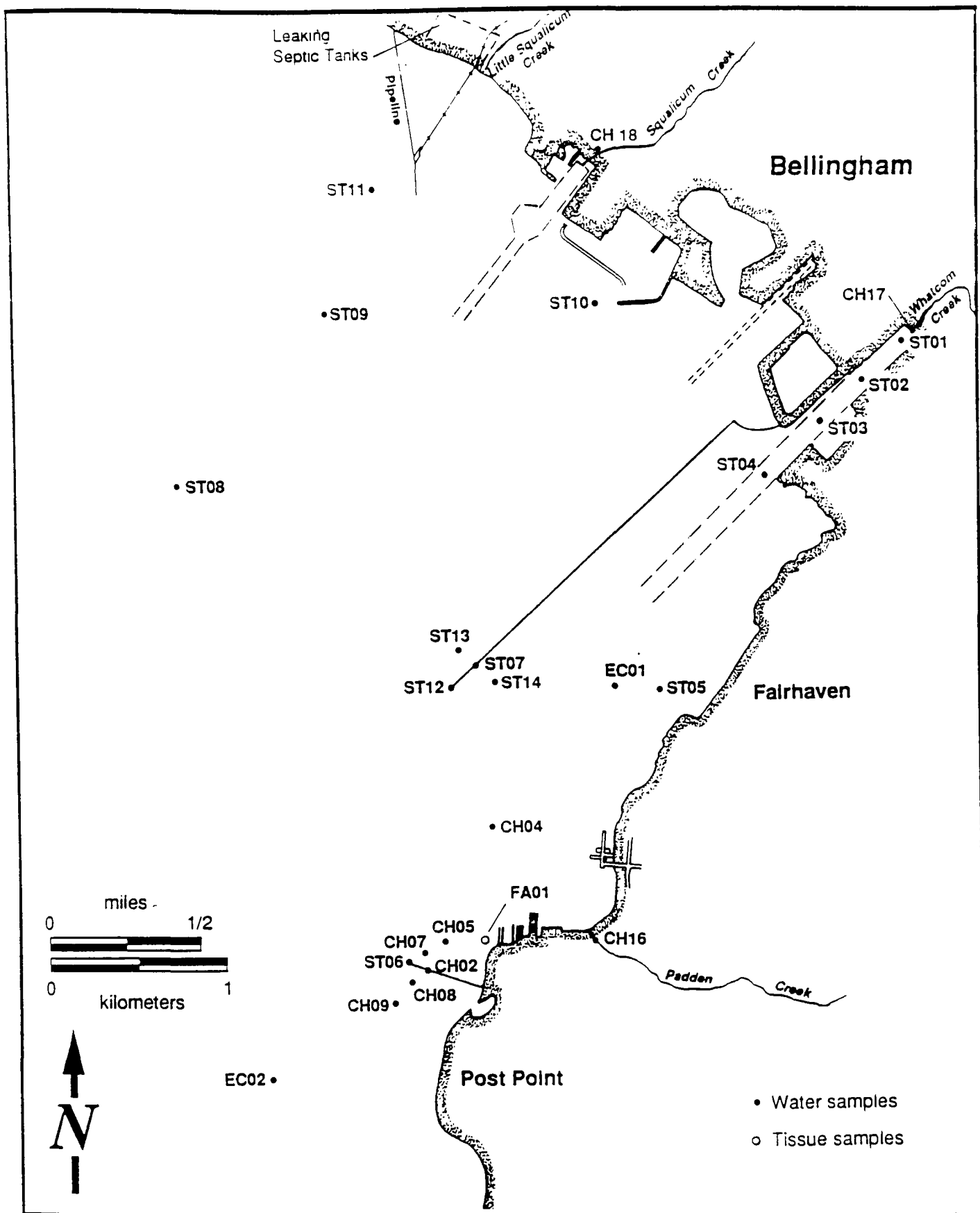


Figure 23. Locations of stations sampled for fecal coliform bacteria in water and shellfish tissue from inner Bellingham Bay

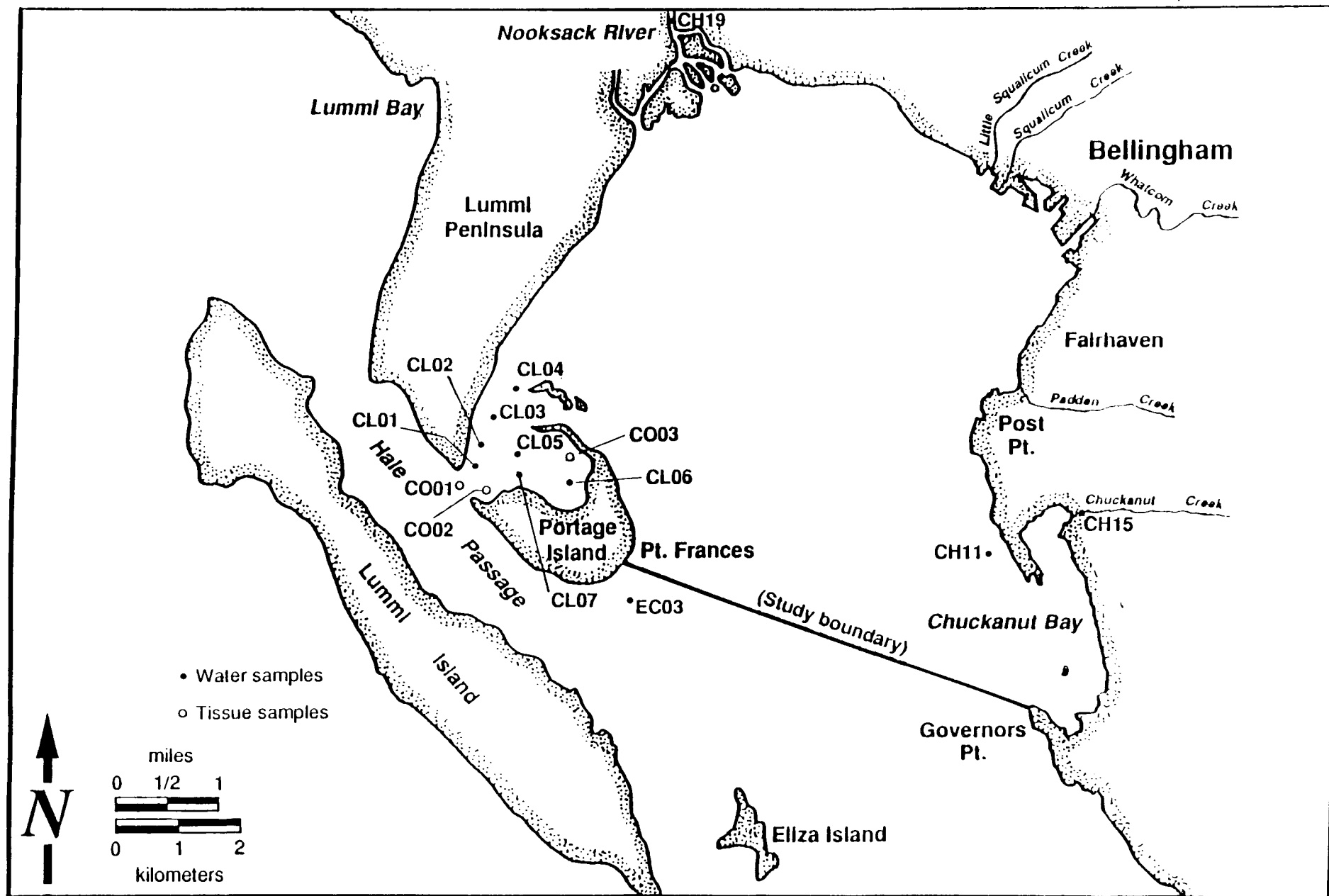


Figure 24. Locations of stations sampled for fecal coliform bacteria in water and shellfish tissue in outer Bellingham Bay

for fecal coliform bacteria in Bellingham Bay and the Whatcom Creek Waterway (Figure 23) on 8 April 1980 after the Georgia-Pacific secondary treatment lagoon was installed (Stanley 1980). Station codes are defined in Appendix A, Table A-1.

Data on bacteriological measurements in fresh waters were obtained from a survey performed by CH2M HILL at the mouths of Chuckanut, Padden, Whatcom, and Squalicum creeks and the Nooksack River (Figures 23 and 24). Monthly sampling for this survey occurred from October 1983 through September 1984 (CH2M HILL 1984).

Measurements of fecal coliform bacteria in shellfish tissue were obtained from two DSHS surveys in Portage Bay (Cook 1985; Cleland 1985), and a study performed by DSHS and EPA during 1986-1987 off Post Point (Faigenblum 1988) (Figures 23 and 24).

Two different laboratory techniques were used to generate bacteriological water quality data for Bellingham Bay samples: multiple-tube most probable number (MPN) and membrane filtration. Although these two methods are considered equivalent (APHA 1985), the MPN method can sometimes result in higher values than the membrane-filtration technique. The MPN method was used for the DSHS studies and the CH2M HILL surveys. The membrane filtration technique was used for the remaining measurements.

## Reference Data

Reference data were based on Washington state standards for fecal coliform bacteria concentrations in water (Ecology and DSHS) and in shellfish (DSHS). Ecology standards for fecal coliform bacteria for the waters of the Bellingham Bay study area are as follows:

- Class A Marine—"...shall not exceed a geometric mean value of 14 organisms/100 mL with not more than 10 percent of samples exceeding 43 organisms/100 mL" [WAC 173-201-045(2)(c)(i)(B)]
- Class B Marine—"...shall not exceed a geometric mean value of 100 organisms/100 mL, with not more than 10 percent of samples exceeding 200 organisms/100 mL" [WAC 173-201-045(3)(c)(i)(B)]
- Class A Fresh—"...shall not exceed a geometric mean value of 100 organisms/100 mL, with not more than 10 percent of samples exceeding 200 organisms/100 mL" [WAC 173-201-045(2)(c)(i)(A)].

The maximum allowable fecal coliform bacteria concentrations for commercial shellfish harvesting areas certified by DSHS are as follows:

- Shellfish tissue—230 organisms/100 grams (FDA guideline)
- Water—A median of 14 organisms/100 mL with not more than 10 percent of the samples exceeding 43 organisms/100 mL (note: this standard is similar to the Class A standard for marine waters; see above).

## Elevation Above Reference Analysis

Geometric means for fecal coliform bacteria concentrations were calculated from all available information. For stations where only one value was available, that value is presented in this report. EAR values were calculated as the quotient of the geometric mean bacteria concentration divided by the appropriate regulatory standard (see above). Therefore, EAR values greater than 1 indicate that the geometric mean bacterial concentration failed to meet the water quality standard, and EAR values below 1 indicate that the geometric mean bacteria concentration met the water quality standard. For example, the geometric mean concentration of fecal coliform bacteria at Station EC03 is <1.4 organisms/100 mL (see Table 18). Because the Class A marine water quality standard is 14 organisms/100 mL, the calculated EAR value for this station is <0.10.

Note that the Class A water quality standards for fresh water and the Class B water quality standard for marine water are both 100 organisms/100 mL, and the maximum allowable concentration of fecal coliform bacteria in shellfish tissue is 230 organisms/100 grams. The detection limit reported in each data source was used for the undetected values in the calculations.

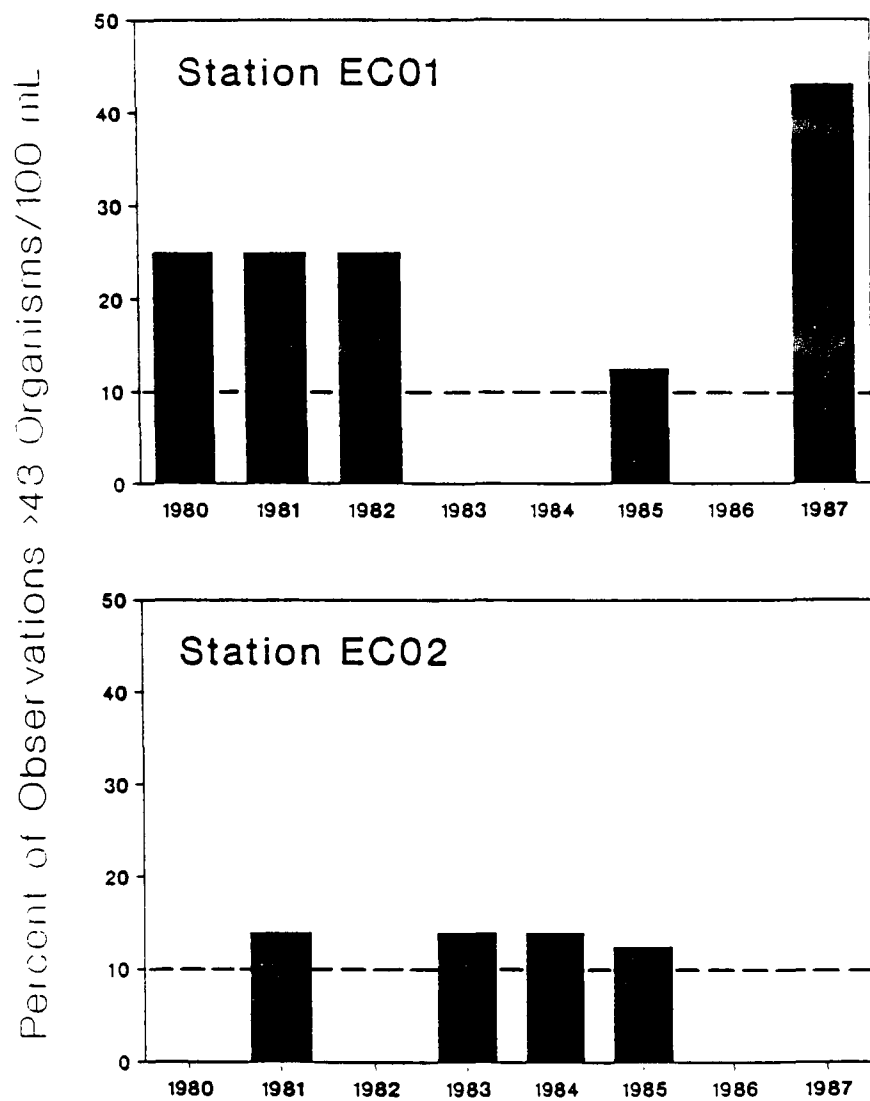
**Marine Waters**—The Class A marine water quality standard of 14 organisms/100 mL was exceeded at two stations from the 1980 Ecology survey. The highest EAR values were detected in the vicinity of the Georgia-Pacific deepwater outfall. Stations ST12 and ST13 (Figure 23) had EAR values of 4.64 and 4.00, respectively. These samples were collected on 8 April 1980. However, these values may be the result of the presence of the fecal coliform bacterium *Klebsiella*, which is commonly found associated with pulp mill effluents and is not specific to mammalian fecal material.

As noted previously, the second component of the Class A marine water quality standards states that "not more than 10 percent of samples exceeding 43 organisms/100 mL" (WAC 173-201-045). This standard was not exceeded at the Point Francis ambient monitoring station (EC03) between 1982 and 1987 (Solomon, F., 23 March 1989, personal communication). However, this standard was exceeded four times between 1980 and 1987 at the Post Point ambient monitoring station (EC02) and five times between 1980 and 1987 at the Starr Rock ambient monitoring station (EC01) (Figure 25) (U.S. EPA 1989; Solomon, F., 23 March 1989, personal communication).

**Fresh Waters**—The Class A freshwater standard of 100 organisms/100 mL was exceeded at all freshwater stations evaluated (Table 18). The greatest exceedance of the freshwater standard was at Padden Creek (EAR=3.31), followed by Whatcom Creek (EAR=2.91), Chuckanut Creek (EAR=2.64), Nooksack River (EAR=1.51), and Squalicum Creek (EAR=1.21). No explanations for these elevated values were provided by CH2M HILL (1984).

**Storm Drains**—No information was found for measurements of fecal coliform bacteria in storm drains in the Bellingham Bay study area.

**Shellfish**—Shellfish at only one station (CO03) in Portage Bay exhibited fecal coliform bacteria concentrations in tissue greater than the FDA guideline of 230 organisms/100 grams of tissue (EAR=3.43). Although four of the seven individual samples of Post Point (Station FA01) exceeded



(Class A water quality standard = 10%)

Note: The standard was not exceeded at station EC03 during any year (i.e., 1982-1987)

Figure 25. Percent of fecal coliform bacteria observations that violated the Class A water quality standard

the FDA standard, the geometric mean for all samples collected at this location was less than 130 (Table 18).

**Septic System Failures**—Measurement of fecal coliform bacterial concentrations in surface water drainage in the residential area south of Marine Drive, west of the cement plant pier, and east of the cement plant in Bellingham indicate untreated sewage was entering Bellingham Bay in this area (Figure 23). During a survey of drainage in this area (1980-1981), three of four residential septic tanks were determined to be contributing to high levels of fecal coliform bacteria in the surface water (Kloc, B., 1 March 1989, personal communication). The surface water drains into Bellingham Bay via the beach in this area. The septic tank problem is currently about 90 percent corrected (Kloc, B., 1 March 1989, personal communication).

Kloc (1 March 1989, personal communication) described one occasion when the sanitary sewer became plugged and raw sewage was diverted to Padden Creek. This situation was discovered quickly and corrected within a few hours.



## DATA SUMMARY: EUTROPHICATION

Eutrophication in marine waters can result in large amounts of organic material (e.g., phytoplankton, raw sewage) decomposing in a body of water. Decomposition of organic material consumes dissolved oxygen, and eutrophic environments generally have low dissolved oxygen concentrations in near-bottom waters. Low dissolved oxygen concentrations cause physiological stress to demersal, epibenthic, and benthic organisms that may exacerbate toxic stress. In extreme cases, low dissolved oxygen concentrations can result in the mortality of these organisms. Nutrient enrichment can increase algal biomass in environments where low nutrient concentrations limit algal growth. In such environments, nutrient inputs can contribute indirectly to problems of low dissolved oxygen caused by algal decomposition.

## DATA SYNTHESIS

### Choice of Indicators

Eutrophic conditions in Bellingham Bay were evaluated by analyzing the concentrations of dissolved oxygen, nitrate-nitrogen, ammonia-nitrogen, and phosphate in surface, mid-water, and near-bottom waters. Only data collected after 1979 were evaluated, because earlier information was not considered representative of present conditions in the bay.

### Available Data and Station Locations

Ecology's ambient water quality monitoring program provided the most representative information on dissolved oxygen, nitrogen, and phosphorus for Bellingham Bay. These data were obtained from the EPA STORET system (U.S. EPA 1989; Solomon, F., 23 March 1989, personal communication). Water quality data were collected at the same three locations in Bellingham Bay described previously for microbial contamination: Stations EC01, EC02, and EC03 (Figure 26). Information collected from 1980 to 1987 was analyzed for Stations EC01 and EC02 and data obtained from 1982 to 1988 were evaluated for Station EC03. Station codes are defined in Appendix A, Table A-1.

## DISSOLVED OXYGEN

The water quality standard for Class A marine waters in Washington specifies that "dissolved oxygen shall not be reduced below 6.0 mg/L" [WAC 172-201-045(2)(c)(ii)(B)]. Monthly trends in dissolved oxygen concentrations for the period of study at each of the ambient monitoring stations are presented in Figure 27. Dissolved oxygen concentrations were depressed below this level several times at each ambient monitoring station within Bellingham Bay. At Station EC01, concentrations were below 6.0 mg/L 10 times between 1980 and 1987. All but two of these low measurements occurred in near-bottom waters. A dissolved oxygen concentration of 4.2 mg/L was recorded on 6 September 1983 at a depth of 10 meters below the surface. At Station EC02, dissolved oxygen levels were below 6.0 mg/L on 16 occasions between 1980 and 1987. Ten of these

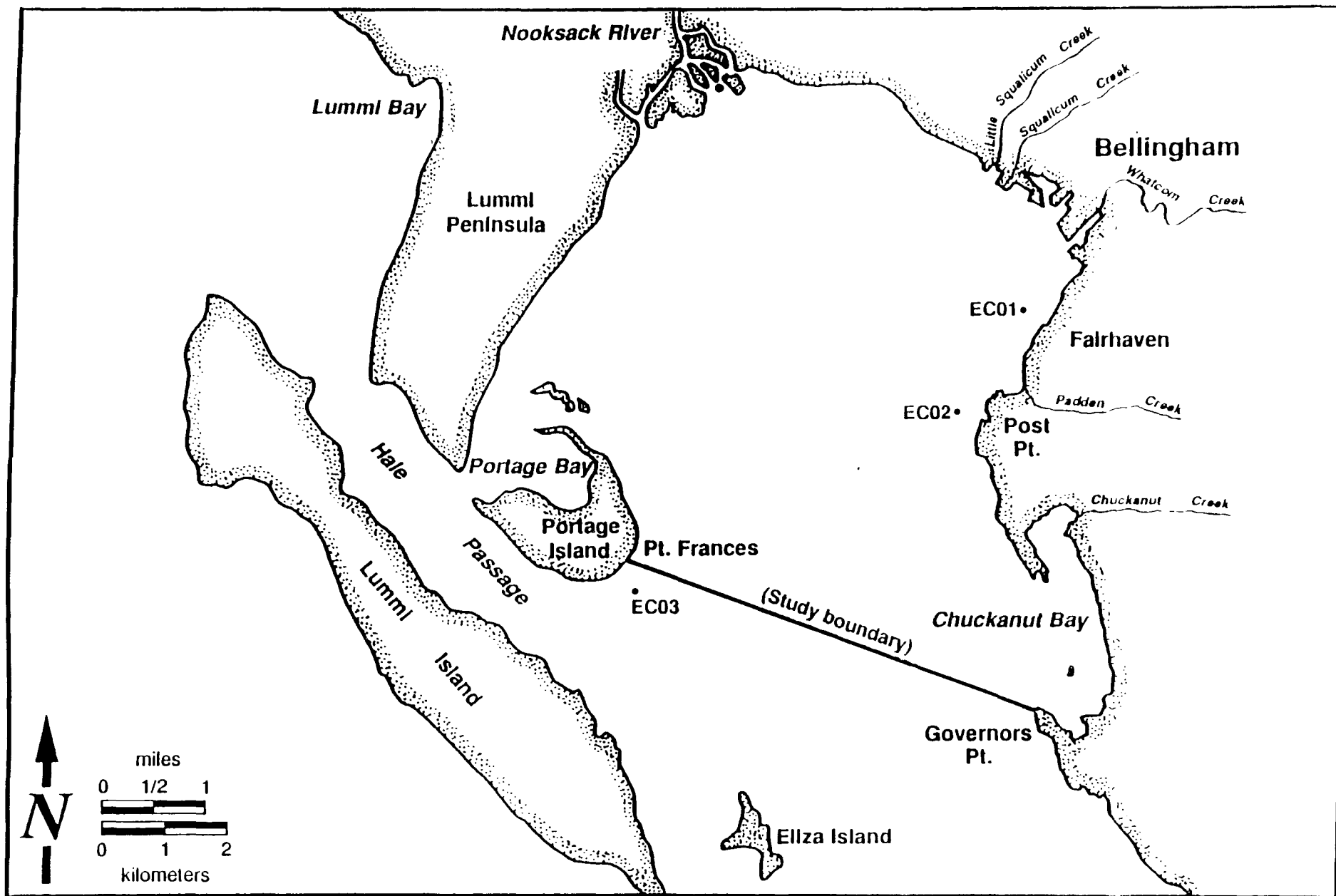


Figure 26. Locations of stations sampled for dissolved oxygen, nitrogen, and phosphate in the water column

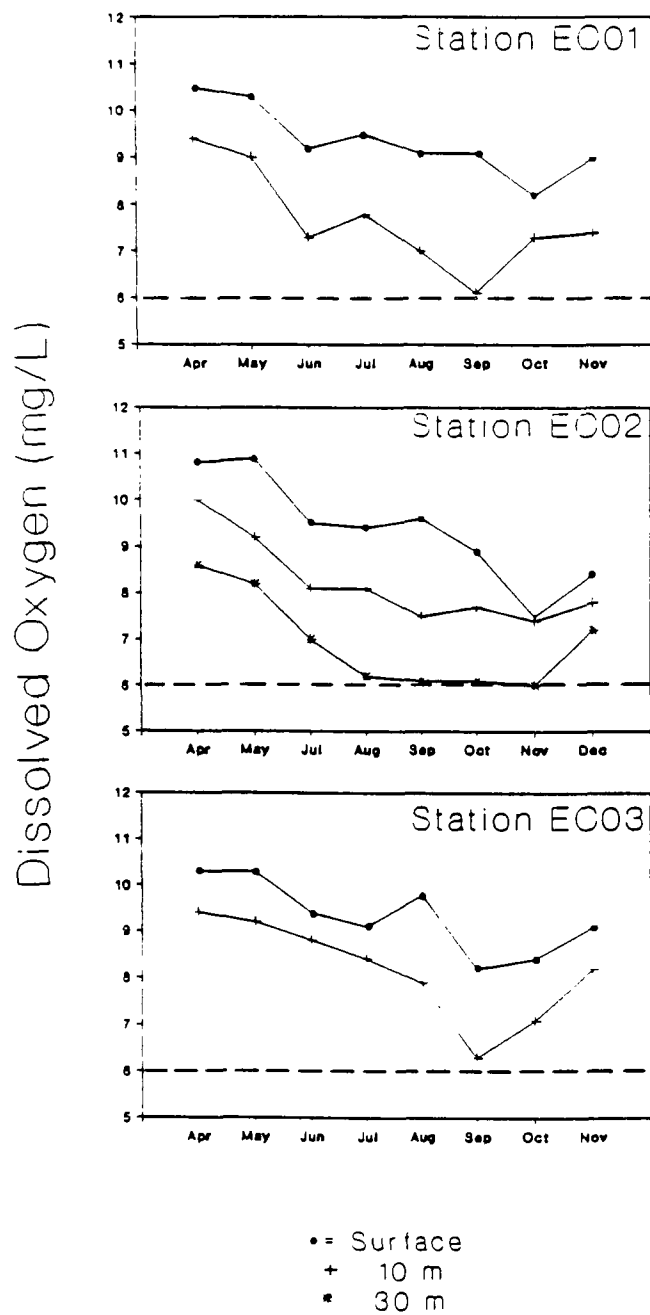


Figure 27. Monthly variation of dissolved oxygen concentrations averaged over the period 1980-1988

occurrences took place in near-bottom waters (i.e., 30 meters below the surface). Of the remaining occurrences, four were found at a depth of 10 meters below the surface and two were found at the surface. The lowest measurement (4.1 mg/L) was found at the surface on 1 October 1985. Slightly depressed dissolved oxygen measurements were found on three occasions at Station EC03 between 1982 and 1988. The lowest value of 5.6 mg/L was measured at the surface on 1 July 1987.

## NUTRIENTS

### Nitrogen

There are no water quality standards for nitrogen in marine waters of Washington. Nitrogen concentrations in the water column can influence primary productivity and thus indirectly affect dissolved oxygen concentrations. Nitrogen concentrations in the waters of Bellingham Bay are presented in this report as the sum of nitrate and ammonia, which are forms of nitrogen readily available for assimilation by phytoplankton.

Monthly geometric means of nitrogen concentration were calculated for various depths at Stations EC01, EC02, and EC03 (Figure 28). Surface concentrations at Station EC01 were lowest during July and August. At this station, concentrations were greater at the 10-meter depth than at the surface for all months evaluated. Trends in nitrogen concentrations at Station EC03 were similar to those at Station EC01, except the lowest concentrations extended from June, July, August, and October. Nitrogen concentrations at this station were greater at the 10-meter depth than at the surface for each month. At Station EC02, nitrogen concentrations increased with increasing depth for all months except October and November. During these two months, concentrations were greatest at the 10-meter depth. The lowest nitrogen concentrations occurred in June, July, and August. Nitrogen concentrations at all three stations were inversely related to amount of sunlight available for photosynthesis.

### Phosphorus

There are no water quality standards for phosphorus concentrations in marine waters of Washington. Like nitrogen, phosphorus concentrations in the water column affect primary productivity and thus indirectly affect dissolved oxygen concentrations. The form of phosphorus used in this report for evaluation is orthophosphate, the form most readily taken up by phytoplankton.

Geometric mean concentrations of phosphate were calculated monthly for various depths at Stations EC01, EC02, and EC03 (Figure 29). At Station EC03, phosphate concentrations were greater at the 10-meter depth than at the surface. Also, concentrations decreased in the summer months and then increased again in the fall. The highest phosphate measurements were found in samples taken from the 10-meter depth in September. Trends in phosphate concentrations at Station EC01 were similar to those at Station EC03. The greatest concentrations of phosphate at this station were recorded in November for both the surface and 10-meter depths. Differences among depths were much greater at Station EC01 than EC03. Phosphate concentrations at Station EC02 also exhibited an increase with increasing depth for all months except November. During November, the geometric mean concentration of phosphate was almost equal at the surface, 10-meter, and 30-meter depths. The lowest concentration of phosphate at the surface occurred in June and August.

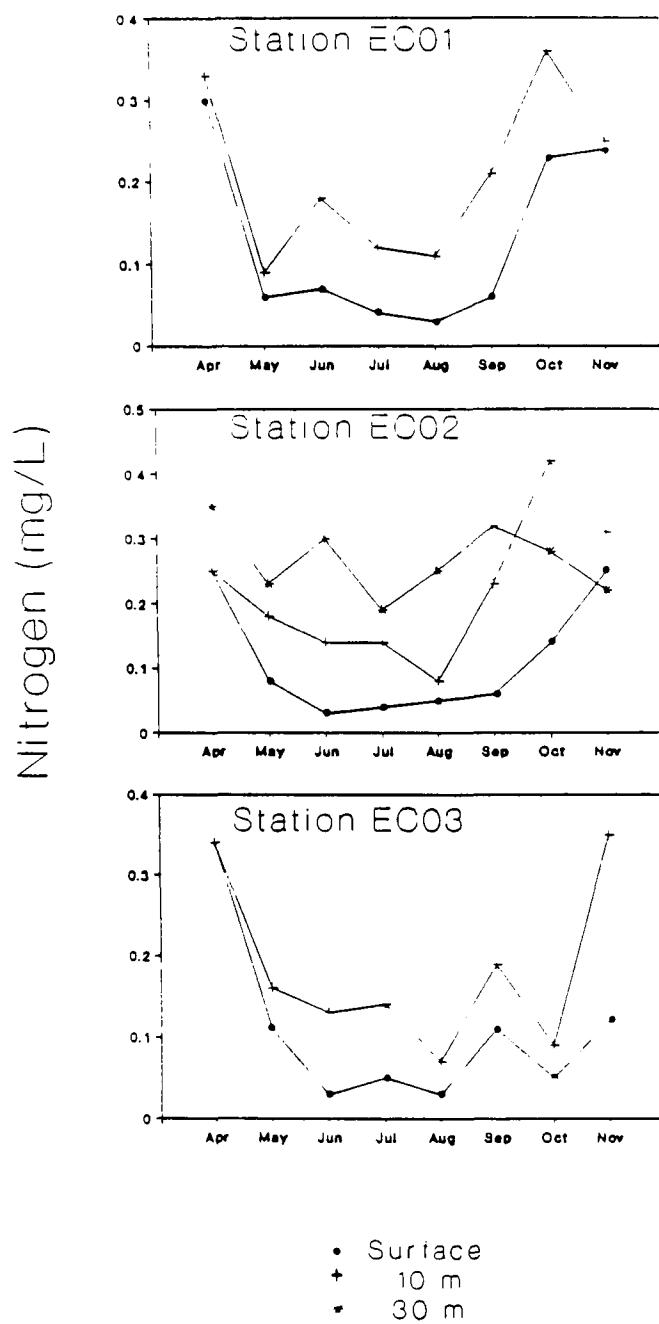


Figure 28. Monthly variation of nitrogen concentrations averaged over the period 1980-1988

Phosphate (mg/L)

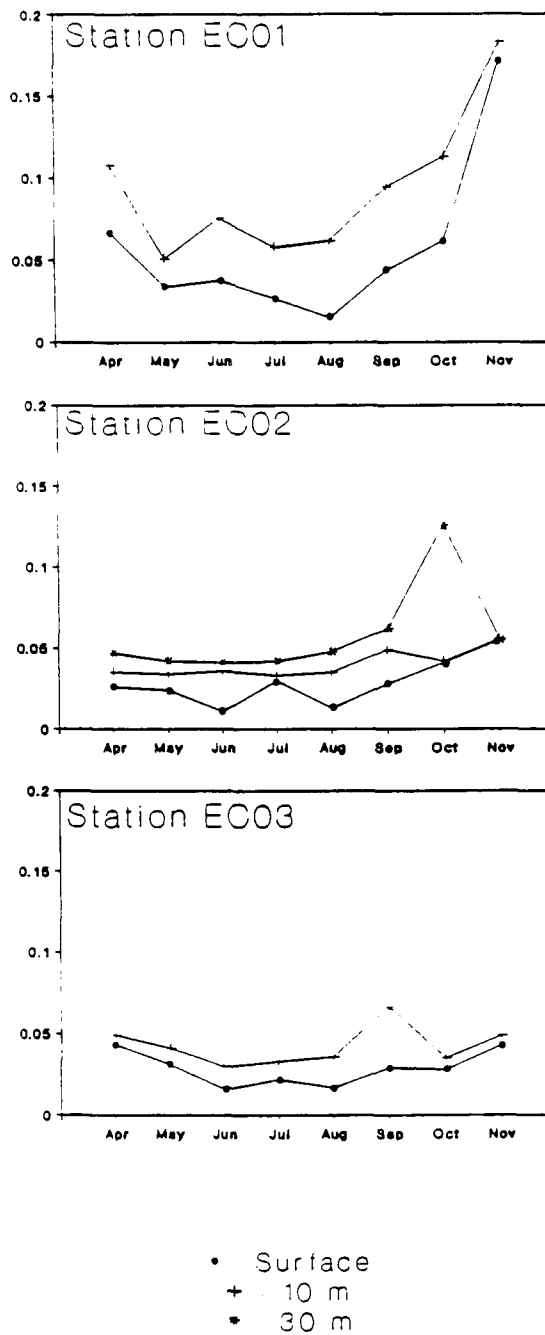


Figure 29. Monthly variation of phosphate concentrations averaged over the period 1980-1988

## IDENTIFICATION OF PROBLEM STATIONS

### CHEMICAL CONTAMINATION

Indicators of chemical contamination and biological effects at each station in Bellingham Bay were evaluated for problem station identification using the action-level criteria presented in Table 1. Concentrations of organic compounds and metals were considered moderately significant for problem area identification if they exceeded their respective LAET. Concentrations were classified as highly significant if they exceeded their respective HAET. Values of amphipod mortality were considered moderately significant for problem station identification if they could be discriminated statistically from the reference value in Sequim Bay. Values were classified as highly significant if they exceeded 50 percent. Abundances of benthic macroinvertebrate major taxa were considered moderately significant for problem area identification if they were depressed below reference abundances by 80 percent or more. Depressed abundances were considered highly significant if they exceeded 95 percent.

A station was considered a problem station if any one indicator was highly significant or if any two indicators were moderately significant. A station was considered a potential problem station if any single indicator was moderately significant, but not highly significant.

Of the total of 66 stations evaluated, 53 stations (80 percent) were characterized by only a single indicator (Table 19). Six stations were characterized by two indicators, seven stations were characterized by three indicators, and no stations were characterized by all four indicators. Concentrations of organic compounds were not significant for any station, and therefore did not contribute to the identification of problem stations. Concentrations of metals were highly significant at only one station, but were moderately significant at 18 stations. In all but one instance (i.e., copper at Station BA03), mercury was elevated above its LAET. Values of amphipod mortality were highly significant at a single station, and moderately significant at two stations. Depressed abundances of benthic macroinvertebrate major taxa exhibited the largest number of highly significant values (9) of any of the four indicators. Depressed abundances were moderately significant at 12 stations.

Thirteen stations were classified as problem stations according to the action-level criteria (Table 20; Figures 30 and 31). These stations were grouped into the following four problem areas:

- Mouth of Whatcom Creek Waterway (five stations)
- Area near the terminus of the Georgia-Pacific outfall (two stations)
- Area immediately inshore of the terminus of the Post Point WWTP outfall (five stations)
- A small area off the Fairhaven shoreline (one station).

The first three problem areas are located near potential sources of contamination (i.e., Whatcom Creek Waterway and its surrounding upland areas, the Georgia-Pacific outfall, and the Post Point WWTP outfall), whereas the fourth area is not located near an obvious potential contaminant source.

TABLE 19. STATION CHARACTERISTICS RELATIVE  
TO PROBLEM AREA IDENTIFICATION<sup>a</sup>

Station	Indicator			
	Organic Compounds <sup>b</sup>	Metals <sup>c</sup>	Toxicity <sup>d</sup>	Benthic Effects <sup>e</sup>
BA01	--	ns	--	--
BA02	--	ns	--	--
BA03	ns	*	ns	--
BA04	ns	**	--	--
BA05	ns	*	*	--
BA06	--	*	--	--
BA07	ns	*	ns	--
BA08	--	ns	--	--
BA09	--	*	--	--
BA10	--	ns	--	--
BA11	ns	*	ns	--
BA12	ns	*	ns	--
BA13	--	ns	--	--
BA14	--	*	--	--
BA15	--	*	--	--
BA16	--	*	--	--
BA17	--	ns	--	--
BA18	--	ns	--	--
BA19	--	ns	--	--
BA20	--	ns	--	--
BA21	--	ns	--	--
BA22	--	ns	--	--
BA23	ns	*	**	--
BA24	ns	*	ns	--
BA25	--	*	--	--
BA26	--	*	--	--
BR01	--	--	--	*
BR02	--	--	--	ns
BR03	--	--	--	**
BR04	--	--	--	**
BR05	--	--	--	--
BR06	--	--	--	ns
BR07	--	--	--	**
BR08	--	--	--	ns
BR09	--	--	--	*
BR10	--	--	--	--
BR11	--	--	--	*
BR12	--	--	--	ns



TABLE 19. (Continued)

Station	Indicator			
	Organic Compounds <sup>b</sup>	Metals <sup>c</sup>	Toxicity <sup>d</sup>	Benthic Effects <sup>e</sup>
BR13	--	--	--	ns
BR14	--	--	--	*
BR15	--	--	--	**
BR16	--	--	--	**
BR17	--	--	--	ns
BR18	--	--	--	*
BR19	--	--	--	*
BR20	--	--	--	ns
BR21	--	--	--	ns
BR22	--	--	--	ns
CH01	--	--	--	**
CH02	--	--	--	ns
CH03	--	--	--	**
CH04	--	--	--	*
CH05	--	--	--	*
CH06	--	--	--	*
CH07	--	ns	--	ns
CH08	--	--	--	**
CH09	--	--	--	**
CH10	--	--	--	ns
CH11	--	*	--	ns
CH12	--	--	--	*
CH13	--	--	--	*
CH14	--	--	--	*
MA01	ns	*	--	--
MA02	ns	*	--	--
RE01	--	*	*	--
RE02	--	ns	--	--

<sup>a</sup> A dash (--) signifies that no data were available at a station for a particular indicator.

<sup>b</sup> ns = all concentrations < LAET.

<sup>c</sup> ns = all concentrations < LAET  
 \* = any concentration > LAET  
 \*\* = any concentration > HAET.

<sup>d</sup> ns = amphipod mortality not significant ( $P > 0.05$ )  
 \* = mortality significant ( $P \leq 0.05$ ) and < 50%  
 \*\* = mortality significant ( $P \leq 0.05$ ) and > 50%.

<sup>e</sup> ns = no taxon depression > 80%  
 \* = at least one taxon depression > 80%, but < 95%  
 \*\* = at least one taxon depression > 95%.

TABLE 20. PROBLEM STATIONS AND POTENTIAL PROBLEM STATIONS WITH RESPECT TO CHEMICAL CONTAMINATION IN BELLINGHAM BAY<sup>a</sup>

Classification	Station	Significant Indicator
Problem station	BA04	Metals
	BA05	Metals, toxicity
	BA23	Metals, toxicity
	BR03	Benthos
	BR04	Benthos
	BR07	Benthos
	BR15	Benthos
	BR16	Benthos
	CH01	Benthos
	CH03	Benthos
	CH08	Benthos
	CH09	Benthos
	RE01	Metals, toxicity
Potential problem station	BA03	Metals
	BA06	Metals
	BA07	Metals
	BA09	Metals
	BA11	Metals
	BA12	Metals
	BA14	Metals
	BA15	Metals
	BA16	Metals
	BA23	Metals
	BA24	Metals
	BA25	Metals
	BA26	Metals
	BR09	Benthos
	BR11	Benthos
	BR14	Benthos
	BR18	Benthos
	BR19	Benthos
	CH04	Benthos
	CH05	Benthos
	CH06	Benthos
	CH12	Benthos
	CH13	Benthos
	CH14	Benthos
	MA01	Metals
	MA02	Metals

<sup>a</sup> Classifications were based on information presented in Table 19.

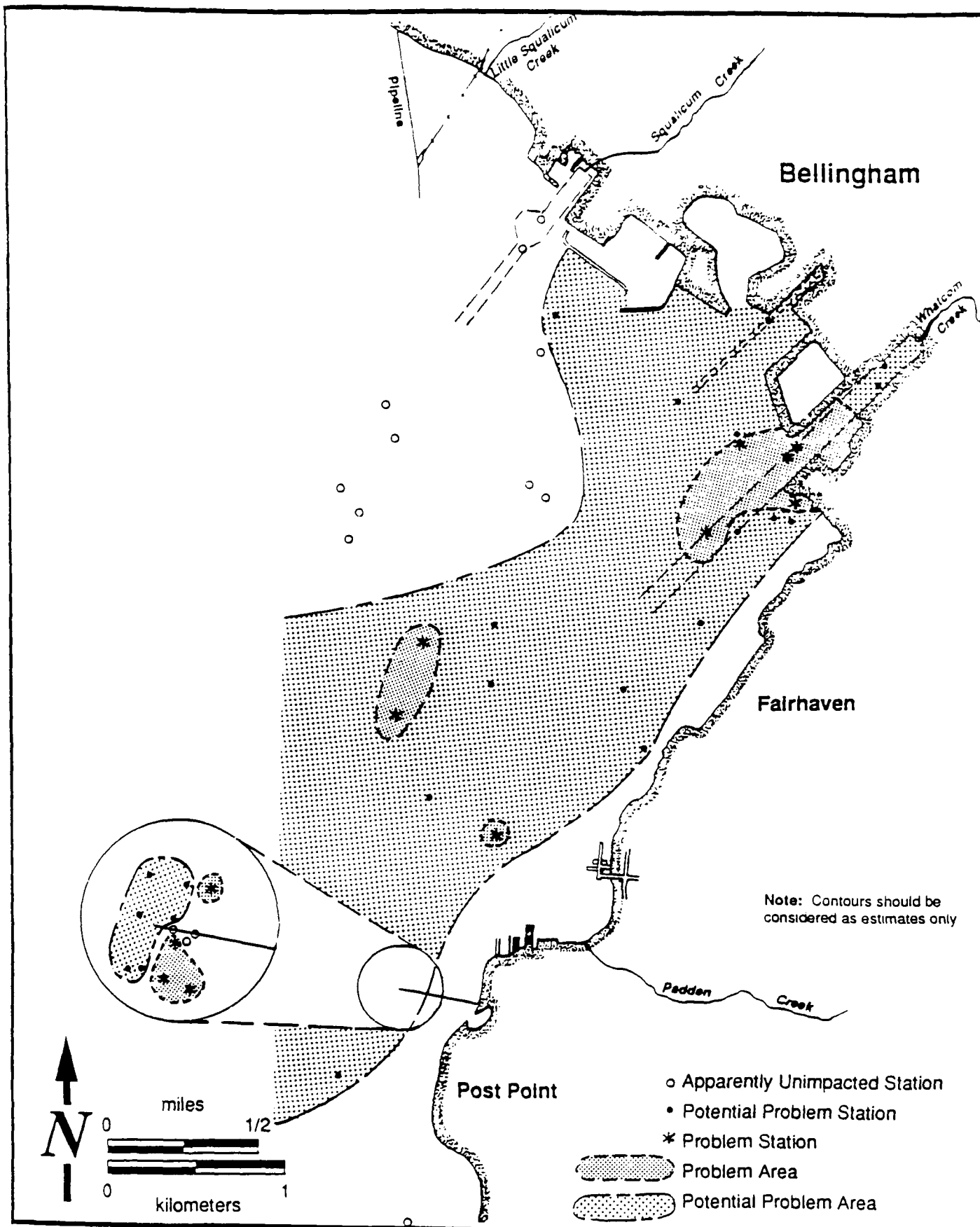


Figure 30. Classification of stations in inner Bellingham Bay according to action-level criteria

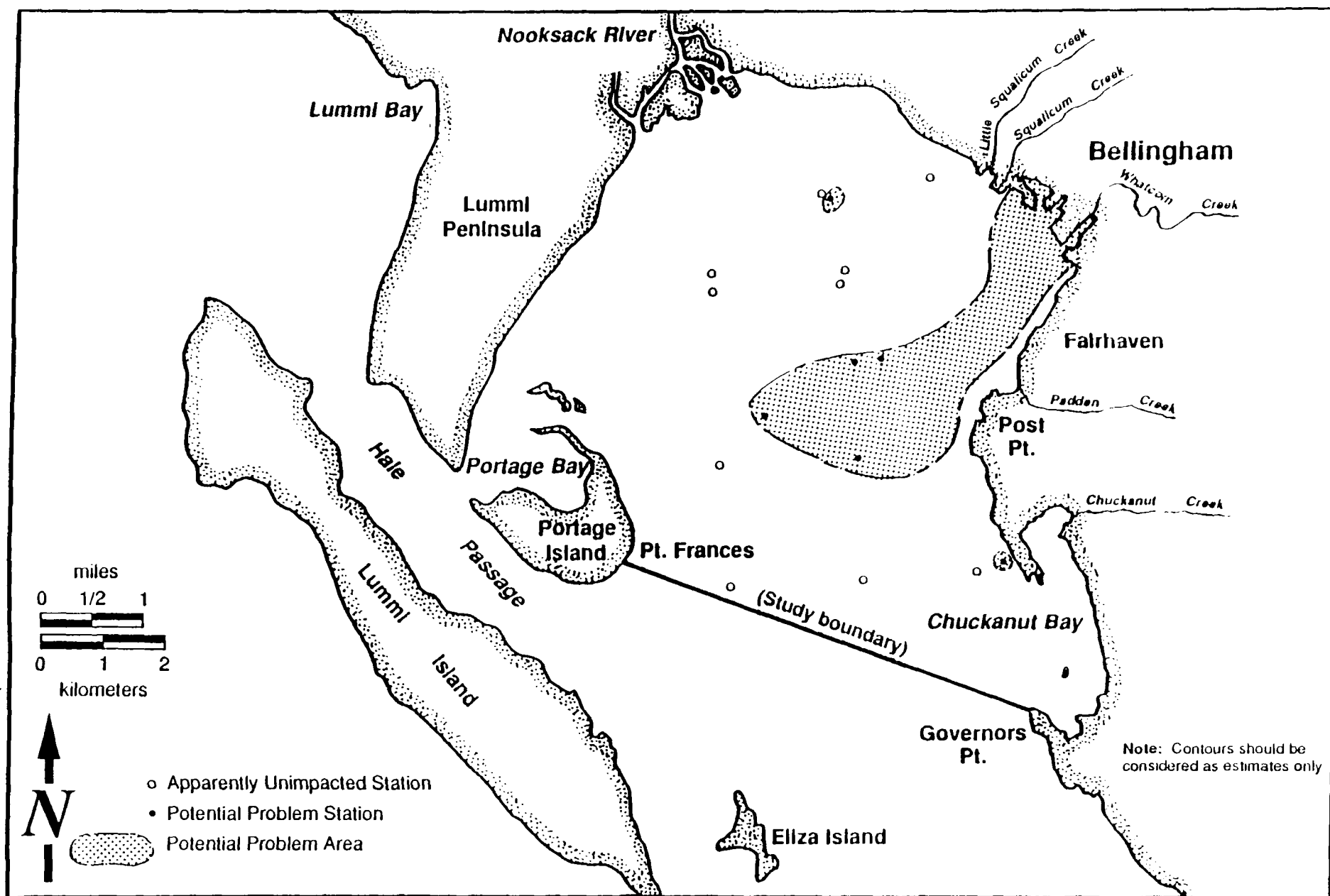


Figure 31. Classification of stations in outer Bellingham Bay according to action-level criteria

Twenty-six stations were classified as potential problem stations (Table 20; Figures 30 and 31). Most of these stations were located in a large group that extended from the I&J Street and Whatcom Creek waterways along the eastern shoreline of Bellingham Bay to Post Point, and then into the central part of the bay. Only two stations (BR11 and CH11) were separate from the large group. The large group encompassed the four problem areas.

## MICROBIAL CONTAMINATION

Problem stations with respect to microbial contamination in Bellingham Bay were identified on the basis of violations of the Washington state water quality standards and the FDA guideline for tissues. For marine waters, the state standards for geometric mean bacterial concentrations in Class A and B waters (i.e., 14 and 100 organisms/100 mL, respectively) were violated at Stations ST12 and ST13 near the Georgia-Pacific deepwater outfall. However, a large fraction of the bacteria could have been comprised of *Klebsiella*, which is a fecal coliform bacteria often associated with pulp mill discharges, but not specific to mammalian fecal pollution. The second state standard for Class A marine waters (i.e., no more than 10 percent of samples exceeding 43 organisms/100 mL) was violated five times between 1980 and 1987 at Station EC01 near the Starr Rock dredged material disposal area, and four times during the same time period at Station EC02 near the Post Point WWTP outfall.

For fresh waters, the state standard for Class A waters (i.e., 100 organisms/100 mL) was violated at all five stations evaluated in this study. All of those stations were located at the mouths of the five major sources of fresh water to Bellingham Bay (i.e., Nooksack River, Squalicum Creek, Whatcom Creek, Padden Creek, and Chuckanut Creek). The EAR values at the two former sources were less than or equal to 1.5, whereas the EAR values at the latter three sources were greater than 2.5.

For shellfish tissue, the FDA guideline of 230 organisms/100 grams was violated on the basis of geometric mean values only at Station CO03 in Portage Bay. On the basis of individual shellfish, the standard was violated at Stations CO01 and CO03 in Portage Bay and at Station FA01 off Post Point.

## EUTROPHICATION

Problem stations with respect to eutrophication in Bellingham Bay were identified on the basis of violations of the Washington state water quality standard of 6.0 mg/L for Class A marine waters. Concentrations of dissolved oxygen were evaluated for only three stations in Bellingham Bay. The state standard was violated at least one time since 1980 at all three stations. However, the total number of violations during that period was highest for Station EC002 near the Post Point WWTP outfall (16 violations), lowest for Station EC03 near Point Francis (3 violations), and intermediate in magnitude at Station EC01 near the Starr Rock dredged material disposal site. Concentrations lower than 5.0 mg/L were observed twice at Stations EC01 and EC02. Concentrations lower than 4.0 mg/L were not observed at any site.

## IDENTIFICATION OF DATA GAPS AND RECOMMENDATIONS

Although a large amount of information was reviewed for this report, important gaps were found in the historical database and are identified in this section. A data gap was considered important if it substantially limited the degree to which a comprehensive evaluation of environmental degradation in Bellingham Bay could be conducted. In most cases, additional field sampling would be required to collect this missing information.

### CONTAMINANT SOURCES

Almost no information was found on contaminant input to Bellingham Bay from the Nooksack River and storm drains. In addition, few environmental samples were collected near either of these potential contaminant sources. The Nooksack River should be evaluated as a potential contaminant source because it drains a large area influenced by agricultural activities and several small communities. In addition, the river is the major source of fresh water to the bay. Storm drains should be evaluated because many drain industrial and urban areas throughout the city of Bellingham during storm events. This surface runoff could sometimes contain substantial quantities and concentrations of contaminants.

### INDICATORS OF CONTAMINATION

A relatively large amount of historical information was found for metals concentrations in sediment and for abundances of benthic macroinvertebrates in Bellingham Bay. By contrast, a small amount of information was available for other important indicators of contamination such as organic compounds in sediment, sediment toxicity, bioaccumulation, and fish pathology. Additional information on several of these latter indicators would be helpful in providing a more comprehensive assessment of environmental degradation in the bay.

For chemical contaminants in general, vertical profiles of contamination at selected locations in Bellingham Bay would be useful for evaluating whether subsurface sediments could cause environmental problems if they were exposed by natural processes (e.g., current scour, organism burrowing) or anthropogenic activities (e.g., dredging). Vertical profiles would also be useful for evaluating historical patterns and sources of contamination, temporal variability of contaminant concentrations in the environment, and the likely recovery periods if present contaminant sources are controlled.

For organic compounds, additional stations should be located in areas of Bellingham Bay near potential contaminant sources or in areas that have not been sampled previously using appropriate detection limits. Examples of such areas include the Squalicum Harbor marina, Squalicum Waterway, the area near the Georgia-Pacific deepwater outfall, the area near the Post Point WWTP outfall, and the mouth of the Nooksack River. In addition to sampling more stations, a greater range of chemicals should be analyzed for, such as pesticides, dioxins, tributyltin, and compounds characteristic of pulp mill discharges (e.g., alkylated phenols, guaiacols, and resin acids).

For sediment toxicity, additional stations should be located in areas where chemical analyses suggest that sediment toxicity may be a problem. This tiered approach would probably require separate sampling efforts to collect sediments for chemical analyses and bioassays. It would be preferable if one or more bioassays were conducted in conjunction with the amphipod mortality test to evaluate other species that may be responsive to different contaminants than the amphipods. In addition, the use of a long-term bioassay in conjunction with the amphipod mortality test would be helpful in assessing the potential chronic toxicity of sediment contamination.

For bioaccumulation, contaminant concentrations in muscle tissue of crabs and whole body tissue of bivalve molluscs should be evaluated in the more contaminated areas of Bellingham Bay to evaluate the risk to human health from consumption of contaminated seafood. The target contaminants should be PCB and mercury because both chemicals can bioaccumulate to levels that threaten human health. In addition, studies have shown these contaminants to be elevated in sediments in several parts of the bay. The target species should include the Dungeness crab and a recreationally important bivalve. Dungeness crabs should be evaluated because they are harvested throughout Bellingham Bay. Recreationally important bivalves should be evaluated because they are relatively stationary, and therefore are highly susceptible to contamination from local sources. If bioaccumulation of contaminants is found to be a problem for crabs or bivalves, a survey of bioaccumulation in selected fishes (i.e., species that are commercially or economically important) should be considered.

For fish pathology, it is not recommended that evaluations of liver pathology be given a high priority in Bellingham Bay. Aromatic hydrocarbons are thought to be the primary causative agents of most observed cases of pathological conditions in livers of Puget Sound fishes. Because concentrations of these compounds are relatively low in the bay, the prevalences of liver lesions in fishes are also expected to be relatively low.

## GEOGRAPHIC LOCATIONS

Little information was found on contamination and biological effects in many nearshore areas of inner Bellingham Bay (e.g., the Fairhaven shoreline). Because many of these areas are influenced by surface drainage (e.g., through storm drains or creeks), it is recommended that they be prioritized with respect to the likelihood of contamination and that the areas having the highest priority be evaluated.

Very little information on contamination and biological effects was found for Chuckanut Bay and the entire northwest shoreline of Bellingham Bay, from Portage Bay to Little Squalicum Creek. Except for the Nooksack River, there are no major potential sources of contaminants in these areas. It therefore is unlikely that major environmental problems are present. However, nonpoint contaminant sources may influence these areas. Water currents may also carry contaminants into these areas. Therefore, a limited number of stations should be sampled at representative locations in these areas to identify any potential environmental problems.

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## GLOSSARY

**Acute toxicity**—toxic effects that result from a single exposure to a chemical or multiple exposure occurring during a relatively short time period.

**AET**—acronym for "apparent effects threshold"; refers to the concentration of a particular chemical above which adverse biological effects have always been found for a particular region (e.g., Puget Sound).

**Amphipod**—a small shrimplike crustacean belonging to the order Amphipoda; commonly referred to as sand fleas.

**Anadromous fish**—species, such as salmon, which hatch in fresh water, spend a large part of their lives in the ocean, and return to fresh water rivers and streams to reproduce.

**Assemblage**—a group of organisms (e.g., benthic macroinvertebrates) that occur together in the environment.

**Benthic organisms**—organisms that live in or on the bottom of a body of water.

**Bioaccumulation**—the accumulation of chemical contaminants in animal tissue.

**Bioassay**—a test procedure that measures the response of living plants, animals, or tissues to potential contaminants. 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 biological materials present in a sample as measured by a specific test. BOD is defined as a conventional pollutant under the Federal Clean Water Act.

**Biomass**—the weight of organism tissue.

**Biota**—the animal and plant life of a particular region.

**Bivalve**—a mollusc having a shell consisting of two hinged parts.

**Capping**—the technique of covering contaminated sediments with clean sediments in order to contain and isolate the contaminated material.

**Chronic effect**—any toxic effect on an organism that results after exposure of long duration (often 1/10th of the life span or more). The end result of a chronic effect can be death, although the usual effects are sublethal (e.g., inhibited reproduction or growth). These sublethal effects may be reflected by changes in the productivity and population structure of the community.

**Coliform bacteria**—a type of bacteria which includes many species. Fecal coliform bacteria are those coliform bacteria which are found in the intestinal tracts of warm-blooded animals. The presence of high numbers of fecal coliform bacteria in a water body can indicate the release of untreated sewage, 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 sewage and storm water. The overflow occurs because the system does not have the capacity to transport and treat the increased flow caused by stormwater runoff.

**Contaminant**—a substance that is not naturally present in the environment or is present in amounts that can, in sufficient concentration, adversely affect the environment.

**Conventional pollutant**—one of the pollutants specified under the federal Clean Water Act. The list includes total suspended solids, coliform bacteria, BOD, COD, pH, and oil and grease.

**Crustacean**—an invertebrate belonging to the class Crustacea; includes amphipods, crabs, and shrimp.

**Detection limit**—the minimum chemical concentration that can be reliably measured by a particular analytical technique or instrument.

**Dissolved oxygen (DO)**—oxygen which 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 or zero, then exposed aquatic animals will die.

**Diversity**—a measure of the complexity of a species assemblage based on the total number of species and the distribution of individual organisms among the species.

**Dredging**—any physical digging into the bottom of a water body.

**EAR**—acronym for "elevation above reference"; refers to the ratio between the value of a variable at a potentially impacted station and the value of the same variable at a reference site.

**Ecosystem**—an ecological assemblage together with its physical and chemical environment, considered as an integrated unit.

**Effluent**—the liquid that flows out of a facility or household into a water body or sewer system (e.g., the treated liquid discharged by a wastewater treatment plant is the plant's effluent).

**Eutrophication**—the condition in which minerals and organic nutrients in a body of water have increased to the extent that concentrations of dissolved oxygen are reduced and plant life is favored over animal life.

**HAET**—acronym for "highest apparent effects threshold"; refers to the highest AET value observed for a range of biological indicators.

**Hydrocarbon**—an organic compound that contains carbon and hydrogen.



**Invertebrate**—an animal that lacks a backbone (e.g., shellfish, insects, worms)

**Larvae**—one of the earliest stages of an animal that experiences multiple life stages before the adult stage is reached.

**LAET**—acronym for "lowest apparent effects threshold"; refers to the lowest AET value observed for a range of biological indicators.

**Lesion**—a wound or injury; a pathological tissue alteration.

**Macroinvertebrate**—an invertebrate that is retained by a sieve having a mesh size of 1.0 mm.

**Microtox**—a bioassay that measures light reductions in bacteria (commonly *Photobacterium phosphoreum*) following exposure to a stimulus; the light reductions are indicative of altered metabolic processes.

**Microorganism**—an organism of microscopic size (e.g., bacterium).

**Mollusc**—an invertebrate belonging to the phylum Mollusca; includes clams and snails.

**National Pollutant Discharge Elimination System (NPDES)**—a part of the federal Clean Water Act that requires permits for discharge of pollutants from any point source (e.g., an industrial outfall) into waters of the United States.

**Neoplasm**—an abnormal growth of new tissue; a tumor.

**Nonpoint source water pollution**—pollution that is not discharged through pipes. Nonpoint sources are related to either land or water use.

**Nutrients**—essential chemicals needed by plants or animals for growth. Excessive amounts of one nutrient or several nutrients can lead to the growth of excessive numbers of particular plants and/or degradation of water quality.

**Organic chemical**—a chemical that contains carbon.

**Pathology**—the anatomical or functional manifestations of disease.

**Point source water pollution**—pollution that is discharged through pipes.

**Polychaete**—an invertebrate belonging to the class Polychaeta; often referred to as marine worms.

**Polychlorinated biphenyls (PCB)**—a group of ubiquitous, environmentally persistent chlorinated hydrocarbons (between 12-68 percent chlorine). PCB were formerly used in insulating fluids in capacitors and transformers, in the plastics industry, and in hydraulic fluids and lubricants. PCB can cause cancer. They have caused birth defects in laboratory animals and are believed to be capable of causing birth defects in humans.

**Polycyclic aromatic hydrocarbons (PAH)** [sometimes called polynuclear aromatics (PNA)]—many ringed organic chemicals containing carbon and hydrogen formed as a result of incomplete combustion of organic materials (e.g., coal, coke, wood, tobacco). Some PAH can cause cancer.

**Pretreatment**—the treatment of industrial wastewater to remove contaminants prior to discharge into municipal sewage systems.

**Primary treatment**—a wastewater treatment method that uses settling, skimming, and chlorination to remove solids, floating materials, and pathogens from wastewater. Primary treatment typically removes about 35 percent of BOD and less than half of the metals and toxic organic substances.

**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 treatment.

**Sediment**—material suspended in or settling to the bottom of a liquid. As used here, it refers to the sand and mud that make up much of the shorelines and bottom of Lake Union and the Ship Canal.

**Shellfish**—an aquatic animal, such as a mollusc (clams and snails) or crustacean (crabs and shrimp), having a shell or shell-like exoskeleton.

**Storm drain**—a system of gutters, pipes, or ditches used to carry storm water from surrounding lands to streams, lakes, or Puget Sound. Often carries 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.

**Taxon**—a group of organisms constituting one of the formal groups or units of taxonomic classification.

**Toxicant**—a chemical that poses a risk of producing an adverse biological effect or in some way damaging a living organism.

**Tributyltin**—an antifouling agent used in boat paints which is highly toxic to aquatic life.

## **APPENDIX A**

### **Station Descriptions and Concentrations of Sediment Contaminants**

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**TABLE A-1. COORDINATES, DEPTHS, AND STUDY AREA DESIGNATIONS  
OF STATIONS USED FOR PROBLEM STATION IDENTIFICATION  
IN BELLINGHAM BAY**

Study Station <sup>a,b</sup>	Original Station <sup>c</sup>	Latitude	Longitude	Depth (m)
BA01	1	48°45'06.0"N	122°30'40.5"W	7
BA02	2	48°45'28.2"N	122°30'47.0"W	9
BA03	3	48°44'52.6"N	122°29'46.0"W	6
BA04	4	48°44'49.7"N	122°29'32.0"W	12
BA05	5	48°44'35.2"N	122°29'49.0"W	12
BA06	6	48°44'06.0"N	122°30'15.5"W	13
BA07	7	48°44'37.5"N	122°29'34.1"W	10
BA08	8	48°44'53.3"N	122°31'22.0"W	13
BA09	9	48°44'16.8"N	122°30'52.0"W	15
BA10	10	48°44'40.0"N	122°30'39.6"W	11
BA11	11	48°44'58.0"N	122°30'02.1"W	7
BA12	12	48°45'12.5"N	122°29'40.0"W	6
BA13	13	48°44'43.0"N	122°34'55.0"W	8
BA14	14	48°43'17.0"N	122°34'13.0"W	27
BA15	15	48°43'07.0"N	122°31'31.0"W	42
BA16	16	48°43'48.0"N	122°32'20.0"W	26
BA17	17	48°44'44.0"N	122°32'52.0"W	17
BA18	18	48°45'35.5"N	122°33'07.0"W	3
BA19	19	48°45'38.0"N	122°31'28.0"W	4
BA20	20	48°44'39.0"N	122°31'42.0"W	15
BA21	21	48°44'36.5"N	122°31'33.0"W	11
BA22	22	48°44'30.0"N	122°31'35.0"W	15
BA23	23	48°43'35.3"N	122°30'53.1"W	17
BA24	24	48°43'56.0"N	122°30'12.5"W	11
BA25	25	48°44'19.0"N	122°29'57.0"W	9
BA26	26	48°45'02.9"N	122°29'09.8"W	10
BR01	E01	48°45'14"N	122°30'39"W	6
BR02	E02	48°45'25"N	122°30'48"W	8
BR03	E03	48°44'50"N	122°29'43"W	5
BR04	E04	48°44'49"N	122°29'34"W	12
BR05	E05	48°44'34"N	122°29'53"W	14
BR06	E06	48°44'06"N	122°30'16"W	12
BR07	E07	48°44'37"N	122°29'33"W	11
BR08	E08	48°44'49"N	122°31'23"W	14
BR09	E09	48°44'16"N	122°30'54"W	14
BR10	E10	48°44'41"N	122°30'43"W	11
BR11	L01	48°45'30"N	122°33'00"W	8
BR12	L02	48°44'35"N	122°34'55"W	11
BR13	L03	48°44'35"N	122°32'55"W	15
BR14	L04	48°43'45"N	122°32'45"W	24
BR15	L05	48°44'00"N	122°31'20"W	18
BR16	L06	48°44'20"N	122°31'15"W	22
BR17	L07	48°42'46"N	122°34'55"W	27
BR18	L08	48°42'46"N	122°32'50"W	29
BR19	L09	48°42'55"N	122°31'35"W	27
BR20	L10	48°41'30"N	122°34'50"W	27
BR21	L11	48°41'30"N	122°32'46"W	26
BR22	L12	48°41'30"N	122°31'05"W	24

TABLE A-1. (Continued)

Study Station <sup>a,b</sup>	Original Station <sup>c</sup>	Latitude	Longitude	Depth (m)
CH01	A-1	48°43'17"N	122°31'14"W	20
CH02	A-2	48°43'11"N	122°31'18"W	20
CH03	A-3	48°43'04"N	122°31'21"W	20
CH04	B-1	48°43'46"N	122°31'10"W	20
CH05	B-2	48°43'18"N	122°31'20"W	23
CH06	B-3	48°43'12"N	122°31'22"W	23
CH07	B-4	48°43'11"N	122°31'22"W	23
CH08	B-5	48°43'10"N	122°31'22"W	23
CH09	B-6	48°43'05"N	122°31'26"W	23
CH10	B-7	48°42'26"N	122°31'12"W	23
CH11	B-8	48°41'35"N	122°30'40"W	23
CH12	C-1	48°43'20"N	122°31'29"W	27
CH13	C-2	48°43'13"N	122°31'32"W	28
CH14	C-3	48°43'07"N	122°31'35"W	28
CH15	Chuckanut Creek	(not reported)		
CH16	Padden Creek	(not reported)		
CH17	Whatcom Creek	(not reported)		
CH18	Squalicum Creek	(not reported)		
CH19	Nooksack River	(not reported)		
MA01	204199	(not reported)		
MA02	104200	(not reported)		
RE01	A	48°43'11"N	122°31'19"W	25
RE02	B	48°43'12"N	122°31'25"W	25
EC01	BLL009	(not reported)		
EC02	BLL008	(not reported)		
EC03	BLL006	(not reported)		
CL01	10	(not reported)		
CL02	11	(not reported)		
CL03	12	(not reported)		
CL04	13	(not reported)		
CL05	14	(not reported)		
CL06	15	(not reported)		
CL07	16	(not reported)		
ST01	1	(not reported)		
ST02	2	(not reported)		
ST03	3	(not reported)		
ST04	4	(not reported)		
ST05	5	(not reported)		
ST06	6	(not reported)		
ST07	7	(not reported)		
ST08	8	(not reported)		
ST09	9	(not reported)		
ST10	10	(not reported)		
ST11	11	(not reported)		
ST12	12	(not reported)		
ST13	13	(not reported)		
ST14	14	(not reported)		

TABLE A-1. (Continued)

Study Station <sup>a,b</sup>	Original Station <sup>c</sup>	Latitude	Longitude	Depth (m)
C001	A	(not reported)		
C002	B	(not reported)		
C003	C	(not reported)		
FA01	PP	(not reported)		

<sup>a</sup> New station names given as part of this study.

<sup>b</sup> Station prefixes relate to original studies as follows:

BA = Battelle (1986)  
 BR = Broad et al. (1983)  
 CH = CH2M HILL (1984)  
 RE = Reif (1988)  
 MA = Malins et al. (1982).  
 EC = U.S. EPA 1989  
 CL = Cleland (1985)  
 ST = Stanley (1980)  
 CO = Cook (1985)  
 FA = Faigenblum (1988)

<sup>c</sup> Station names given in original studies.

**TABLE A-2. CONCENTRATIONS OF SEDIMENT CONTAMINANTS  
IN BELLINGHAM BAY, AS REPORTED BY THE ORIGINAL INVESTIGATORS\***

	Malins et al. (1982)		Reif (1988)		CH2M HILL (1984)		Bartelle (1986) - 1983 Data											
	MA01	MA02	RE01	RE02	CH07	CH11	BA01	BA02	BA03	BA04	BA05	BA06	BA07	BA08	BA09	BA10	BA11	BA12
<b>Low Molecular Weight PAH</b> (µg/kg dry weight)																		
Total LPAH			U800	U1,000	U2,400	U2,400												
Naphthalene			U310	U400	U400	U400												
Acenaphthylene			U19	U25	U400	U400												
Acenaphthene			U110	U140	U400	U400												
Fluorene			U110	U140	U400	U400												
Phenanthrene			U160	U210	U400	U400												
Anthracene			U87	U110	U400	U400												
<b>High Molecular Weight PAH</b> (µg/kg dry weight)																		
Total HPAH			U1,800	U2,000 <sup>b</sup>	U3,200 <sup>b</sup>	U3,200 <sup>b</sup>												
Fluoranthene			U340	U440	U400	U400												
Pyrene			U310	U400	U400	U400												
Benzo(a)anthracene			U240	U310	U400	U400												
Chrysene			U76	U98	U400	U400												
Benzofluoranthene			U400	U510	U800	U800												
Benzo(ghi)perylene			U180	U230	U400	U400												
Dibenzo(a,h)anthracene			U190	U250 <sup>c</sup>	U400 <sup>c</sup>	U400 <sup>c</sup>												
Indeno(1,2,3-cd)pyrene			U41	U53	U400	U400												
<b>Phthalates (µg/kg dry weight)</b>																		
Bis(2-ethylhexyl)phthalate			U370	U480	U400	U400												
Butyl benzyl phthalate			U390 <sup>c</sup>	U500	U400 <sup>c</sup>	U400 <sup>c</sup>												
Di-n-octyl phthalate			U310	U400	U400	U400												
<b>Acid Compounds</b> (µg/kg dry weight)																		
Phenol																		
<b>Volatiles (µg/kg dry weight)</b>																		
Benzene			U15	U19	U25	U25												
1,1-Dichloroethylene			U15	U19	U25	U25												
Ethylbenzene			U15	U19	U25	U25												
Tetrachloroethylene			U15	U19	U25	U25												
Toluene			U15	U19	U25	U25												
Trichloroethylene			U15	U19	U25	U25												
Hexachlorobenzene	13		U15	U19	U25	U25												
Acetone			91	160														
Chloroform			U15	U19	U25	U25												
<b>Total PCB (µg/kg dry weight)</b>																		
PCB 1254	100				U10	U10												
PCB 1260					U10	U10												
<b>Metals (mg/kg dry weight)</b>																		
Antimony			U32	U35	0.91	2												
Arsenic			U32	35	14	22												
Mercury	U11	20	0.66	0.38	U0.1	0.5	0.283	0.124	1.91	2.60	0.717	0.755	1.97	0.268	0.671	0.317	0.755	0.679
Cadmium	0.87	1.9	U1.6	U1.8	0.28	0.2												
Copper			54	55	18	46												
Lead	95	34	22	18	3.2	12	13.5	13.2	28.6	47.8	23.9	20.5	37.6	15.0	20.2	11.8	20.8	21.4
Zinc			120	130	43	110												
Silver			U3.2	U3.5	0.11	0.21	0.125	0.125	0.295	0.382	0.217	0.200	0.303	0.121	0.178	0.111	0.219	0.203
Nickel			98	110	37	69												
Chromium			80	80	32	46												
Beryllium			U1.1	U1.2	0.54	1.2												
Selenium			U2.0	U2.0	1.3	1.8												
Thallium			U2.0	U2.0	6.4	10												



TABLE A-2. (Continued)

Bartelle (1986) - 1983 Data														Bartelle (1986) - 1984 Data							
BA13	BA14	BA15	BA16	BA17	BA18	BA19	BA20	BA21	BA22	BA23	BA24	BA25	BA26	BA03	BA04	BA05	BA07	BA11	BA12	BA23	BA24
														U1,300 220	U1,600 370	U1,300 260	U1,900 290	U640 91	U770 100	U1,000 95	U1,200 140
														U200	U200	U200	U200	U200	U200	U200	U200
														U200	150	U200	110	J20	U200	U200	U200
														U200	210	U200	150	32	66	U200	U200
														240	570	210	880	170	170	110	230
														U200	110	U200	280	130	38	U200	U200
														U1,900 <sup>b</sup> 710	U3,600 <sup>b</sup> 1,400	U1,800 <sup>b</sup> 480	4,500 <sup>b</sup> 1,500	1,400 <sup>b</sup> 550	U700 <sup>b</sup> 200	U680 <sup>b</sup> 200	U730 <sup>b</sup> U250
														620	1,100	390	1,300	380	230	180	180
														250	430	U100	700	150	80	U100	U100
														250	540	U100	820	170	93	U100	U100
														U100	U100	770	190	100	U100	U100	U100
														U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>
														U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>
														U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>
														U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>	U800 <sup>c</sup>
														390	290	250	310	U1,100	U1,100	U1,100	U1,100
														U200 <sup>c</sup> d	U200 <sup>c</sup> d	U200 <sup>c</sup> d	U200 <sup>c</sup> 590	U200 <sup>c</sup> d	U200 <sup>c</sup> d	U200 <sup>c</sup> 300	U200 <sup>c</sup> d
														U200	U200	U200	U200	U200	U200	U200	U200
														U12	J5	U12	J5	U12	U12	U12	U12
														U12	U12	U12	U12	J10	U12	U12	U12
														U12	J5	U12	U12	U12	U12	U12	U12
														U12	J5	U12	J5	U12	U12	U12	J10
														U12	11	J5.2	J5	U12	U12	U12	U12
														U12	J5	U12	U12	U12	U12	U12	U12
														U12	U12	U12	U12	U12	U12	U12	U12
														U12	U12	U12	U12	U12	U12	U12	U12
														74	54	27	31	54	53	U20	U20
														U20	U20	U20	U20	U20	U20	U20	U20
														8.5	7.9	11.6	8.9	10.8	6.9	10.8	8.5
0.170	0.434	0.623	0.457	0.306	0.0230	0.057	0.166	0.099	0.317	0.623	0.604	0.830	1.79	1.35	1.69	0.081	0.97	0.54	0.64	0.54	0.59
														0.98	1.2	0.55	0.88	0.31	0.5	0.33	0.36
														400	72	69	72	79	61	62	67
10.1	22.7	23.7	21.5	16.9	2.70	6.70	15.4	10.7	16.9	24.7	21.1	21.2	158.3	46	37	13	18	13	11	10	8
														102	135	111	117	113	97	114	115
0.076	0.200	0.263	0.231	0.155	0.0140	0.0420	0.128	0.0640	0.162	0.241	0.212	0.190	0.522	0.29	0.47	0.24	0.29	0.09	0.13	0.15	0.13
														73.5	89.6	111.2	105.1	118	72	102	117
														68	81	86	82	63	57	66	69

<sup>a</sup> U = Undetected at the detection limit shown  
J = Estimated value.

<sup>b</sup> Data were not included in the sum when the detection limit was equal to or exceeded the LAET for a chemical.

<sup>c</sup> Detection limit exceeds LAET.

<sup>d</sup> Undetected, but detection limits were not reported.

## **APPENDIX B**

### **Summary of Spills Reported to the U.S. Coast Guard: Bellingham Bay Action Program**

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**SUMMARY OF SPILLS REPORTED TO THE U.S. COAST GUARD:  
BELLINGHAM BAY ACTION PROGRAM**

Spills from vessels and facilities in Bellingham Bay are frequently reported to the U.S. Coast Guard. All spills that the U.S. Coast has responded to in the study area since 1973 are summarized in the following tables. For each spill, information is provided on the U.S. Coast Guard's Marine Safety Information System (MSIS) case number, spill location, type and quantity of material spilled and recovered, and the name and type of vessel or facility that spilled the material.

TABLE B-1. ALL VESSEL SPILLS IN BELLINGHAM BAY FOR YEARS 1973 - 1979  
PAGE 1 OF 2

MSIS CASE NUMBER	LATITUDE	LONGITUDE	SPILT IN WATER	RECOVERED IN WATER	SPILT OUT WATER	RECOVERED OUT WATER	UNITS	CARGO NAME
MP73912119	4845.0	12230.0	400	336	0	0	G	Oil, fuel: No. 6
MP73912400	4845.0	12230.0	5	0	0	0	G	Caustic soda solution
MP73912879	4845.0	12230.0	1	1	0	0	G	Oil: Crude
MP73912881	4845.0	12230.0	10	0	0	0	G	Oil: Crude
MP74913615	4845.0	12230.0	200	0	0	0	G	Oil: Crude
MP74913753	4845.0	12238.0	15	0	0	0	G	Oil: Crude
MP74913787	4845.0	12230.0	15	0	0	0	G	Oil, misc: Motor
MP74913843	4845.0	12230.0	250	50	0	0	G	Oil: Clarified
MP74913975	4845.0	12230.0	3	40	0	0	G	Oil, fuel: No. 1-D
MP74914250	4844.0	12230.0	15	0	0	0	G	Oil, fuel: No. 2
MP75901069	4845.0	12230.0	80	0	0	0	G	Oil: Crude
MP75901070	4845.0	12230.0	10	0	0	0	G	Oil: Crude
MP75902348	4845.0	12230.0	5	0	0	0	G	Oil, misc: Motor
MP75912673	4845.0	12230.0	1	0	0	0	G	Gasoline: Aviation (4.26g Pb/gal)
MP75912890	4845.0	12230.0	10	0	0	0	G	Oil, fuel: No. 2-D
MP76901187	4845.0	12230.0	1	0	0	0	G	Oil: Crude
MP76902101	4845.0	12230.0	30	0	0	0	G	Oil, fuel: No. 1-D
MP77900682	4844.0	12230.0	10	10	0	0	G	Oil, fuel: No. 2-D
MP77900683	4845.0	12230.0	10	0	0	0	G	Oil, fuel: No. 1-D
MP77901378	4845.0	12230.0	5	3	0	0	G	Oil, misc: Spindle
MP77902139	4844.0	12230.0	1	0	0	0	G	Oil, misc: Motor
MP77902874	4845.0	12230.0	5	0	0	0	G	Oil: Crude
MP78901287	4846.0	12230.0	1	0	0	0	G	Oil: Crude
MP78901335	4845.0	12230.0	1	0	0	0	G	Oil: Crude
MP78901620	4845.0	12230.0	3	0	0	0	G	Oil: Clarified
MP78902577	4845.0	12230.0	1	0	0	0	G	Oil, fuel: No. 1-D
MP78903220	4840.0	12230.0	17	0	0	0	G	Oil, fuel: No. 1-D
MP78903386	4845.0	12230.0	250	250	0	0	G	Oil, fuel: No. 2
MP78913917	4845.0	12230.0	100	0	0	0	G	Oil, fuel: No. 1-D
MP78913923	4845.0	12230.0	30	30	0	0	G	Oil: Crude
MP78913951	4845.0	12230.0	4	3	0	0	G	Oil: Clarified
MP78914073	4845.0	12230.0	1	0	0	0	G	Oil: Crude
MP78914463	4845.0	12230.0	1	0	0	0	G	Oil: Clarified
MP79901206	4845.0	12230.0	1	0	0	0	G	Oil: Crude
MP79901374	4842.0	12239.0	1	0	0	0	G	Oil: Crude
MP79901376	4845.0	12231.0	4	0	0	0	G	Oil, misc: Turbine
MP79901378	4845.0	12230.0	15	0	0	0	G	Oil, fuel: No. 2
MP79902753	4845.0	12230.0	1	0	0	0	G	Oil: Crude
MP79913108	4845.0	12230.0	1	0	0	0	G	Oil, fuel: No. 1-D
MP79913651	4843.0	12240.0	200	0	0	0	G	Oil, fuel: No. 1-D
MP79913845	4845.0	12230.0	10	4	0	0	G	Oil, misc: Motor

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ALL VESSEL SPILLS IN BELLINGHAM BAY FOR YEARS 1973 - 1979  
PAGE 2 OF 2

MSIS CASE NUMBER	SPILL DATE	REPORT DATE	VESSEL NAME
MP73512119	24-Apr-73		
MP73512400	7-Jul-73		
MP73512878	16-Nov-73		
MP73912681	15-Nov-73		
MP74513615	22-May-74		
MP74913753	13-Jun-74		
MP74913787	24-Jun-74		
MP74913843	4-Jul-74		
MP74913975	31-Aug-74		
MP74914250	3-Dec-74		
MP75901069	14-Jul-75		
MP75901070	14-Jul-75		
MP75902348	6-Jun-75		HILMAR B
MP75912673	12-Apr-75		
MP75912890	17-Aug-75		
MP76901187	6-Jan-76		
MP76902101	11-Oct-76		RICHARD FOSS
MP77900682	12-Jul-77		SARATOGA
MP77900623	12-Jul-77		SARATOGA
MP77901378	12-May-77		CENALI
MP77902139	11-Oct-77		
MP77902874	4-Jan-77		
MP78901287	20-Jun-78		
MP78901339	11-Apr-78		
MP78901620	3-Jul-78		
MP78902577	12-Jul-78		
MP78903220	20-Nov-78		SANDRA FOSS
MP78903386	3-Dec-78		
MP78913917	28-Mar-78		
MP78913923	5-Apr-78		
MP78913951	15-Apr-78		
MP78914073	12-Jun-78		
MP78914463	20-Nov-78		
MP79901206	14-Feb-79		
MP79901374	17-Jul-79		
MP79901376	13-Jun-79		
MP79901378	10-Sep-79		
MP79902753	5-Mar-79		
MP79913108	23-Jan-79		
MP79913651	19-Aug-79		
MP79913645	1-Nov-79		

TABLE B-2. ALL NON-VESSEL SPILLS IN BELLINGHAM BAY FOR YEARS 1973 - 1979  
PAGE 1 OF 2

MSIS CASE NUMBER	LATITUDE	LONGITUDE	SPILT IN WATER	RECOVERED IN WATER	SPILT OUT WATER	RECOVERED OUT WATER	UNITS	CARGO NAME
MP73911773	4845.0	12230.0	440000	400000	0	0	G	Oil: Crude
MP73912771	4845.0	12230.0	2	0	0	0	G	Oil: Crude
MP73912948	4844.0	12230.0	50	50	0	0	G	Oil, fuel: No. 2
MP73913017	4845.0	12230.0	50	0	0	0	G	Oil, fuel: No. 1-D
MP74913475	4845.0	12230.0	10	220	0	0	G	Oil, fuel: No. 6
MP74913518	4845.0	12230.0	3	0	0	0	G	Oil: Crude
MP74913770	4845.0	12238.0	15	0	0	0	G	Not elsewhere specified
MP74914245	4845.0	12230.0	1	0	0	0	G	Gasoline: Aviation (4.86g Pb/gal)
MP75912487	4845.0	12230.0	15	0	0	0	G	Cyclopropane
MP75912623	4845.0	12230.0	500	0	0	0	G	Oil, fuel: No. 4
MP75912644	4847.0	12240.0	10	0	0	0	G	Oil, fuel: No. 6
MP75912651	4845.0	12230.0	1	0	0	0	G	Creosote (Coal tar)
MP75912769	4845.0	12230.0	2	0	0	0	G	Oil, fuel: No. 1-D
MP75912779	4845.0	12230.0	1	0	0	0	G	Oil, fuel: No. 2
MP75912816	4845.0	12230.0	50	0	0	0	G	Chromous chloride
MP75912831	4844.0	12230.0	100	0	0	0	G	Not elsewhere specified
MP75912835	4845.0	12230.0	1	1	0	0	G	Oil, misc: Mineral seal
MP75913036	4844.0	12230.0	20	0	0	0	G	Oil, fuel: No. 2
MP75913057	4845.0	12230.0	6	0	0	0	G	Gas oil: Cracked
MP76913320	4845.0	12230.0	2	0	0	0	G	Oil: Crude
MP76913447	4845.0	12230.0	2	0	0	0	G	Oil: Crude
MP76913459	4845.0	12230.0	1	0	0	0	G	Oil: Crude
MP76913460	4845.0	12230.0	5	0	0	0	G	Oil: Crude
MP76913478	4844.0	12230.0	1	0	0	0	G	Oil, fuel: No. 1-D
MP76913480	4845.0	12230.0	1	0	0	0	G	Oil: Crude
MP76913503	4840.0	12233.0	1	0	0	0	G	Not elsewhere specified
MP76913504	4843.0	12230.0	1	0	0	0	G	Gasoline: Aviation (4.86g Pb/gal)
MP76913540	4845.0	12230.0	1	0	0	0	G	Oil, fuel: No. 1-D
MP76913566	4844.0	12230.0	25	1	0	0	G	Sodium hydroxide
MP78913655	4845.0	12230.0	1	1	0	0	G	Oil: Crude
MP78913660	4845.0	12231.0	20	10	0	0	G	Oil, misc: Absorption
MP78913698	4845.0	12230.0	1	0	0	0	G	Oil, misc: Spindle
MP78913745	4845.0	12230.0	1	0	0	0	G	Oil, fuel: No. 1-D
MP78913760	4845.0	12230.0	1	0	0	0	G	Gasoline: Aviation (4.86g Pb/gal)
MP78913814	4846.0	12231.0	20	0	0	0	G	Oil, fuel: No. 2-D
MP78913871	4845.0	12230.0	1	0	0	0	G	Oil, fuel: No. 2
MP78913934	4844.0	12230.0	30	30	0	0	G	Oil: Crude
MP78914007	4845.0	12230.0	1	0	0	0	G	Oil, fuel: No. 2
MP78914152	4845.0	12230.0	5	0	0	0	G	Oil: Crude
MP78914178	4845.0	12230.0	1	0	0	0	G	Oil, fuel: No. 2
MP78914503	4845.0	12230.0	5	0	0	0	G	Oil: Crude
MP79913040	4844.0	12230.0	5	0	0	0	G	Oil, fuel: No. 1-D
MP79913097	4844.0	12230.0	1	0	0	0	G	Oil, fuel: No. 2-D
MP79913221	4845.0	12230.0	15	0	0	0	G	Oil, fuel: No. 2-D
MP79913392	4845.0	12230.0	5	3	0	0	G	Oil: Crude

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ALL NON-VESSEL SPILLS IN BELLINGHAM BAY FOR YEARS 1973 - 1979  
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MSIS CASE NUMBER	SPILL DATE	REPORT DATE	SOURCE NAME
MP73511772	10-Jan-73		
MP73512771	14-Oct-73		
MP73512943	3-Dec-73		
MP73513017	21-Dec-73		
MP74913475	28-Feb-74		
MP74913518	10-Mar-74		
MP74913770	17-Jun-74		
MP74914245	1-Dec-74		
MP75512487	15-Jan-75		
MP75512623	13-Mar-75		
MP75512644	27-Mar-75		
MP75512651	31-Mar-75		
MP75512768	5-Jun-75		
MP75512773	13-Jun-75		
MP75512816	12-Jul-75		
MP75512831	1-Jul-75		
MP75512833	15-Jul-75		
MP75513036	4-Dec-75		
MP75513057	23-Dec-75		
MP76513320	26-Jan-76		
MP76513447	16-Mar-76		
MP76513459	22-Mar-76		
MP76513460	22-Mar-76		
MP76513473	29-Mar-76		
MP76513490	31-Mar-76		
MP76513503	7-Apr-76		
MP76513504	7-Apr-76		
MP76513540	19-Apr-76		
MP76513566	29-Apr-76		
MP78513655	5-Jan-78		
MP78513660	6-Jan-78		
MP78513699	17-Jan-78		
MP78513749	3-Feb-78		
MP78513760	6-Feb-78		
MP78513814	22-Feb-78		
MP78513871	10-Mar-78		
MP78513934	5-Apr-78		
MP78914007	10-May-78		
MP78914152	10-Jul-78		
MP78914178	18-Jul-78		
MP78914503	1-Dec-78		
MP79513040	3-Jan-79		
MP79513087	18-Jan-79		
MP79513221	2-Mar-79		
MP79513392	9-May-79		



TABLE B-3. ALL VESSEL SPILLS IN BELLINGHAM BAY FOR YEARS 1980 - PRESENT  
PAGE 1 OF 2

MSIS CASE NUMBER	LATITUDE	LONGITUDE	SPILT		RECOVERED		SPILT		RECOVERED		CARGO NAME
			IN WATER	OUT WATER	IN WATER	OUT WATER	IN WATER	OUT WATER	IN WATER	OUT WATER	
MP80901010	4845.0	12230.0	4	0	0	0	0	0	0	0	Oil, fuel: No. 2-D
MP80901715	4845.0	12230.0	5	3	0	0	0	0	0	0	Oil, fuel: No. 2
MP81900971	4846.0	12230.0	2	0	0	0	0	0	0	0	Gasoline: Aviation (4.86g Pb/gal)
MP81911203	4845.0	12230.0	3	0	0	0	0	0	0	0	Oil: Crude
MP82901462	4844.0	12230.0	2	0	0	0	0	0	0	0	Oil, fuel: No. 2-D
MP83900576	4845.0	12230.0	200	0	0	0	0	0	0	0	Oil, fuel: No. 1-D
MP83901493	4844.0	12230.0	1	0	0	0	0	0	0	0	Oil, fuel: No. 2-D
MP84901184	4845.0	12230.0	25	0	0	0	0	0	0	0	Oil, misc: Lubricating
MP84901379	4845.0	12230.0	5	0	0	0	0	0	0	0	Oil, fuel: No. 6
MP84911971	4845.0	12230.0	20	0	0	0	0	0	0	0	Oil, fuel: No. 1-D
MP84912354	4845.0	12231.0	1	0	0	0	0	0	0	0	Gasoline: Automotive (4.23g Pb/gal)
MP85002668	4845.0	12230.0	11	4	1	1	1	1	1	1	Oil: Diesel
MP85002669	4845.0	12230.0	85	75	0	0	0	0	0	0	Oil: Diesel
MP85900313	4845.0	12230.0	400	0	0	0	0	0	0	0	Oil, fuel: No. 1-D
MP85900430	4845.0	12230.0	15	0	0	0	0	0	0	0	Oil, fuel: No. 2-D
MP85000425	4845.0	12230.0	450	400	0	0	0	0	0	0	Oil, fuel: No. 2
MP86006635	4845.0	12230.0	3	0	0	0	0	0	0	0	Oil, fuel: No. 2-D
MP86007544	4844.1	12230.1	2	0	0	0	0	0	0	0	Oil: Diesel
MP87001095	4845.0	12230.0	5	0	0	0	0	0	0	0	Oil: Diesel
MP87002922	4845.0	12230.0	10	0	0	0	0	0	0	0	Oil, fuel: No. 2-D
MP87004361	4845.0	12230.0	2	0	0	0	0	0	0	0	Oil: Diesel
MP87006091	4845.0	12230.0	10	8	0	0	0	0	0	0	Oil: Diesel
MP87006091	4845.0	12230.0	1	1	0	0	0	0	0	0	Oil, misc: Motor
MP87006983	4844.0	12230.0	20	0	0	0	0	0	0	0	Oil: Diesel
MP87008861	4844.0	12230.0	10	0	0	0	0	0	0	0	Oil: Diesel
MP87008883	4845.0	12230.0	10	1	0	0	0	0	0	0	Oil, waste/lubricants - possible contaminant
MP88000107	4845.0	12230.0	2	0	0	0	0	0	0	0	Oil, waste/lubricants - possible contaminant
MP88003018	4845.0	12230.0	3	0	0	0	0	0	0	0	Oil, misc: Lubricating
MP88003661	4845.0	12230.0	1	0	0	0	0	0	0	0	Oil, waste/lubricants - possible contaminant
MP88004014	4845.0	12230.0	1	0	0	0	0	0	0	0	Oil, waste/lubricants - possible contaminant
MP88004609	4844.1	12233.4	1	0	0	0	0	0	0	0	Oil, waste/lubricants - possible contaminant
MP88004955	4845.0	12230.0	1	0	0	0	0	0	0	0	Oil, waste/lubricants - possible contaminant
MP88006607	4844.0	12230.0	5	0	0	0	0	0	0	0	Oil: Diesel
MP88006758	4844.0	12230.0	20	0	0	0	0	0	0	0	Oil: Diesel
MP88008196	4845.1	12228.9	50	30	0	0	0	0	0	0	Oil: Diesel

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## ALL VESSEL SPILLS IN BELLINGHAM BAY FOR YEARS 1980 - PRESENT

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MSIS CASE NUMBER	SPIII DATE	REPORT DATE	VESSEL NAME
MP80901010	19-Dec-80		PACIFIC CASTLE
MP80901715	23-Jan-80		PACIFIC RANGER
MP81900971	8-Aug-81		S.O.CO.NO.17
MP81911203	16-Aug-81		
MP82901462	13-Aug-82		
MP83900576	21-Dec-83		
MP83901493	24-Mar-83		SCOUT
MP84901184	26-Jan-84		
MP84901379	7-Aug-84		
MP84911971	3-Jan-84		
MP84912354	28-Dec-84		
MP85002668	24-Apr-86	24-Apr-86	SNOW MIST
MP85002669	20-Apr-86	20-Apr-86	LOCHINVAR
MP85900313	19-Jul-85		
MP85900430	5-Sep-85		
MP86000425	16-Jan-86	16-Jan-86	ROSMELL
MP86005639	22-Aug-86	22-Aug-86	
MP86007544		22-Aug-86	
MP87001095	10-Feb-87	10-Feb-87	UNKNOWN SOURCE
MP87002922	1-May-87	1-May-87	UNKNOWN SOURCE
MP87004361	23-Jun-87	23-Jun-87	UNKNOWN SOURCE
MP87006091	22-Aug-87	22-Aug-87	AMERICAN BEAUTY
MP87006091	22-Aug-87	22-Aug-87	AMERICAN BEAUTY
MP87006983	24-Sep-87	24-Sep-87	UNKNOWN SOURCE
MP87008881	13-Dec-87	13-Dec-87	UNKNOWN SOURCE
MP87008883	17-Dec-87	17-Dec-87	MELISSA CHRIS
MP88000107	5-Jan-88	5-Jan-88	UNKNOWN SOURCE
MP88003016	15-May-88	15-May-88	UNKNOWN SOURCE
MP88003661	25-Apr-88	25-Apr-88	UNKNOWN SOURCE
MP89004014	22-Jun-88	22-Jun-88	UNKNOWN SOURCE
MP88004609	5-Jul-88	8-Jul-88	UNKNOWN SOURCE
MP88004955		28-Jul-88	UNKNOWN SOURCE
MP88006607	3-Oct-88	3-Oct-88	UNKNOWN SOURCE
MP88006758	4-Oct-88	4-Oct-88	FRANCIS H
MP88008196	8-Dec-88	8-Dec-88	UNKNOWN SOURCE

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TABLE B-4. ALL NON-VESSEL SPILLS IN BELLINGHAM BAY FOR YEARS 1980 - PRESENT  
PAGE 1 OF 2

MSIS CASE NUMBER	LATITUDE	LONGITUDE	SPILT IN WATER	RECOVERED IN WATER	SPILT OUT WATER	RECOVERED OUT WATER	UNITS	CARGO NAME
MP80911347	4847.0	12229.0	20	0	0	0	G	Oil, misc: Motor
MP80911388	4846.0	12229.0	20	0	0	0	G	Oil: Crude
MP80911418	4843.0	12230.0	5	0	0	0	G	Oil, fuel: No. 2
MP80911774	4845.0	12230.0	2	0	0	0	G	Oil: Crude
MP80911931	4845.0	12230.0	30	0	0	0	G	Gasoline: Automotive (4.23g Pb/gal)
MP81910726	4845.0	12230.0	400	100	0	0	G	Not elsewhere specified
MP81910739	4844.0	12230.0	2	0	0	0	G	Oil, misc: Lubricating
MP81910796	4845.0	12230.0	2	0	0	0	G	Oil, misc: Spindle
MP81910815	4844.0	12232.0	50	0	0	0	G	Oil, fuel: No. 2
MP81911250	4845.0	12230.0	10	5	0	0	G	Oil, fuel: No. 6
MP82910612	4845.0	12230.0	100	0	0	0	G	Oil: Crude
MP82910871	4845.0	12229.0	60	0	0	0	G	Oil, fuel: No. 2-D
MP82910958	4845.0	12229.0	1	0	0	0	G	Oil, fuel: No. 2-D
MP82910977	4845.0	12229.0	10	0	0	0	G	Oil, fuel: No. 2-D
MP83912226	4844.0	12230.0	500	0	0	0	G	Gasoline: Aviation (4.86g Pb/gal)
MP83912403	4845.0	12229.0	20	20	0	0	G	Oil, fuel: No. 4
MP83912421	4844.0	12230.0	2	0	0	0	G	Gasoline: Automotive (4.23g Pb/gal)
MP84912012	4845.0	12230.0	40	0	0	0	G	Oil, misc: Motor
MP84912172	4845.0	12230.0	5	0	0	0	G	Oil, misc: Motor
MP84912177	4844.0	12230.0	1860	0	0	0	P	Sulfuric acid
MP85907579	4846.0	12230.0	120	0	0	0	G	Oil, fuel: No. 2
MP85907594	4844.0	12230.0	3	0	0	0	G	Oil, misc: Motor
MP85907603	4846.0	12231.0	5	0	0	0	G	Oil: Clarified
MP86000992	4845.0	12230.0	30	0	20	0	G	Oil: Diesel
MP86001181	4845.0	12230.0	4	3	1	1	G	Kerosene
MP86006546	4845.0	12230.0	2	1	13	13	G	Oil: Diesel
MP87004659	4845.0	12230.0	1	0	0	0	G	Oil, waste/lubricants - possible contaminant
MP87005291	4845.0	12230.0	0	0	2000	2000	P	Not defined
MP87007587	4844.0	12230.0	0	0	5	0	F	Ferrous chloride
MP87007587	4844.0	12230.0	0	0	5	0	F	Chlorine
MP88002795	4845.0	12230.0	30	0	0	0	G	Not defined

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ALL NON-VESSEL SPILLS IN BELLINGHAM BAY FOR YEARS 1980 - PRESENT  
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MSIS CASE NUMBER	SPILL DATE	REPORT DATE	SOURCE NAME
MP80911347	2-Feb-80		
MP80911388	14-Feb-80		
MP80911419	2-Mar-80		
MP80911774	26-Aug-80		
MP80911931	26-Nov-80		
MP81910726	1-Jan-91		
MP81910738	9-Jan-81		
MP81910796	28-Jan-81		
MP81910815	8-Feb-81		
MP81911250	9-Sep-81		
MP82910612	23-Jan-82		
MP82910871	4-Sep-82		
MP82910938	26-Nov-82		
MP82910977	15-Dec-82		
MP83912226	30-Mar-83		
MP83912403	12-Aug-83		
MP83912421	27-Aug-83		
MP84912012	7-Feb-84		
MP84912172	1-Jul-84		
MP84912177	8-Jul-84		
MP85907579	8-Apr-85		
MP85907594	30-Apr-85		
MP85907603	3-May-85		
MP86C00992	30-Jan-86	30-Jan-86	1984 PETERBUILT LIC.*LM6233
MP86001181	19-Dec-85	19-Dec-85	GEORGIA PACIFIC SALVAGE YARD
MP86006546	22-Aug-86	22-Aug-86	NORTHWEST FUEL CO INC.
MP87004653	2-Jul-87	2-Jul-87	UNK
MP87005291	15-Jul-87	16-Jul-87	PUGET SOUND TRUCKING
MP87007587	19-Oct-87	19-Oct-87	GEORGIA PACIFIC
MP87007587	19-Oct-87	19-Oct-87	GEORGIA PACIFIC
MP88002795	26-Apr-88	26-Apr-88	GEORGIA PACIFIC CHEMICAL CO.

## APPENDIX C

**Bibliography: Bellingham Bay Action Program**

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## APPENDIX D

### NPDES Permits for Dischargers in the Bellingham Bay Area

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Issuance Date: April 7, 1988  
Expiration Date: March 16, 1993

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In compliance with the provisions of  
The State of Washington Water Pollution Control Law, as amended  
Chapter 90.48 Revised Code of Washington  
and  
The Federal Water Pollution Control Act  
(The Clean Water Act)  
Title 33 United States Code, Section 1251 et. seq.

City of Bellingham  
210 Lottie Street  
Bellingham, Washington 98225

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Plant Location:

200 McKenzie  
Bellingham, Washington 98225

Receiving Water:

Bellingham Bay

Waterway Segment Number:

01-01-02

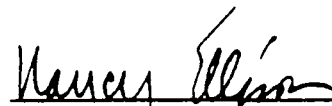
Discharge Location:

Latitude: 48°31'11"N

Longitude: 122°31'22"W

---

is authorized to discharge in accordance with the special and general conditions  
which follow.



Nancy Ellison, Regional Manager  
Northwest Regional Manager  
Department of Ecology

SPECIAL CONDITIONS

SI. EFFLUENT LIMITATIONS

Beginning on the issuance date of this permit and lasting through the expiration date of this permit, the Permittee is authorized to discharge treated municipal wastewater to Bellingham Bay at the discharge location specified on page one of this permit subject to the following effluent limitations:

EFFLUENT LIMITATIONS

<u>Parameter</u>	<u>Monthly Average</u>	<u>Weekly Average</u>
Biochemical Oxygen Demand (BOD <sub>5</sub> )*	30 mg/L, 2,225 kg/d**	45 mg/L, 3,340 kg/d**
Total Suspended Solids (TSS)*	30 mg/L, 2,225 kg/d**	45 mg/L, 3,340 kg/d**
Fecal Coliform Bacteria	200/100 mL	400/100 mL
pH***	Shall be within the limits of 6.0 - 9.0	

- \* The monthly average percent removal for BOD<sub>5</sub> and TSS shall not be less than 85 percent except during the "wet weather" months extending from October 1st through May 31st.
- \*\* Mass effluent loading values based on best available information at time of permit issuance. The Department may amend these values by permit modification based on any amended facility engineering report or design report as approved by the Department.
- \*\*\* Values outside of this range may be allowed if the Permittee demonstrates that such excursions are not the result of inorganic chemical additions to the treatment process or contributions from industrial sources.

The monthly and weekly average effluent limitations for BOD<sub>5</sub> and TSS are the arithmetic mean of the samples taken during a calendar month or week. The average effluent limitations for Fecal Coliform are the geometric mean of the samples taken during a calendar month or week.

Total available residual chlorine shall be maintained which is sufficient to attain the Fecal Coliform limits specified above. Chlorine concentrations in excess of that necessary to reliably achieve these limits shall be avoided.



## S2. TESTING SCHEDULE

The Permittee shall monitor influent wastewater, effluent wastewater and plant operating parameters according to the following schedule:

<u>Tests</u>	<u>Sample Point</u>	<u>Sampling Frequency</u>	<u>Sample Type</u>
Flow	effluent	7/week	continuous recording
Temperature	raw sewage incinerator hearth* afterburner*	7/week  daily operating daily operating	
pH	raw sewage final effluent clarifier effluent(s)	7/week 7/week 7/week	
DO	raw sewage final effluent clarifier effluent(s)	7/week 7/week 7/week	
BOD	raw sewage final effluent	5/week 5/week	24 hr. comp. 24 hr. comp.
Settleable Solids	raw sewage final effluent	daily daily	
Suspended Solids	raw sewage final effluent	5/week 5/week	24 hr. comp. 24 hr. comp.
Total Solids	raw sewage raw sludge	5/week 1/week	
Volatile Solids	raw sludge	1/week	
Total Available (Residual) Chlorine**	final effluent	7/week	
Fecal Coliform	final effluent	5/week	
Oil and Grease	final effluent	1/month	
Percent Total Solids	centrifuge centrate cake	daily operating daily operating daily operating	

NOTE: Unless otherwise indicated, Sample Type is grab.

- \* Hearth - Minimum operating temperature in maximum temperature hearth.
- \* Afterburner - Minimum operating temperature.

S2. TESTING SCHEDULE (Cont.)

- \*\* Total available (residual) chlorine shall be measured and reported at the same time that fecal coliform samples are taken.

S3. MONITORING AND REPORTING

A. Reporting

The Permittee shall monitor the parameters as specified in Condition S2. of this permit and report the results for each calendar month. The reports shall be submitted no later than the 15th day of the month following the completed reporting period and shall be on forms supplied or approved by the department. Completed forms shall be sent to the Northwest Regional Office of the Washington State Department of Ecology, 4350-150th Avenue N.E., Redmond, Washington 98052.

In addition, a summary report form (EPA Form 3320-1) covering each calendar month, shall be submitted no later than the 15th day of the month following the completed reporting period. This report is limited to the parameters specified in Condition S1.

If the Permittee monitors any pollutants any more frequently than required by the permit, such results shall be recorded and reported in accordance with these instructions.

B. Records Retention

The Permittee shall retain for a minimum of three years all records of monitoring activities and results, including all reports of recordings from continuous monitoring instrumentation. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by the director of the department.

C. Recording of Results

For each measurement or sample taken, the Permittee shall record the following information: (1) the date, exact place, and time of sampling; (2) the dates the analyses were performed; (3) who performed the analyses; (4) the analytical techniques or methods used; and (5) the results of all analyses.

D. Representative Sampling

Samples and measurements taken to meet the requirements of this condition shall be representative of the volume and nature of the monitored discharge, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance related conditions affecting effluent quality.

S3. MONITORING AND REPORTING (Cont.)

E. Test Procedures

All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall, unless approved otherwise in writing by the Department, conform to the Guidelines Establishing Test Procedures for the Analysis of Pollutants, contained in Title 40 Code Of Federal Regulations Part 136.

- F. The department may establish specific treatment plant, receiving water, sediment and biological monitoring requirements beyond those identified in this permit by permit modification or administrative order.

S4. PREVENTION OF FACILITY OVERLOADING

A. Design Criteria\*

The design criteria for the permitted treatment facility are as follows:

Average Flow For Maximum Month:	74,200 m <sup>3</sup> /d
Influent BOD Loading for Maximum Month:	19,033 kg/d
Influent TSS Loading for Maximum Month:	15,540 kg/d
Design Effluent Quality for Maximum Month:	
BOD <sub>5</sub>	30 mg/L
TSS <sub>5</sub>	30 mg/L
Design Effluent Quality for Maximum Week:	
BOD <sub>5</sub>	45 mg/L
TSS <sub>5</sub>	45 mg/L

\*Design criteria based on best available information at time of permit issuance. The department may amend these values by permit modification based on any amended facility engineering report or design report as approved by the department.

B. Plans for Maintaining Adequate Capacity

When the actual flow or waste load reaches 85 percent of the design capacity as specified in paragraph A. above, or when the projected increases would reach design capacity within five years, whichever occurs first, the permittee shall submit to the department, a plan and a schedule for continuing to maintain capacity at the facility sufficient to achieve the effluent limitations and other conditions of this permit. This plan shall address any of the following actions or any others necessary to meet this objective.

1. Analysis of the present design including the introduction of any process modifications that would establish the ability of the existing facility to achieve the effluent limits and other requirements of this permit at specific levels in excess of the existing design criteria specified in paragraph A. above.
2. Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system.

S4. PREVENTION OF FACILITY OVERLOADING (Cont.)

3. Limitation on future sewer extension or connections or additional waste loads.
4. Modification or expansion of facilities necessary to accommodate increased flow or waste load.

The plan shall specify any contracts, ordinances, methods for financing or other arrangements necessary to achieve this objective.

S5. OPERATION AND MAINTENANCE OF FACILITIES

In accordance with the Washington Administrative Code, Chapter 173-230 (Certification of Operators of Wastewater Treatment Plants), the Permittee shall provide an adequate operating staff which is qualified to carry out the operation, maintenance and testing activities required to insure compliance with the conditions of this permit. An operator certified for a Class III plant by the State of Washington shall be in responsible charge of the day to day operation of the wastewater treatment facility.

S6. PROVISION FOR POWER FAILURE

The Permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during power failure at the treatment facility or sewage lift stations either by means of alternate power sources, standby generation of power, or retention of inadequately treated wastes.

S7. COMBINED SEWER OVERFLOWS

The following is a list of combined sewer overflows and sewage pumping station bypasses which are occasional point sources of pollutants as a result of precipitation events. The Permittee shall employ all available and reasonable measures to prevent or moderate such discharges. Such discharges shall not violate water quality standards. On or before January 1, 1988, the Permittee shall submit to the department a plan and compliance schedule for the greatest reasonable reduction of combined sewer overflows at the earliest possible date. The plan shall be prepared in accordance with Chapter 173-245 Washington Administrative Code.

<u>Discharge No.</u>	<u>Location</u>	<u>Receiving Water</u>
002	200 McKenzie (Plant)	Bellingham Bay
003	"C" and Holly Street	Inner Whatcom Waterway

S8. RESIDUAL SOLIDS HANDLING

- A. The Permittee shall handle, utilize and dispose of all residual solids in such a manner as to prevent its entry into state ground or surface waters.
- B. The Permittee shall not permit leachate from its residual solids to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to violate the State Water Quality Standards, Chapter 173-201, Washington Administrative Code, or cause any adverse effect on state ground waters. The Permittee shall apply for a permit or permit modification as may be required for such discharges.
- C. Disposal or utilization of residual solids on land shall be in accordance with the requirements of the jurisdictional health department.
- D. The Department may establish specific sludge management requirements beyond those identified in this permit by permit modification or administrative order.

S9. CONSTRUCTION OR MAINTENANCE RELATED OVERFLOW, BYPASS OR REDUCTION IN LEVEL OF TREATMENT

- A. The overflow, bypass or reduction in level of treatment of sewage at the treatment facility or within the sewage collection and transmission system tributary to the treatment facility in excess of that allowed by the effluent limitations of this permit during construction or maintenance shall be avoided if at all possible.
- B. If an event as described in paragraph A. above is contemplated which the Permittee could reasonably be expected to have anticipated, the Permittee shall submit to the department not less than 90 days prior to the contemplated event, a report which describes in detail any construction work which will result in such a discharge of wastewater. The report shall contain: (1) an analysis of all known alternatives which would eliminate, reduce or mitigate the need for bypassing or reducing the level of treatment; (2) a cost effective analysis of alternatives including comparative resource damage assessment; (3) the expected duration of such events for each alternative; (4) a recommended alternative for the bypass or reduction in level of treatment; (5) the projected time schedule for the event; (6) a statement of compliance with the State Environmental Policy Act; and (7) a request for a water quality modification, as provided for in Chapter 173-201-100(2) of the Washington Administrative Code.
- C. Final authorization to discharge wastewater as described in paragraph A. above may be granted after review of the above information, in accordance with General Condition G5. Authorization to discharge such wastewater will only be by administrative order.
- D. If the Permittee expects a reduction in the required level of treatment that would exceed permit effluent limitations on a short term basis for any reason, and such reduction cannot be avoided without resulting in the discharge of greater quantities of pollutants in the future, and the Permittee could not reasonably be expected to have anticipated the need for such reductions in the level of treatment within the time required for justifying such actions as required in paragraph B. above, the Permittee

S9.D CONSTRUCTION OR MAINTENANCE RELATED OVERFLOW, BYPASS OR REDUCTION IN LEVEL TREATMENT (Cont.)

shall give written notification to the department in accordance with General Conditions G4 and G5.

S10. INDUSTRIAL AND COMMERCIAL SOURCES (PRETREATMENT)

The Permittee shall not allow discharges to their sewer system which would violate the general or specific prohibitions contained in Title 40, Code of Federal Regulations Part 403.5, or categorical standards contained in Title 40 Code of Federal Regulations Subchapter N, or any applicable regulations promulgated under Chapter 90.48 of the Revised Code of Washington.

The permittee shall assist the Department in monitoring commercial and industrial discharges into the sewer system and ensuring that all industrial and commercial users are in compliance with applicable pretreatment regulations.

The permittee shall submit written notice to the Department whenever any new or altered commercial or industrial source proposes to discharge waste into its sewer system which may interfere with the operation of the treatment facility, or interfere with the use or disposal of municipal sludge, or which may pass through the treatment facility causing violations of State Water Quality Standards (Chapter 173-201 of the Washington Administrative Code). Neither connection nor discharge to the sewer system shall be allowed until the commercial or industrial source obtains a State Waste Discharge Permit or such source is otherwise approved by the Department as provided in Chapter 90.48.160 or Chapter 90.48.200 or the Revised Code of Washington.

The permittee shall perform industrial user survey, reporting, and other local assistance activities as specified by the Department in support of the state pretreatment program.

GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The Permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with conditions of this permit.
- G3. The Permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the Permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the Permittee shall, at a minimum, provide the department with the following information:
- A. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized water discharges;
  - B. The period of noncompliance, including exact dates and times and/or the anticipated time when the Permittee will return to compliance; and
  - C. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the Permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The Permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge subject to any applicable toxic pollutant effluent standard under Section 307 (a) of the Clean Water Act, or which could constitute a threat to human health, welfare, or the environment, 40 CFR Part 122 requires that the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the Permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the Permittee becomes aware of the circumstances, unless the department waives or extends this requirement of a case-by-case basis.

Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:

- A. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance related activities essential to meet the requirements of the Clean Water Act and authorized by administrative order;
- B. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
- C. The Permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the Permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special condition);
- D. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

G6. The Permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:

- A. To enter upon the Permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
- B. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;
- C. To inspect at reasonable times any monitoring equipment or method required in the permit;
- D. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
- E. To sample at reasonable times any discharge of pollutants.



- G7. The Permittee shall submit a new application or supplement to the previous application where facility expansions, production increases, or process modifications will (1) result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.
- G8. After notice and opportunity for public hearing, this permit may be modified, terminated, or revoked during its term for cause as follows:
- A. Violation of any term or condition of the permit;
  - B. Failure of the Permittee to disclose fully all relevant facts or misrepresentation of any relevant facts by the Permittee in the application or during the permit issuance process;
  - C. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit;
  - D. Information indicating that the permitted discharge poses a threat to human health or welfare;
  - E. A change in ownership or control of the source; or
  - F. Other cause listed in 40 CFR Part 122.62 and 122.63.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

- G9. A Permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. or 40 CFR Part 122.62 must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the department shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.
- G11. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.

- G12. All other requirements of 40 CFR 122.41 and 122.42 are incorporated into this permit by reference.
- G13. Nothing in this permit shall be construed as excusing the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

Permit Number WA-002245-4

Issuance Date: 9/5/84

Expiration Date: 9/5/89

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In compliance with the provisions of  
Chapter 90.48 Revised Code of Washington as amended  
and  
The Clean Water Act as amended  
Public Law 95-217

CITY OF FERNDALE  
P O Box 936  
Ferndale, Washington 98248

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Plant Location:

Ferndale Road  
Ferndale, Washington

Receiving Water:

Nooksack River

Waterway Segment Number:

01-01-04

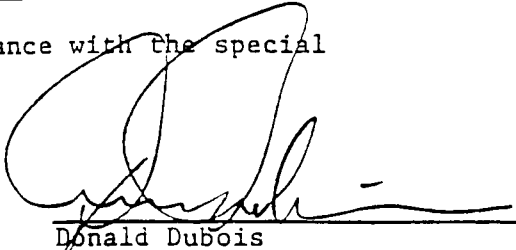
Discharge Location:

Latitude: 47° 50' 04"

Longitude: 122° 35' 49"

---

is authorized to discharge in accordance with the special  
and general conditions which follow.

  
Donald Dubois  
Assistant Director  
Department of Ecology

SPECIAL CONDITIONS

S1. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Beginning on the issuance date of this permit and lasting through the expiration date of this permit, the permittee is authorized to discharge treated municipal wastewater to the Nooksack River at the permitted discharge location subject to the following limitations and monitoring requirements:

EFFLUENT LIMITATIONS

<u>Parameter</u>	<u>Monthly Average</u>	<u>Weekly Average</u>
Biochemical Oxygen Demand* (5 day)	30 mg/l, 57 kg/d (125 lbs/day)	45 mg/l, 85 kg/d (190 lbs/day)
Suspended Solids	75 mg/l, 143 kg/d (313 lbs/day)	110 mg/l, 210 kg/d (460 lbs/day)
Fecal Coliform Bacteria	200/100 ml	400/100 ml
pH**	Shall not be outside the range 6.0 - 9.0	

\*The monthly average effluent concentrations limitations for BOD<sub>5</sub> shall not exceed 30 mg/l or 15 percent of the respective influent concentrations, whichever is more stringent.

\*\*Effluent values for pH shall not exceed the limits 6.0 - 9.0 where such values are attributable to inorganic chemical addition to the treatment process or to industrial contributions.

The monthly and weekly averages for BOD<sub>5</sub> and Suspended Solids are based on the arithmetic mean of the samples taken. The averages for Fecal Coliform are based on the geometric mean of the samples taken.

Total available residual chlorine shall be maintained which is sufficient to attain the Fecal Coliform limits specified above. Chlorine concentrations in excess of that necessary to reliably achieve the limits shall be avoided.

S2. TESTING SCHEDULE

The permittee shall monitor plant processes and wastewater according to the following schedule:

<u>Tests</u>	<u>Sample Point</u>	<u>Sampling Frequency</u>	<u>Sample Type</u>
Flow	Effluent	7/week	continuous recording
Temperature	Influent	5/week	
	Individual cells	5/week	
	Effluent	7/week	
pH	Influent	5/week	
	Individual cells	5/week	
	Effluent	7/week	
BOD	Influent	1/week	24 hr composite
	Effluent	1/week	24 hr composite
Suspended Solids	Influent	1/week	24 hr composite
	Effluent	1/week	24 hr composite
Settleable Solids	Influent	5/week	
	Effluent	5/week	
Dissolved Oxygen	Influent	5/week	
	Individual cells	5/week	
Total available residual chlorine	Effluent	7/week	
Fecal Coliform	Effluent	1/week	

Note: Unless otherwise indicated, Sample type is grab.

S2. MONITORING AND REPORTING

a. Reporting

A monthly report recording each required analysis shall be submitted no later than the 15th day of the following month. The monthly reporting form will be supplied to the permittee or approved by the department and sent to the Northwest Regional Office of the Washington State Department of Ecology, 4350-150th Avenue N.E., Redmond, Washington 98052.

In addition, a summary report form (EPA Form 3320-1) covering a one month period, shall be submitted no later than the 15th day of the following month. This report is limited to the limitations listed in Condition S1.

Monitoring shall be started on the effective date of this permit and the first monthly report is due 45 days thereafter.

If the permittee monitors any pollutant any more frequently than required by the permit, he shall record and report such results.

b. Records Retention

The permittee shall retain for a minimum of three years all records of monitoring activities and results, including all reports of recordings from continuous monitoring instrumentation. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or when requested by the director.

c. Recording of Results

For each measurement or sample taken, the permittee shall record the following information: (1) the date, exact place, and time of sampling; (2) the dates the analyses were performed; (3) who performed the analyses; (4) the analytical techniques or methods used; and (5) the results of all analyses.

d. Representative Sampling

Samples and measurements taken to meet the requirements of this condition shall be representative of the volume and nature of the monitored discharge, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance related conditions affecting effluent quality.

S3. MONITORING AND REPORTING (Continued)

e. Test Procedures

All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall, unless approved otherwise in writing by the Department, conform to the Guidelines Establishing Test Procedures for the Analysis of Pollutants, contained in 40 CFR Part 136, as published in the Federal Register on December 1, 1976, or the latest revision thereof, which references the following publications:

1. American Public Health Association, Standard Methods for the Examination of Water and Wastewaters.
  2. American Society for Testing and Materials, A.S.T.M. Standards, Part 31, Water, Atmospheric Analysis.
  3. Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes.
- f. The department may establish specific monitoring requirements beyond those identified in this permit by permit modification or administrative order.

S4. PREVENTION OF FACILITY OVERLOADING

a. Design Criteria

The design criteria for the permitted treatment facility are as follows:

Average flow - 0.5 MGD

Population equivalent - 3500

b. Facility Upgrade

Upon completion of the expansion to the wastewater treatment facility, this permit shall be modified to incorporate the new design criteria and effluent loading limits.

S5. NOTIFICATION OF SIGNIFICANT NEW OR ALTERED SOURCES

The permittee shall submit written notice to the department whenever any new or altered commercial or industrial source proposes to discharge waste into it's municipal sewer system which may interfere with the operation of the treatment works including interference with the use or disposal of municipal sludge and/or which may pass through the treatment works causing violations of the State Water Quality Standards (Chapter 173-201 Washington Administrative Code). Connection to the sewer system shall not be allowed until the commercial or industrial applicant obtains a State Waste Discharge Permit as provided in the Revised Code of Washington Chapter 90.48.160.

The permittee shall assist the department in monitoring commercial and industrial discharges into the municipal sewer system.

S6. RESIDUAL SOLIDS HANDLING

- a. The permittee shall handle, utilize and dispose of all residual solids in such a manner as to prevent its entry into state ground or surface waters.
- b. The permittee shall not permit leachate from its residual solids to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effect on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.

S7. OPERATION AND MAINTENANCE OF FACILITIES

In accordance with the Washington Administrative Code, Chapter 173-230 (Certification of Operators of Wastewater Treatment Plants), the permittee shall provide an adequate operating staff which is qualified to carry out the operation, maintenance and testing activities required to insure compliance with the conditions of this permit. An operator certified for a Class 1 plant by the State of Washington shall be in responsible charge of the day to day operation of the wastewater treatment plant.

S8. CONSTRUCTION OR MAINTENANCE RELATED REDUCTION IN LEVEL OF TREATMENT

If the permittee contemplates a reduction in the required level of treatment that would exceed permit effluent limitations on a short term basis for any reason, and such reduction cannot be avoided, the permittee shall give written notification to the department, if possible, 30 days prior to such activities, detailing the reasons for, length of time of, and the potential effects of the reduced level of treatment. If such a reduction involves a bypass, the requirements of Condition G5. and the "Construction or Maintenance Related Overflow or Bypass" conditions must be met.



S9. CONSTRUCTION OR MAINTENANCE RELATED OVERFLOW OR BYPASS

Bypasses of untreated or partially treated sewage during construction or maintenance shall be avoided if at all feasible.

If a construction or maintenance related overflow or bypass is contemplated, the permittee shall submit to the department not less than 90 days prior to the contemplated overflow or bypass, a report which describes in detail any construction work which will result in the overflow or bypass of wastewater. The report shall contain: (1) an analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing; (2) a cost effective analysis of alternatives including comparative resource damage assessment; (3) the minimum and maximum duration of bypass under each alternative; (4) a recommendation as to the preferred alternative for conducting the bypass; (5) the projected date of bypass initiation; (6) a statement of compliance with the State Environmental Policy Act; and (7) a request for a water quality modification, as provided for in Chapter 173-201-100(2) of the Washington Administrative Code. For probably construction bypasses, the need the bypass is to be identified as early in the planning process as possible. The analysis required above shall be considered during preparation of the engineering report or facilities plan and plans and specifications, and shall be included to the extent practical. In cases where the probable need to bypass is determined early, continued analysis is necessary up to and including the construction period in an effort to minimize or eliminate the bypass.

Final authorization to bypass may be granted after review of the above information, in accordance with Condition G5. Authorization to bypass will only be by administrative order.

S10. PROVISION FOR ELECTRIC POWER FAILURE

The permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during electric power failure at the treatment plant and/or sewage lift stations either by means of alternate power sources, standby generator, or retention of inadequately treated wastes.

GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
- a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized water discharges;
  - b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - c. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge subject to any applicable toxic pollutant effluent standard under Section 307 (a) of the Clean Water Act, or which could constitute a threat to human health, welfare, or the environment, 40 CFR Part 122 requires that the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement of a case-by-case basis.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:

- a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the Clean Water Act and authorized by administrative order;
- b. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
- c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special condition);
- d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:

- a. To enter upon the permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
- b. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;
- c. To inspect at reasonable times any monitoring equipment or method required in the permit;
- d. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
- e. To sample at reasonable times any discharge of pollutants.

- G7. The permittee shall submit a new application or supplement to the previous application where facility expansions, production increases, or process modifications will (1) result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.
- G8. After notice and opportunity for public hearing, this permit may be modified, terminated, or revoked during its term for cause as follows:
- a. Violation of any term or condition of the permit;
  - b. Failure of the permittee to disclose fully all relevant facts or misrepresentation of any relevant facts by the permittee in the application or during the permit issuance process;
  - c. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit;
  - d. Information indicating that the permitted discharge poses a threat to human health or welfare;
  - e. A change in ownership or control of the source; or
  - f. Other cause listed in 40 CFR Part 122.62 and 122.63.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

- G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. or 40 CFR Part 122.62 must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the department shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.
- G11. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.
- G12. All other requirements of 40 CFR 122.41 and 122.42 are incorporated into this permit by reference.
- G13. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

Issuance Date: MAY 09 1988  
Expiration Date: MAY 09 1993

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In Compliance with the Provisions of  
The State of Washington Water Pollution Control Law  
Chapter 90.48 Revised Code of Washington  
and  
The Federal Water Pollution Control Act  
(The Clean Water Act)  
Title 33 United States Code, Section 1251 et seq.

City of Lynden  
327 Front Street  
Lynden, Washington 98264

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Plant Location:

800 South 6th Street  
Lynden, Washington

(Whatcom County)

Receiving Water:

Nooksack River

Waterway Segment Number:

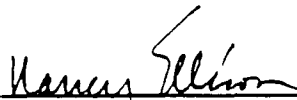
01-01-04

Discharge Location:

48°56'16"N  
122°27'10"W

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is authorized to discharge in accordance with the special and general conditions  
which follow.

  
Nancy Ellison, Regional Manager  
Northwest Regional Office  
Department of Ecology

SPECIAL CONDITIONS

S1. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Beginning on the issuance date of this permit and lasting through the expiration date of this permit, the Permittee is authorized to discharge treated municipal wastewater to the Nooksack River at the discharge location specified on page one of this permit subject to the following effluent limitations:

EFFLUENT LIMITATIONS

<u>Parameter</u>	<u>Monthly Average</u>	<u>Weekly Average</u>
Biochemical Oxygen Demand* (5 day)	30 mg/L, 135 kg/d (300 lb/d)	45 mg/L, 200 kg/d (450 lb/d)
Total Suspended Solids*	30 mg/L, 135 kg/d (300 lb/d)	45 mg/L, 200 kg/d (450 lb/d)
Fecal Coliform Bacteria	200/100 mL	400/100 mL
pH**	Shall not be outside the range 6.0 - 9.0	

\* The monthly average percent removal for BOD<sub>5</sub> and TSS shall not be less than 85 percent.

\*\* Values outside of this range may be allowed if the Permittee demonstrates that such excursions are not the result of inorganic chemical additions to the treatment process or contributions from industrial sources.

The monthly and weekly average effluent limitations for BOD<sub>5</sub> and TSS are the arithmetic mean of the samples taken during a calendar month or week. The average effluent limitations for Fecal Coliform are the geometric mean of the samples taken during a calendar month or week.

Total available (Residual) Chlorine shall be maintained which is sufficient to attain the Fecal Coliform limits specified above. Chlorine concentrations in excess of that necessary to reliably achieve the limits shall be avoided.

S2. TESTING SCHEDULE

The Permittee shall monitor influent wastewater, effluent wastewater and plant operating parameters according to the following schedule:

<u>Tests</u>	<u>Sample Point</u>	<u>Sampling Frequency</u>	<u>Sample Type</u>
Flow	effluent	7/week	continuous recording
BOD	influent	5/week	24-hour composite
	effluent	5/week	24-hour composite
TSS	influent	7/week	24-hour composite
	effluent	7/week	24-hour composite
	aeration basins	5/week	
Fecal Coliform <sup>*</sup>	effluent	3/week	
Total Available (Residual) Chlorine	effluent	7/week	
pH	influent	7/week	
	effluent	7/week	
	aeration basins	7/week	
	digester	2/week	
DO	influent	7/week	
	effluent	7/week	
	aeration basins	7/week	
	digester	2/week	
Temperature	influent	7/week	
	effluent	7/week	
	aeration basins	7/week	
	digester	2/week	
30-Minute Settleability	aeration basins	3/week	
SVI	aeration basins	3/week	
Oxygen Uptake Rate	aeration basins	3/week	
Volatile Suspended Solids	aeration basins	3/week	
F/M Ratio	aeration basins	2/week	
MCRT	aeration basins	3/week	

S2. TESTING SCHEDULE (Continued)

<u>Tests</u>	<u>Sample Point</u>	<u>Sampling Frequency</u>	<u>Sample Type</u>
Total Alkalinity	influent	7/week	
	aeration basins	7/week	
	digester	2/week	
NO <sub>2</sub> -N	effluent	3/week	
NO <sub>3</sub> -N	effluent	3/week	
PO <sub>4</sub> -P	effluent	3/week	
Total Solids	digester	2/week	
Total Volatile Solids	digester	2/week	

NOTE: Except where otherwise stated, sample type is grab.

- \* Total available (Residual) Chlorine shall be measured and reported at the same time that Fecal Coliform samples are taken.

S3. MONITORING AND REPORTING

a. Reporting

The Permittee shall monitor the parameters as specified in Condition S1. of this permit and report the results for each calendar month. The reports shall be submitted no later than the 15th day of the month following the completed reporting period and shall be on forms supplied or approved by the Department. Completed forms shall be sent to the Northwest Regional Office of the Washington State Department of Ecology, 4350 - 150th Avenue NE, Redmond, Washington 98052-5301.

In addition, a summary report form (EPA Form 3320-1) covering each calendar month shall be submitted no later than the 15th day of the month following the completed reporting period. This report is limited to the parameters specified in Condition S1.

If the Permittee monitors any pollutant more frequently than required by this permit, such results shall be recorded and reported in accordance with these instructions.

b. Records Retention

The Permittee shall retain for a minimum of three years all records of monitoring activities and results, including all reports or recordings from continuous monitoring instrumentation. This period of retention



S3. MONITORING AND REPORTING (Continued)

shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by the Director of this Department.

c. Recording of Results

For each measurement or sample taken, the Permittee shall record the following information: (1) the date, exact place, and time of sampling; (2) the dates the analyses were performed; (3) who performed the analyses; (4) the analytical techniques or methods used; and (5) the results of all analyses.

d. Representative Sampling

Samples and measurements taken to meet the requirements of this condition shall be representative of the volume and nature of the monitored discharge, including representative sampling of any unusual discharge or discharge condition, such as bypasses, upsets, and maintenance related conditions affecting effluent quality.

e. Test Procedures

All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall, unless approved otherwise in writing by the Department, conform to the Guidelines Establishing Test Procedures for the Analysis of Pollutants, contained in Title 40 Code of Federal Regulations Part 136.

f. Additional Monitoring

The Department may establish specific treatment plant, receiving water, sediment and biological monitoring requirements beyond those identified in this permit by permit modification or administrative order.

S4. PREVENTION OF FACILITY OVERLOADING

a. Design Criteria

The design criteria for the permitted treatment facility are as follows:

Average flow for maximum month:	4540 m <sup>3</sup> /d (1.2 MGD)
Influent BOD <sub>5</sub> loading for maximum month:	4885 kg/d (10,770 lb/d)
Design effluent quality for maximum month:	BOD <sub>5</sub> 30 mg/L (85% reduction)
	TSS <sub>5</sub> 30 mg/L (85% reduction)
Design effluent quality for maximum week:	BOD <sub>5</sub> 45 mg/L
	TSS <sub>5</sub> 45 mg/L

S4. PREVENTION OF FACILITY OVERLOADING (Continued)

Plans for Maintaining Adequate Capacity

When the actual flow or wasteload reaches 85 percent of the design capacity as specified in paragraph A. above, or when the projected increases would reach design capacity within five years, whichever occurs first, the Permittee shall submit to the Department, a plan and a schedule for continuing to maintain capacity at the facility sufficient to achieve the effluent limitations and other conditions of this permit. This plan shall address any of the following actions or any others necessary to meet this objective.

1. Analysis of the present design including the introduction of any process modifications that would establish the ability of the existing facility to achieve the effluent limits and other requirements of this permit at specific levels in excess of the existing design criteria specified in paragraph A. above.
2. Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system.
3. Limitation on future sewer extensions or connections or additional wasteloads.
4. Modification or expansion of facilities necessary to accommodate increased flow or wasteload.

The plan shall specify any contracts, ordinances, methods for financing or other arrangements necessary to achieve this objective.

S5. OPERATION AND MAINTENANCE OF FACILITIES

In accordance with the Washington Administrative Code, Chapter 173-230 (Certification of Operators of Wastewater Treatment Plants), the Permittee shall provide an adequate operating staff qualified to carry out the operation, maintenance and testing activities required to ensure compliance with the conditions of this permit. An operator certified for a Class II plant by the State of Washington shall be in responsible charge of the day to day operations of the wastewater treatment facility.

S6. PROVISION FOR POWER FAILURE

The Permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during power failure at the treatment facility including sewage lift stations either by means of alternate power sources, standby generation of power, or retention of inadequately treated wastes.

S7. RESIDUAL SOLIDS HANDLING

- a. The Permittee shall handle, utilize and dispose of all residual solids in such a manner as to prevent its entry into state ground or surface waters.
- b. The Permittee shall not permit leachate from its residual solids to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to violate the State Water Quality Standards, Chapter 173-201, Washington Administrative Code, or cause any adverse effect of state ground waters. The Permittee shall apply for a permit or permit modification as may be required for such discharges.
- c. Disposal or utilization of residual solids on land shall be in accordance with the requirements of the jurisdictional health Department.
- d. The Department may establish specific sludge management requirements beyond those identified in this permit by permit modification or administrative order.

S8. CONSTRUCTION OR MAINTENANCE RELATED OVERFLOW, BYPASS OR REDUCTION IN LEVEL OF TREATMENT

- a. The overflow, bypass or reduction in level of treatment of sewage at the treatment facility or within the sewage collection and transmission system tributary to the treatment facility in excess of that allowed by the effluent limitations of this permit during construction or maintenance shall be avoided if at all possible.
- b. If an event as described in paragraph A. above is contemplated which the Permittee could reasonably be expected to have anticipated, the Permittee shall submit to the Department not less than 90 days prior to the contemplated event, a report which describes in detail any construction work which will result in such a discharge of wastewater. The report shall contain: (1) an analysis of all known alternatives which would eliminate, reduce or mitigate the need for bypassing or reducing the level of treatment; (2) a cost effective analysis of alternatives including comparative resource damage assessment; (3) the duration of such events for each alternative; (4) a recommended preferred alternative for the bypass or reduction in level of treatment; (5) the projected date for the event; (6) a statement of compliance with the State Environmental Policy Act; and (7) a request for a water quality modification as provided for in Chapter 173-201-100(2) of the Washington Administrative Code.
- c. Final authorization to discharge wastewater as described in paragraph A. above may be granted after review of the above information, in accordance with Condition G5. Authorization to discharge such wastewater will only be by administrative order.

S8. CONSTRUCTION OR MAINTENANCE RELATED OVERFLOW, BYPASS OR REDUCTION IN LEVEL OF TREATMENT (Continued)

- d. If the Permittee expects a reduction in the required level of treatment that would exceed permit effluent limitations on a short-term basis for any reason, and such reduction cannot be avoided without resulting in the discharge of greater quantities of pollutants in the future, and the Permittee could not reasonably be expected to have anticipated the need for such reductions in the level of treatment within the time required for justifying such actions as required in paragraph B. above, the Permittee shall give written notification to the Department in accordance with Conditions G4. and G5.

S9. INDUSTRIAL AND COMMERCIAL SOURCES (PRETREATMENT)

The Permittee shall not allow discharges to their sewer system which would violate the general or specific prohibitions contained in Title 40, Code of Federal Regulations Part 403.5, or categorical standards contained in Title 40 Code of Federal Regulations Subchapter N, or any applicable regulations promulgated under Chapter 90.48 of the Revised Code of Washington.

The permittee shall assist the Department in monitoring commercial and industrial discharges into the sewer system and ensuring that all industrial and commercial users are in compliance with applicable pretreatment regulations.

The permittee shall submit written notice to the Department whenever any new or altered commercial or industrial source proposes to discharge waste into its sewer system which may interfere with the operation of the treatment facility, or interfere with the use or disposal of municipal sludge, or which may pass through the treatment facility causing violations of State Water Quality Standards (Chapter 173-201 of the Washington Administrative Code). Neither connection nor discharge to the sewer system shall be allowed until the commercial or industrial source obtains a State Waste Discharge Permit or such source is otherwise approved by the Department as provided in Chapter 90.48.160 or Chapter 90.48.200 or the Revised Code of Washington.

The permittee shall perform industrial user survey, reporting, and other local assistance activities as specified by the Department in support of the state pretreatment program.

GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The Permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this permit.
- G3. The Permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power or the treatment facility is reduced, lost, or fails.
- G4. If for any reason the Permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the Permittee shall, at a minimum, provide the Department with the following information:
- A. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized water discharges;
  - B. The period of noncompliance, including exact dates and times and/or the anticipated time when the Permittee will return to compliance; and
  - C. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the Permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The Permittee shall notify the Department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge subject to any applicable toxic pollutant effluent standard under Section 307 (a) of the Clean Water Act, or which could constitute a threat to human health, welfare, or the environment, 40 CFR Part 122 requires that the information specified in items G4.A., G4.B., and G4.C., above, shall be provided not later than 24 hours from the time the Permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the Permittee becomes aware of the circumstances, unless the Department waives or extends this requirement on a case-by-case basis.

G4. (Continued)

Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:

- A. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance related activities essential to meet the requirements of the Clean Water Act and authorized by administrative order;
- B. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
- C. The Permittee submits notice of an unanticipated bypass to the Department in accordance with Condition G4. Where the Permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the Department, if possible, at least 30 days before the date of bypass (or longer if specified in the special condition);
- D. The bypass is allowed under conditions determined to be necessary by the Department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the Department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

G6. The Permittee shall allow an authorized representative of the Department, upon the presentation of credentials and such other documents as may be required by law:

- A. To enter upon the Permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
- B. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;

G6. (Continued)

- C. To inspect at reasonable times any monitoring equipment or method required in the permit;
  - D. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
  - E. To sample at reasonable times any discharge of pollutants.
- G7. The Permittee shall submit a new application or supplement to the previous application where facility expansions, production increases, or process modifications will (1) result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.
- G8. After notice and opportunity for public hearing, this permit may be modified, terminated, or revoked during its term for cause as follows:
- A. Violation of any term or condition of the permit;
  - B. Failure of the Permittee to disclose fully all relevant facts or misrepresentation of any relevant facts by the Permittee in the application or during the permit issuance process;
  - C. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit;
  - D. Information indicating that the permitted discharge poses a threat to human health or welfare;
  - E. A change in ownership or control of the source; or
  - F. Other cause listed in 40 CFR Part 122.62 and 122.63.

Permit modification, revocation and reissuance, or termination may be initiated by the Department or requested by any interested person.

- G9. A Permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. or 40 CFR Part 122.62 must report its plans, or such information, to the Department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The Department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. If any applicable toxic effluent standard or prohibition (including any schedule or compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the Department shall institute proceedings to

G10. (Continued)

modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.

- G11. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the Department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.
- G12. All other requirements of 40 CFR 122.41 and 122.42 are incorporated into this permit by reference.
- G13. Nothing in this permit shall be construed as excusing the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.



Issuance Date: 02 28 1989

Expiration Date: APR 30 1994

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In Compliance with the Provisions of  
The State of Washington Water Pollution Control Law  
Chapter 90.48 Revised Code of Washington  
and  
The Federal Water Pollution Control Act  
(The Clean Water Act)  
Title 33 United States Code, Section 1251 et seq.

CITY OF EVERSON  
P.O. Box 315  
Everson, Washington 98247

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Plant Location:

Main Street and Park Drive

Receiving Water:

Nooksack River. Class A

Waterway Segment Number:

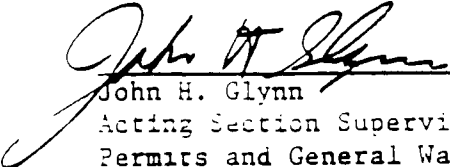
01-01-04

Discharge Location:

Outfall 001	Latitude: 48° 55' 06"
	Longitude: 122° 20' 52"
Outfall 002	Latitude: 48° 55' 10"
	Longitude: 122° 21' 10"

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is authorized to discharge in accordance with the special and general conditions which follow.

  
John H. Glynn  
Acting Section Supervisor  
Permits and General Water Quality  
Northwest Regional Office  
Department of Ecology

SPECIAL CONDITIONS

51. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Beginning on the issuance date of this permit and lasting through the expiration date of this permit, the permittee is authorized to discharge treated municipal wastewater to the Nooksack River at the permitted discharge locations (outfalls 001 and 002) subject to the following limitations and monitoring requirements:

EFFLUENT LIMITATIONS

<u>Parameter</u>	<u>Monthly Average</u>	<u>Weekly Average</u>
Biochemical Oxygen Demand* (5 day)	30 mg/l (77 lbs/day)	45 mg/l. (142 lbs/day)
Total Suspended Solids*	30 mg/l (58 lb/day)	45 mg/l (142 lbs/day)
Fecal Coliform Bacteria	200/100 ml	400/100ml
pH**	Shall not be outside the range 6.0 - 9.0	

\*The monthly average effluent concentration limitations for BOD<sub>5</sub> and Total Suspended Solids shall not exceed 30 mg/l or 15 percent of the respective influent concentrations, whichever is more stringent.

\*\*Effluent values for pH shall not exceed the limits 6.0 - 9.0 where such values are attributable to inorganic chemical addition to the treatment process or to industrial contributions.

The monthly and weekly averages for BOD<sub>5</sub> and Suspended Solids are based on the arithmetic mean of the samples taken. The averages for Fecal Coliform are based on the geometric mean of the samples taken.

Total available residual chlorine shall be maintained which is sufficient to attain the Fecal Coliform limits specified above. Chlorine concentrations in excess of that necessary to reliably achieve the limits shall be avoided.

## S2. TESTING SCHEDULE

The permittee shall monitor plant processes and wastewater according to the following schedule:

<u>Tests</u>	<u>Sample Point</u>	<u>Sampling Frequency</u>	<u>Sample Type</u>
Flow	influent	7/week	Continuous Recording
pH	influent	5/week	
	effluent	5/week	
	aeration basins	5/week	
Temperature	influent	5/week	
	aeration basins	5/week	
BOD <sub>5</sub>	influent	Weekly	24 hr composite
	effluent	Weekly	24 hr composite
Total Suspended Solids	influent	Weekly	24 hr composite
	effluent	Weekly	24 hr composite
	aeration basins	Weekly	
Dissolved Oxygen	influent	5/week	
	effluent	5/week	
	aeration basins	5/week	
Volatile Solids	influent	Weekly	24 hr composite
	aerobic digester	Weekly	
TVSS	aeration basins	Weekly	
SVI	aeration basins	Weekly	
Loading Index (F/M Ratio)	aeration basins	Weekly	
Total available (residual) chlorine	effluent	5/week*	
Fecal Coliform	effluent	3/week*	

\* Total available (residual) chlorine shall be measured and reported at the same time that Fecal Coliform samples are taken.

Except where otherwise indicated, sample type is grab.

53. MONITORING AND REPORTING

a. Reporting

A monthly report recording each required analysis shall be submitted no later than the 15th day of the following month. The monthly reporting form will be supplied to the permittee or approved by the department and sent to the Northwest Regional Office of the Washington State Department of Ecology, 4350-150th Avenue N.E., Redmond, Washington 98052.

Monitoring shall be started on the issuance date of this permit and the first monthly report is due 45 days thereafter.

If the permittee monitors any pollutant any more frequently than required by the permit, he shall record and report such results.

b. Records Retention

The permittee shall retain for a minimum of three years all records of monitoring activities and results, including all reports of recordings from continuous monitoring instrumentation. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or when requested by the director.

c. Recording of Results

For each measurement or sample taken, the permittee shall record the following information: (1) the date, exact place, and time of sampling; (2) the dates the analyses were performed; (3) who performed the analyses; (4) the analytical techniques or methods used; and (5) the results of all analyses.

d. Representative Sampling

Samples and measurements taken to meet the requirements of this condition shall be representative of the volume and nature of the monitored discharge, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance related conditions affecting effluent quality.

53. MONITORING AND REPORTING (Continued)

a. Test Procedures

All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall, unless approved otherwise in writing by the Department, conform to the Guidelines Establishing Test Procedures for the Analysis of Pollutants, contained in 40 CFR Part 136.

i. Additional Monitoring

The department may establish specific monitoring requirements beyond those identified in this permit by permit modification or administrative order.

54. PREVENTION OF FACILITY OVERLOADING

a. Design Criteria

The design loading criteria for the permitted treatment facility are as follows:

Flow		
average day	(0.226 MGD)	85% capacity = .201 MGD
peak hour	(1.657 MGD)	
peak monthly	(.378 MGD)	85% capacity = .321 MGD
Population		
	2,051	
Biochemical Oxygen Demand		
(5-day)	(513 lb/d)	85% capacity = 436 lb/d
Total Suspended Solids		
	(390 lb/d)	85% capacity = 332 lb/d

Design removal for BOD(5) and TSS no less than 85%.

b. Plans for Maintaining Adequate Capacity

When the actual flow or waste load reaches 85 percent of the design capacity as specified in Paragraph a.. or when projected increases would reach design capacity within five years, whichever occurs first, the permittee shall submit to the department, a plan and a schedule for continuing to maintain adequate capacity. This plan shall address any and all of the actions necessary to meet this objective. This may include the following items:

1. Analysis of the present design and/or process modifications that would establish the ability of the existing facility to reliably treat flows and/or waste loads (i.e., achieve the effluent limits and other requirements of this permit), in excess of the existing design criteria.
2. Elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system to reduce extraneous flow.

S4. PREVENTION OF FACILITY OVERLOADING (Continued)

3. Limitation on future sewer extension or connections or additional or waste load.
4. Modification or expansion of facilities necessary to accommodate increased flow or waste load.
5. Any other actions necessary to achieve this objective. The plan shall specify any contracts, ordinances, methods for financing or other arrangements necessary to achieve this objective.

S5. INDUSTRIAL AND COMMERCIAL SOURCES (PRETREATMENT)

The permittee shall submit written notice to the department whenever any new or altered commercial or industrial source proposes to discharge waste into it's municipal sewer system which may interfere with the operation of the treatment works including interference with the use or disposal of municipal sludge and/or which may pass through the treatment works causing violations of the State Water Quality Standards (Chapter 173-201 Washington Administrative Code). Connection to the sewer system shall not be allowed until the commercial or industrial applicant obtains a State Waste Discharge Permit as provided in the Revised Code of Washington Chapter 90.48.160.

The permittee shall assist the department in monitoring commercial and industrial discharges into the municipal sewer system.

S6. RESIDUAL SOLIDS HANDLING

- a. The permittee shall handle, utilize and dispose of all residual solids in such a manner as to prevent its entry into state ground or surface waters.
- b. The permittee shall not permit leachate from its residual solids to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effect on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.
- c. All residual solids disposal shall be in accordance with the requirements of the jurisdictional health department.

S7. OPERATION AND MAINTENANCE OF FACILITIES

In accordance with the Washington Administrative Code, Chapter 173-230 (Certification of Operators of Wastewater Treatment Plants), the permittee shall provide an adequate operating staff which is qualified to carry out the operation, maintenance and testing activities required to insure compliance with the conditions of this permit. An operator certified for a Class I plant by the State of Washington shall be in responsible charge of the day to day operation of the wastewater treatment plant.

S8. CONSTRUCTION OR MAINTENANCE RELATED OVERFLOW, BYPASS OR REDUCTION IN LEVEL OF TREATMENT

If the permittee contemplates a reduction in the required level of treatment that would exceed permit effluent limitations on a short term basis for any reason, and such reduction cannot be avoided, the permittee shall give written notification to the department, if possible, 30 days prior to such activities, detailing the reasons for, length of time of, and the potential effects of the reduced level of treatment. If such a reduction involves a bypass, the requirements of Condition G5, and the "Construction or Maintenance Related Overflow or Bypass" conditions must be met.

S9. CONSTRUCTION OR MAINTENANCE RELATED OVERFLOW OR BYPASS

Bypasses of untreated or partially treated sewage during construction or maintenance shall be avoided if at all feasible.

If a construction or maintenance related overflow or bypass is contemplated, the permittee shall submit to the department not less than 90 days prior to the contemplated overflow or bypass, a report which describes in detail any construction work which will result in the overflow or bypass of wastewater. The report shall contain: (1) an analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing; (2) a cost effective analysis of alternatives including comparative resource damage assessment; (3) the minimum and maximum duration of bypass under each alternative; (4) a recommendation as to the preferred alternative for conducting the bypass; (5) the projected date of bypass initiation; (6) a statement of compliance with the State Environmental Policy Act; and (7) a request for a water quality modification, as provided for in Chapter 173-201-100(2) of the Washington Administrative Code.

For probable construction bypasses, the need to bypass is to be identified as early in the planning process as possible. The analysis required above shall be considered during preparation of the engineering report or facilities plan and plans and specifications, and shall be included to the extent practical. In cases where the probable need to bypass is determined early, continued analysis is necessary up to and including the construction period in an effort to minimize or eliminate the bypass.

Final authorization to bypass may be granted after review of the above information, in accordance with Condition G5. Authorization to bypass will only be by administrative order.

S10. PROVISION FOR ELECTRIC POWER FAILURE

The permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during electric power failure at the treatment plant and/or sewage lift stations either by means of alternate power sources, standby generator, or retention of inadequately treated wastes.

GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
- a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized water discharges;
  - b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - c. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge subject to any applicable toxic pollutant effluent standard under Section 307 (a) of the Clean Water Act, or which could constitute a threat to human health, welfare, or the environment, 40 CFR Part 122 requires that the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement of a case-by-case basis.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.



G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:

- a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the Clean Water Act and authorized by administrative order;
- b. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
- c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special condition);
- d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:

- a. To enter upon the permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
- b. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;
- c. To inspect at reasonable times any monitoring equipment or method required in the permit;
- d. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
- e. To sample at reasonable times any discharge of pollutants.

- G7. The permittee shall submit a new application or supplement to the previous application where facility expansions, production increases, or process modifications will (1) result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.
- G8. After notice and opportunity for public hearing, this permit may be modified, terminated, or revoked during its term for cause as follows:
- a. Violation of any term or condition of the permit;
  - b. Failure of the permittee to disclose fully all relevant facts or misrepresentation of any relevant facts by the permittee in the application or during the permit issuance process;
  - c. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit;
  - d. Information indicating that the permitted discharge poses a threat to human health or welfare;
  - e. A change in ownership or control of the source; or
  - f. Other cause listed in 40 CFR Part 122.62 and 122.63.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

- G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. or 40 CFR Part 122.62 must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the department shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.
- G11. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.
- G12. All other requirements of 40 CFR 122.41 and 122.42 are incorporated into this permit by reference.
- G13. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

Page 1 of 7  
Permit Number WA-000214-3

Issuance Date: AUG 12 1983  
Expiration Date: AUG 12 1986

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In compliance with the provisions of  
Chapter 90.48 Revised Code of Washington as amended  
and  
The Clean Water Act as amended  
Public Law 95-217

Bellingham Cold Storage Company  
P.O. Box 895  
Bellingham, Washington 98225

Plant Location:  
Squalicum Fill

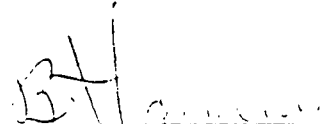
Receiving Water:  
Bellingham Bay

Industry Type :  
Seafood Processing & Cold Storage

Discharge Location:  
Latitude: 001 48° 45' 47" N  
          002 48° 45' 34" N  
Longitude: 001 122° 30' 32" W  
          002 122° 30' 29" W

Waterway Segment Number:  
01-01-03 (Cooling Water)  
01-01-02 (Process Wastewater)

is authorized to discharge in accordance with the special  
and general conditions which follow.

  
\_\_\_\_\_  
Bruce A. Cameron  
Assistant Director  
Department of Ecology (I)

SPECIAL CONDITIONS

## Sl.a. EFFLUENT LIMITATIONS (Non Contact Cooling Water)

During the period beginning on the date of issuance of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge non-contact cooling water to outfalls 001 and 002 to Bellingham Bay at the permitted locations subject to the following limitations:

## EFFLUENT LIMITATIONS

<u>Parameters</u>	<u>Daily Maximum</u>
Flow	220 m <sup>3</sup> /d (58,000 gpd)
Temperature	30° C (85° F)

The daily maximum is defined as the greatest allowable value for any calendar day.

SPECIAL CONDITIONS

S1.b. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (Process Wastewater)

During the period beginning on the date of issuance of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge screened process wastewaters to the Bellingham Sanitary Sewer System subject to the following limitations and monitoring requirements:

EFFLUENT LIMITATIONS

<u>Parameters</u>	<u>Daily Maximum</u>
Flow	40 m <sup>3</sup> /d (10,000 gpd)

D-47

The daily maximum is defined as the greatest allowable value for any calendar day.

S2. OPERATION AND MAINTENANCE

- a. All seafood processing wastewater and washdown water shall be screened (not greater than 40 mesh openings) and discharged to the Bellingham sanitary sewer system.
- b. Off loading of seafood on the dock shall be accomplished with a minimum of waste discharge.
- c. Contents of vessel bilges shall not be discharged into the harbor or inner bay.
- d. All solids to be utilized in by-products shall be stored, handled and transported in a manner which prevents its entry or the drainage thereof into surface waters of the state.
- e. All cold storage warehouse drains shall discharge to the Bellingham sanitary sewer system.
- f. All sanitary wastes shall be discharged into the Bellingham sanitary sewer system.

S3. SOLID WASTE DISPOSAL

- a. The permittee shall handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface waters. All solid waste disposal shall be in accordance with the requirements of the Bellingham Whatcom County Health District.
- b. The permittee shall not permit leachate from its solid waste material to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effect on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.

GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
  - a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized waste discharges;
  - b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - c. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge subject to any applicable toxic pollutant effluent standard under Section 307 (a) of the Clean Water Act, or which could constitute a threat to human health, welfare, or the environment, 40 CFR Part 122 requires that the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement on a case-by-case basis.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

- G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:
- a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the Clean Water Act and authorized by administrative order;
  - b. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
  - c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special conditions);
  - d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.
- "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
- After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.
- G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:
- a. To enter upon the permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
  - b. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;
  - c. To inspect at reasonable times any monitoring equipment or method required in the permit;
  - d. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
  - e. To sample at reasonable times any discharge of pollutants.
- G7. The permittee shall submit a new application or supplement to the previous application where facility expansions, production increases, or process



modifications will (1) result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.

G8. After notice and opportunity for public hearing, this permit may be modified, terminated, or revoked during its term for cause as follows:

- a. Violation of any term or condition of the permit;
- b. Failure of the permittee to disclose fully all relevant facts or misrepresentation of any relevant facts by the permittee in the application or during the permit issuance process;
- c. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit;
- d. Information indicating that the permitted discharge poses a threat to human health or welfare;
- e. A change in ownership or control of the source; or
- f. Other cause listed in 40 CFR Part 122.15 and 122.16.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. or 40 CFR Part 122.15 must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.

G10. If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the department shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.

G11. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.

G12. All other requirements of 40 CFR Part 122.7, 122.60, and 122.61 are incorporated into this permit by reference.

G13. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

Issuance Date: July 21, 1984

Expiration Date: July 21, 1985

STATE WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In compliance with the provisions of  
Chapter 90.48 Revised Code of Washington as amended

BELLINGHAM FROZEN FOODS, INC.  
P.O. Box 1016  
Bellingham, Washington 98225

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Plant Location:

Squalicum Fill

Receiving Water:

Bellingham Bay via Bellingham Wastewater  
Treatment Plant

Industry Type:

Vegetable Processing

Discharge Location:

Latitude: 48° 43' 00" N

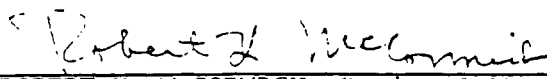
Longitude: 122° 31' 05" W

Waterway Segment Number:

01-01-02

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is authorized to discharge in accordance with the special  
and general conditions which follow.

  
\_\_\_\_\_  
ROBERT K. MCCORMICK, Regional Manager  
Department of Ecology (1)

SPECIAL CONDITIONS

## S1. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Upon the issuance date of this permit and lasting through the expiration date of this permit, the permittee is authorized to discharge screened process wastewater to the Bellingham Sanitary Sewer System subject to the following limitations and monitoring requirements:

<u>Parameters</u>	<u>EFFLUENT LIMITATIONS</u>		<u>MONITORING REQUIREMENTS*</u>	
	<u>Daily Average</u>	<u>Daily Maximum</u>	<u>Minimum Frequency</u>	<u>Sample Type</u>
Flow	7,500 m <sup>3</sup> /d (2,000,000 gpd)	9,500 m <sup>3</sup> /d (2,500,000 pgd)	Daily	Calculate

The daily average is defined as the average of the measured values obtained over a calendar month's time. The daily maximum is defined as the greatest allowable value for any calendar day.

\*Monitoring shall be conducted during the processing season.

52. MONITORING AND REPORTING

The permittee shall monitor the operation and efficiency of all treatment and control facilities and the quantity and quality of the waste discharged. A record of all such data shall be maintained. The permittee shall monitor the parameters as specified in Condition S1 of this permit.

a. Reporting

Monitoring results obtained during the previous three months shall be summarized and reported on a form provided by the department, to be submitted no later than the 15th day of the month following the completed reporting period. The report shall be sent to the Northwest Regional Office of the Department of Ecology, 4350 - 150th Avenue N.E., Redmond, Washington 98052. Monitoring shall be started on the first day of processing and the first report is due 3-½ months later.

b. Records Retention

The permittee shall retain for a minimum of three years all records of monitoring activities and results, including all reports of recordings from continuous monitoring instrumentation. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or when requested by the director.

c. Recording of Results

For each measurement or sample taken the permittee shall record the following information: (1) the date, exact place and time of sampling; (2) the dates the analyses were performed; (3) who performed the analyses; (4) the analytical techniques or methods used; and (5) the results of all analyses.

d. Representative Sampling

Samples and measurements taken to meet the requirements of this condition shall be representative of the volume and nature of the monitored discharge.

S2. MONITORING AND REPORTING (Continued)

e. Test Procedures

All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall, unless approved otherwise in writing by the department, conform to the of the Guidelines Establishing Test Procedures for the Analysis of Pollutants, contained in 40 CFR 136, as published in the Federal Register on December 1, 1976, or the latest revision thereof, which currently references the following publications:

1. American Public Health Association, Standard Methods for the Examination of Water and Wastewaters.
2. American Society for Testing and Materials, A.S.T.M. Standards, Part 31, Water, Atmospheric Analysis.
3. Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes

S3. SOLID WASTE DISPOSAL

- a. The permittee shall handle and dispose of all solid waste including, but not limited to cull materials, screenings and other solids from washing, cutting and sorting, in such a manner as to prevent its entry into state ground or surface waters.
- b. The permittee shall not permit leachate from its solid waste, including, but not limited to cull materials, screenings and other solids from washing, cutting and sorting, to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effect on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.

S4. OPERATION AND MAINTENANCE

- a. All process wastewater shall pass through a 40 mesh screen or its equivalent prior to discharge to the Bellingham Sanitary Sewer System.
- b. All drainage from raw vegetable storage areas shall be screened and shall discharge to the Bellingham Sanitary Sewer System.

5. OTHER REQUIREMENTS

If increased levels of pollutant discharges result in structural deterioration of the sewer system or significant reduction in pollutant removal efficiencies at the Bellingham wastewater treatment plant, this permit may be modified to require pretreatment, reduced levels of production or other measures necessary to eliminate such structural deterioration or reductions in treatment removal efficiencies.

GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times maintain in good working order and operate as efficiently as possible all facilities and systems (and related appurtenances) for collection and treatment which are installed or used by the permittee for water pollution control and abatement to achieve compliance with the terms and conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
  - a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized waste discharges;
  - b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - c. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge which could constitute a threat to human health, welfare, or the environment, the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement on a case-by-case basis.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:

- a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the permit and authorized by administrative order;
- b. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
- c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special conditions);
- d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:

- a. To enter upon the permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
- b. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;



- c. To inspect at reasonable times any monitoring equipment or method required in the permit;
  - d. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
  - e. To sample at reasonable times any discharge of pollutants.
- G7. The permittee shall apply for a new permit at least sixty days prior to the time when facility expansions, production changes, or process modifications will (1) result in new or substantially increased discharges of waste characteristics or volume or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.
- G8. A permit shall be subject to termination upon thirty days notice in writing if the department finds:
- a. That it was procured by misrepresentation of any material fact or by lack of full disclosure in the application;
  - b. That there has been a violation of the conditions thereof;
  - c. That a material change in quantity and type of waste disposal exists.

In the event that a material change in the conditions of the state waters Utilized creates a dangerous degree of pollution, the department may specify additional conditions in the permits previously issued.

The director of the department is authorized to issue permits for waste disposal and specify the conditions and expiration date of such permits.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

- G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.
- G11. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

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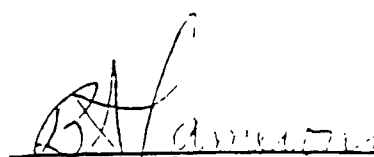
Permit Number WA-002981-5Issuance Date: JUL 22 1983Expiration Date: JUL 22 1988NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WASTE DISCHARGE PERMITState of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504In compliance with the provisions of  
Chapter 90.48 Revised Code of Washington as amended  
andThe Clean Water Act as amended  
Public Law 95-217SEA PAC COMPANY, INC.  
601 West Chestnut Street  
Bellingham, Washington 98225

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Plant Location:  
Squalicum Way  
Bellingham, WAReceiving Water:  
Bellingham BayIndustry Type :  
Seafood ProcessingDischarge Location: (cooling water)

Latitude: 48° 45' 27" N

Longitude: 122° 30' 22" W

Waterway Segment Number:01-01-02 (Process wastewater)  
01-01-03 (Cooling water)is authorized to discharge in accordance with the special  
and general conditions which follow.  
\_\_\_\_\_  
Bruce A. Cameron  
Assistant Director  
Department of Ecology (I)

SPECIAL CONDITIONS

S1.a. EFFLUENT LIMITATIONS (uncontaminated cooling water)

During the period beginning on the date of issuance of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge uncontaminated cooling water to Bellingham Bay subject to the following limitations:

EFFLUENT LIMITATIONS

Parameters

Daily Maximum

Flow

19 m<sup>3</sup>/d (5,000 gpd)

The daily maximum is defined as the greatest allowable value for any calendar day.

SPECIAL CONDITIONS

## S1.b. EFFLUENT LIMITATIONS (process wastewater)

During the period beginning on the date of issuance of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge screened process wastewater to the City of Bellingham Sanitary Sewer System subject to the following limitations:

## EFFLUENT LIMITATIONS

<u>Parameters</u>	<u>Daily Average</u>	<u>Daily Maximum</u>
Flow	11 m <sup>3</sup> /d (3,000 gpd)	38 m <sup>3</sup> /d (10,000 gpd)

The daily average is defined as the average of the measured values for each operating day obtained over a calendar month's time.

The daily maximum is defined as the greatest allowable value for any calendar day.

S2. OPERATION AND MAINTENANCE

- a. All seafood processing wastewater and washdown water shall be screened (not greater than 1/4 inch openings) and discharged to the Bellingham sanitary sewer system.
- b. Off loading of seafood on the dock shall be accomplished with a minimum of waste discharge.
- c. Contents of vessel bilges shall not be discharged into the harbor.
- d. All solids to be utilized in by-products shall be stored, handled and transported in a manner which prevents its entry or the drainage thereof into surface waters of the state.
- e. All sanitary wastes shall be discharged into the Bellingham sanitary sewer system.

S3. SOLID WASTE DISPOSAL

- a. The permittee shall handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface waters. All solid waste disposal shall be in accordance with the requirements of the Bellingham Whatcom County Health District.
- b. The permittee shall not permit leachate from its solid waste material to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effect on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.

GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
  - a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized waste discharges;
  - b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - c. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge subject to any applicable toxic pollutant effluent standard under Section 307 (a) of the Clean Water Act, or which could constitute a threat to human health, welfare, or the environment, 40 CFR Part 122 requires that the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement on a case-by-case basis.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:

- a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the Clean Water Act and authorized by administrative order;
- b. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
- c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special conditions);
- d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:

- a. To enter upon the permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
- b. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;
- c. To inspect at reasonable times any monitoring equipment or method required in the permit;
- d. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
- e. To sample at reasonable times any discharge of pollutants.

G7. The permittee shall submit a new application or supplement to the previous application where facility expansions, production increases, or process

modifications will (1) result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.

G8. After notice and opportunity for public hearing, this permit may be modified, terminated, or revoked during its term for cause as follows:

- a. Violation of any term or condition of the permit;
- b. Failure of the permittee to disclose fully all relevant facts or misrepresentation of any relevant facts by the permittee in the application or during the permit issuance process;
- c. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit;
- d. Information indicating that the permitted discharge poses a threat to human health or welfare;
- e. A change in ownership or control of the source; or
- f. Other cause listed in 40 CFR Part 122.15 and 122.16.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. or 40 CFR Part 122.15 must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.

G10. If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the department shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.

G11. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.

G12. All other requirements of 40 CFR Part 122.7, 122.60, and 122.61 are incorporated into this permit by reference.

G13. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.



Page 1 of 6

Permit Number 5165

Issuance Date: MAR 2 1983

Expiration Date: MAR 2 1988

## STATE WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In compliance with the provisions of  
Chapter 90.48 Revised Code of Washington as amended

SEAWEST INDUSTRIES, INC.  
100 Second Avenue  
Edmonds, Washington 98020

Plant Location:

Squalicum Fill  
P.O. Box 427  
Bellingham, Washington 98227

Receiving Water:

Bellingham Bay via Bellingham wastewater  
treatment system

Waterway Segment Number:

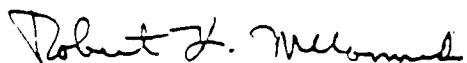
01-01-03

Discharge Location:

48° 43' 0" N

122° 31' 5" W

is authorized to discharge in accordance with the special  
and general conditions which follow.

  
ROBERT K. MCCORMICK, Regional Manager  
Department of Ecology ( )

SPECIAL CONDITIONS

## SI. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Upon permit issuance and lasting through the expiration date of this permit, the permittee is authorized to discharge screened process wastewater to the Bellingham sanitary sewer subject to the following limitations:

## EFFLUENT LIMITATIONS

<u>Parameter</u>	<u>Daily Average</u>	<u>Daily Maximum</u>
Flow	265 m <sup>3</sup> /d (70,000 gpd)	550 m <sup>3</sup> /d (140,000 gpd)

The daily average is defined as the average of the measured values obtained over a calendar month's time.

The daily average is defined as the greatest allowable value for any calendar day.

S2. SOLID WASTE DISPOSAL

- a. The permittee shall handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface waters. All solid waste disposal shall be in accordance with the requirements of the Bellingham Whatcom County Health District.
- b. The permittee shall not permit leachate from its solid waste material to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effect on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.

S3. OPERATION AND MAINTENANCE

- a. All seafood processing wastewater including but not necessarily limited to water originating from butchering, cutting, glazing, fluming and shaking shall be screened (not greater than 1/4 inch openings) and discharged to the Bellingham sanitary sewer system.
- b. All contact cooling water shall be screened and discharged to the Bellingham sanitary sewer system.
- c. All solids to be utilized in by-products shall be stored, handled and transported in a manner which prevents its entry or the drainage thereof into surface waters of the state.
- d. All solids to be used as fertilizer by land spreading shall be stored, handled, transported and utilized in accordance with the requirements of the Bellingham Whatcom County Health District.
- e. All sanitary wastes shall be discharged into the Bellingham sanitary sewer system.

GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times maintain in good working order and operate as efficiently as possible all facilities and systems (and related appurtenances) for collection and treatment which are installed or used by the permittee for water pollution control and abatement to achieve compliance with the terms and conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
  - a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized waste discharges;
  - b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - c. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge which could constitute a threat to human health, welfare, or the environment, the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement on a case-by-case basis.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

- G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:
- a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the permit and authorized by administrative order;
  - b. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
  - c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special conditions);
  - d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

- G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:
- a. To enter upon the permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
  - b. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;

- c. To inspect at reasonable times any monitoring equipment or method required in the permit;
  - d. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
  - e. To sample at reasonable times any discharge of pollutants.
- G7. The permittee shall apply for a new permit at least sixty days prior to the time when facility expansions, production changes, or process modifications will (1) result in new or substantially increased discharges of waste characteristics or volume or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.
- G8. A permit shall be subject to termination upon thirty days notice in writing if the department finds:
- a. That it was procured by misrepresentation of any material fact or by lack of full disclosure in the application;
  - b. That there has been a violation of the conditions thereof;
  - c. That a material change in quantity and type of waste disposal exists.

In the event that a material change in the conditions of the state waters Utilized creates a dangerous degree of pollution, the department may specify additional conditions in the permits previously issued.

The director of the department is authorized to issue permits for waste disposal and specify the conditions and expiration date of such permits.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

- G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.
- G11. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

Issuance Date: JUL 26 1983  
Expiration Date: JUL 26 1988

STATE WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In compliance with the provisions of  
Chapter 90.48 Revised Code of Washington as amended

SCHENK SEAFOOD SALES, INC.  
P.O. Box 984  
Bellingham, Washington 98225

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Plant Location:

17 Squalicum Way  
Bellingham, Washington

Receiving Water:

Bellingham Bay via Bellingham  
Wastewater Treatment Plant

Industry Type:

Seafood Processing

Discharge Location:

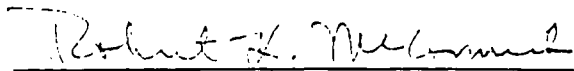
Bellingham Sanitary Sewer System

Waterway Segment Number:

01-01-02

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is authorized to discharge in accordance with the special  
and general conditions which follow.

  
ROBERT K. MCCORMICK, Regional Manager  
Department of Ecology (1)

SPECIAL CONDITIONS

S1. EFFLUENT LIMITATIONS

During the period beginning on the date of issuance of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge screened wastewater to the Bellingham Sanitary Sewer System subject to the following limitations:

EFFLUENT LIMITATIONS

<u>Parameter</u>	<u>Daily Maximum</u>
Flow	32 m <sup>3</sup> /d (8,500 gpd)

The daily maximum is defined as the greatest allowable value for any calendar day.



S2. OPERATION AND MAINTENANCE

- a. All seafood processing wastewater and washdown water shall be screened (not greater than 1/4 inch openings) and discharged to the Bellingham sanitary sewer system.
- b. Off loading of seafood on the dock shall be accomplished with a minimum of waste discharge.
- c. Contents of vessel bilges shall not be discharged into the harbor.
- d. All solids to be utilized in by-products shall be stored, handled and transported in a manner which prevents its entry or the drainage thereof into surface waters of the state.
- e. All sanitary wastes shall be discharged into the Bellingham sanitary sewer system.

S3. SOLID WASTE DISPOSAL

- a. The permittee shall handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface waters. All solid waste disposal shall be in accordance with the requirements of the Bellingham Whatcom County Health District.
- b. The permittee shall not permit leachate from its solid waste material to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effect on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.

Permit No.

### GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times maintain in good working order and operate as efficiently as possible all facilities and systems (and related appurtenances) for collection and treatment which are installed or used by the permittee for water pollution control and abatement to achieve compliance with the terms and conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
  - a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized waste discharges;
  - b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - c. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge which could constitute a threat to human health, welfare, or the environment, the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement on a case-by-case basis.

Permit No.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

- G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:
- a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the permit and authorized by administrative order;
  - b. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
  - c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special conditions);
  - d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

- G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:
- a. To enter upon the permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
  - b. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;

Permit No.

- c. To inspect at reasonable times any monitoring equipment or method required in the permit;
  - d. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
  - e. To sample at reasonable times any discharge of pollutants.
- G7. The permittee shall apply for a new permit at least sixty days prior to the time when facility expansions, production changes, or process modifications will (1) result in new or substantially increased discharges of waste characteristics or volume or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.
- G8. A permit shall be subject to termination upon thirty days notice in writing if the department finds:
- a. That it was procured by misrepresentation of any material fact or by lack of full disclosure in the application;
  - b. That there has been a violation of the conditions thereof;
  - c. That a material change in quantity and type of waste disposal exists.
- In the event that a material change in the conditions of the state waters Utilized creates a dangerous degree of pollution, the department may specify additional conditions in the permits previously issued.
- The director of the department is authorized to issue permits for waste disposal and specify the conditions and expiration date of such permits.
- Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.
- G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.
- G11. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

Page 1 of 7

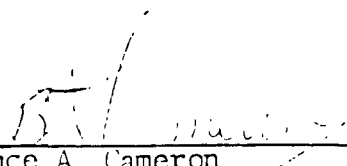
Permit Number WA-002940-8Issuance Date: JUL 22 1983Expiration Date: JUL 22 1988NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WASTE DISCHARGE PERMITState of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504In compliance with the provisions of  
Chapter 90.48 Revised Code of Washington as amended  
and  
The Clean Water Act as amended  
Public Law 95-217DAHL FISH COMPANY, INC.  
601 West Chestnut Street  
Bellingham, Washington 98225Plant Location:601 West Chestnut St.  
Bellingham, WAIndustry Type:

Seafood Processing

Waterway Segment Number:01-01-02 (Process wastewater)  
01-01-03 (Cooling water)Receiving Water:Whatcom Creek Waterway and  
Bellingham BayDischarge Location: cooling water

Latitude: 48° 45' 03" N

Longitude: 122° 29' 05" W

is authorized to discharge in accordance with the special  
and general conditions which follow.  
\_\_\_\_\_  
Bruce A. Cameron  
Assistant Director  
Department of Ecology (1)

SPECIAL CONDITIONS

S1.a. EFFLUENT LIMITATIONS

During the period beginning on the date of issuance of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge uncontaminated cooling water to Whatcom Creek Waterway at the permitted location subject to the following limitations:

EFFLUENT LIMITATIONS

<u>Parameters</u>	<u>Daily Maximum</u>
Flow	90 m <sup>3</sup> /d (24,000 gpd)
Temperature	30°C (85°F)

The daily maximum is defined as the greatest allowable value for any calendar day.

SPECIAL CONDITIONS

## S1.b. EFFLUENT LIMITATIONS (Process wastewater)

During the period beginning on the date of issuance of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge screened process wastewater to the Bell: gham Sanitary Sewer System subject to the following limitations:

EFFLUENT LIMITATIONS

<u>Parameter</u>	<u>Daily Average</u>	<u>Daily Maximum</u>
Flow	230 m <sup>3</sup> /d (60,000 gpd)	285 m <sup>3</sup> /d (75,000 gpd)

The daily average is defined as the average of the measured values for the operating day obtained over a calendar month's time.

The daily maximum is defined as the greatest allowable value for any calendar day.

S2. OPERATION AND MAINTENANCE

- a. All seafood processing wastewater and washdown water shall be screened (not greater than 40 mesh openings) and discharged to the Bellingham sanitary sewer system.
- b. Off loading of seafood on the dock shall be accomplished with a minimum of waste discharge.
- c. Contents of vessel bilges shall not be discharged into the waterway.
- d. All solids to be utilized in by-products shall be stored, handled and transported in a manner which prevents its entry or the drainage thereof into surface waters of the state.
- e. All sanitary wastes shall be discharged into the Bellingham sanitary sewer system.

S3. SOLID WASTE DISPOSAL

- a. The permittee shall handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface waters. All solid waste disposal shall be in accordance with the requirements of the Bellingham Whatcom County Health District.
- b. The permittee shall not permit leachate from its solid waste material to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effect on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.



GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
  - a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized waste discharges;
  - b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - c. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge subject to any applicable toxic pollutant effluent standard under Section 307 (a) of the Clean Water Act, or which could constitute a threat to human health, welfare, or the environment, 40 CFR Part 122 requires that the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement on a case-by-case basis.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

- G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:
- a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the Clean Water Act and authorized by administrative order;
  - b. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
  - c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special conditions);
  - d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

- G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:
- a. To enter upon the permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
  - b. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;
  - c. To inspect at reasonable times any monitoring equipment or method required in the permit;
  - d. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
  - e. To sample at reasonable times any discharge of pollutants.
- G7. The permittee shall submit a new application or supplement to the previous application where facility expansions, production increases, or process

modifications will (1) result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.

- G8. After notice and opportunity for public hearing, this permit may be modified, terminated, or revoked during its term for cause as follows:
- Violation of any term or condition of the permit;
  - Failure of the permittee to disclose fully all relevant facts or misrepresentation of any relevant facts by the permittee in the application or during the permit issuance process;
  - A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit;
  - Information indicating that the permitted discharge poses a threat to human health or welfare;
  - A change in ownership or control of the source; or
  - Other cause listed in 40 CFR Part 122.15 and 122.16.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

- G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. or 40 CFR Part 122.15 must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the department shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.
- G11. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.
- G12. All other requirements of 40 CFR Part 122.7, 122.60, and 122.61 are incorporated into this permit by reference.
- G13. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

Page 1 of 7  
Permit Number 7253

Issuance Date: MAR 14 1983  
Expiration Date: MAR 14 1988

STATE WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In compliance with the provisions of  
Chapter 90.48 Revised Code of Washington as amended

Mt. Baker Plywood, Inc.  
P.O. Box 997  
Bellingham, Washington 98225

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Plant Location:

2929 Roeder Avenue  
Bellingham, Washington 98225

Receiving Water:

Bellingham Bay via Bellingham wastewater  
treatment plant

Industry Type:

Plywood Manufacturing

Discharge Location:


48° 43' 00" N  
122° 31' 00" W

Waterway Segment Number:

01-01-03

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is authorized to discharge in accordance with the special  
and general conditions which follow.

  
for ROBERT K. MCCORMICK, Regional Manager  
Department of Ecology ( )

SPECIAL CONDITIONS

## S1. EFFLUENT LIMITATIONS

Upon issuance of this permit and lasting through the expiration date of this permit, the permittee is authorized to discharge press pit oil/water subnatant wastewater and boiler blowdown to the Bellingham sanitary sewer system subject to the following limitations:

EFFLUENT LIMITATIONS

<u>Parameter</u>	<u>Daily Average</u>	<u>Daily Maximum</u>
Flow	11 m <sup>3</sup> /d (3,000 gpd)	15 m <sup>3</sup> /d (4,000 gpd)
Total Oils		100 mg/l
Total Phenolics		1 mg/l

The daily average is defined as the average of the measured values obtained over a calendar month's time.  
The daily maximum is defined as the greatest allowable value for any calendar day.

S2. MONITORING AND REPORTING

Test Procedures

All sampling and analytical methods used to determine compliance with the effluent limits specified in this permit shall, unless approved otherwise in writing by the department, conform to the Guidelines Establishing Test Procedures for the Analysis of Pollutants, contained in 40 CFR 136, as published in the Federal Register on December 1, 1976, or the latest revision thereof, which currently references the following publications:

1. American Public Health Association, Standard Methods for the Examination of Water and Wastewaters.
2. American Society for Testing and Materials, A.S.T.M. Standards, Part 23, Water, Atmospheric Analysis.

S3. SOLID WASTE DISPOSAL

- a. The permittee shall handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface waters.
- b. The permittee shall not permit leachate from its solid waste material to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effects on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.

S4. OPERATION AND MAINTENANCE

- a. There shall be no discharge of process wastewater or cooling water into Squalicum waterway or other surface waters of the state.
- b. All plant air compressor and boiler grate cooling water shall be recycled for reuse.
- c. All glue washdown water shall be recycled for reuse as glue makeup water.
- d. All water accumulated in the press pit shall pass through a properly sized oil/water separator.
- e. All dryer scrubber water shall be recycled for reuse.
- f. No oil, leachate from sort yard debris, bark or wood chip storage or other contaminated water shall be discharged to waters of the state. . . . .
- g. All sanitary wastewater shall be discharged to the Bellingham sanitary sewer system.

S5. OTHER REQUIREMENTS

If a toxic effluent standard or prohibition is established pursuant to the Federal Clean Water Act as amended, or the State Water Pollution Control Law as amended, or local pretreatment standards established in accordance with the Clean Water Act, for a toxic pollutant which is present in the discharge authorized herein and such standard or prohibition is more stringent than any limitation upon such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee shall be so notified.

### GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times maintain in good working order and operate as efficiently as possible all facilities and systems (and related appurtenances) for collection and treatment which are installed or used by the permittee for water pollution control and abatement to achieve compliance with the terms and conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
- a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized waste discharges;
  - b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - c. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge which could constitute a threat to human health, welfare, or the environment, the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement on a case-by-case basis.



Permit No.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

- G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:
- a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the permit and authorized by administrative order;
  - b. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
  - c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special conditions);
  - d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

- G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:
- a. To enter upon the permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
  - b. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;

Permit No.

- c. To inspect at reasonable times any monitoring equipment or method required in the permit;
  - d. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
  - e. To sample at reasonable times any discharge of pollutants.
- G7. The permittee shall apply for a new permit at least sixty days prior to the time when facility expansions, production changes, or process modifications will (1) result in new or substantially increased discharges of waste characteristics or volume or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.
- G8. A permit shall be subject to termination upon thirty days notice in writing if the department finds:
- a. That it was procured by misrepresentation of any material fact or by lack of full disclosure in the application;
  - b. That there has been a violation of the conditions thereof;
  - c. That a material change in quantity and type of waste disposal exists.

In the event that a material change in the conditions of the state waters Utilized creates a dangerous degree of pollution, the department may specify additional conditions in the permits previously issued.

The director of the department is authorized to issue permits for waste disposal and specify the conditions and expiration date of such permits.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

- G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.
- G11. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

Page 1 of 11  
Permit No. WA-003081-3(I)  
Issuance Date: JUN 20 1984  
Expiration Date: JUN 20 1989

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In compliance with the provisions of  
Chapter 90.48 Revised Code of Washington as amended  
and  
The Clean Water Act as amended  
Public Law 95-217

OESER COMPANY  
P.O. Box 156  
Bellingham, Washington 98225

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Plant Location:

730 Marine Drive  
Bellingham, Washington

Industry Type :

Wood Preserving

Waterway Segment Number:

01-01-02

Receiving Water:

Little Squalicum Drainage and  
Bellingham Bay

Discharge Location:

Latitude: 48° 46' 13"N

Longitude: 122° 30' 52"W

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is authorized to discharge in accordance with the special  
and general conditions which follow.

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Donald P. Dubois  
Assistant Director  
Department of Ecology (I)

SPECIAL CONDITIONS

S1a. INTERIM EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (Process wastewater)

During the period beginning on the issuance date of this permit and lasting through June 30, 1986, the permittee is authorized to discharge process wastewater to the Bellingham sanitary sewer system subject to the following limitations and monitoring requirements:

EFFLUENT LIMITATIONS		MONITORING REQUIREMENTS	
<u>Parameter</u>	<u>Daily Maximum</u>	<u>Minimum Frequency</u>	<u>Sample Type</u>
Total oil	100 mg/l	Quarterly	Grab

Process wastewater is defined as all drainage and condensate from the treating cylinder, all drippage and bearing cooling water discharges from the pump and valves associated with providing treating fluid to the treating cylinder or treating tanks, all sump drainage from the treating tanks and any other oil or oil/water mixture containing pentachlorophenol, creosote or other wood preservative substances.

The daily maximum is defined as the greatest allowable value for any calendar day consisting of the average of at least three grab samples taken at equal intervals during the period of discharge with the first sample taken during the first hour of discharge.

S1b. FINAL EFFLUENT LIMITATIONS (Process wastewater)

Beginning on July 1, 1986 and lasting through the expiration date of this permit, the permittee is authorized to discharge all process wastewater as defined in S1a. above to an evaporation system. Beginning on July 1, 1986, there shall be no discharge of fluids containing wood preservative substances into state ground, or surface waters, or the City of Bellingham sanitary sewer system.

S2. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (Steam condensate and blowdown)

Beginning on the issuance date of this permit and lasting through the expiration date of this permit, the permittee is authorized to discharge treated steam condensate and blowdown to the City of Bellingham sanitary sewer system subject to the following limitations and monitoring requirements:

EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
<u>Parameter</u>	<u>Daily Average</u>	<u>Daily Maximum</u>	<u>Minimum Frequency</u>	<u>Sample Type</u>
Total Oils	10 mg/l No visible sheen	15 mg/l No visible sheen	Quarterly	Grab
Pentachlorophenol		None detected	Quarterly	Grab

The daily average is defined as the average of the measured values obtained over a calendar year's time.

The daily maximum is defined as the greatest allowable value for any calendar day consisting of the average of at least three grab samples taken at equal intervals during the period of discharge with the first sample taken during the first hour of discharge. None detected is defined for the purposes of and for the duration of this permit at less than 0.1 µg/l.

S3. EFFLUENT LIMITATIONS (Plant runoff)

Beginning on the issuance date of this permit and lasting through the expiration date of this permit, the permittee is authorized to discharge treated manufacturing plant runoff to the City of Bellingham stormwater system subject to the following limitations:

<u>Parameters</u>	<u>Daily Average</u>	<u>Daily Maximum</u>
Total oil	10 mg/l No visible sheen	15 mg/l No visible sheen
Pentachlorophenol		None detected

Manufacturing plant runoff is defined as all drainage oil and oil/water mixtures originating within the permittee's manufacturing and storage area exclusive of the areas described in conditions S1 and S2 above.

None detected is defined for the purposes of and for the duration of this permit as less than 0.1 µg/l.

The daily average is defined as the average of the measured values obtained over a calendar year's time.

The daily maximum is defined as the greatest allowable value for any calendar day.

S4. SCHEDULE OF COMPLIANCE

- a. The permittee shall achieve compliance with the effluent limitations specified for discharge in accordance with the following schedule:
  1. On or before January 1, 1985, the permittee shall submit to the Department of Ecology for review and approval an engineering report which proposes steps necessary for the complete elimination of pentachlorophenol, or other wood preservative discharges into state ground or surface waters including the City of Bellingham sanitary or stormwater sewer systems. The report shall include a geohydrological examination of the extent of contamination of the ground by pentachlorophenol or other wood preservatives due to past practices. The report shall propose any measures necessary to contain, control, remove or dispose of such soil to prevent migration of such preservatives into state ground or surface waters.
  2. On or before November 1, 1984 the permittee shall submit to the Department of Ecology for review and approval a Best Management Practices Plan. The plan shall address the items listed in Condition S6 below.
  3. On or before November 1, 1985 the Best Management Practices Plan as approved by the Department of Ecology shall be completely implemented.
- b. The permittee is expected to meet this compliance schedule. No later than 14 calendar days following a date identified above, the permittee shall submit to the appropriate regional office of the department a notice of compliance or noncompliance with the specifications required in the schedule.

S5. MONITORING AND REPORTING

The permittee shall monitor the operations and efficiency of all treatment and control facilities and the quantity and quality of the waste discharged. A record of all such data shall be maintained. The permittee shall monitor the parameters as specified in Conditions S1 and S2 of this permit.

a. Reporting

Monitoring results obtained during the previous month shall be summarized and reported on a form provided or approved by the department, to be submitted no later than the 15th day of the month following the completed reporting period. The report shall be sent to the Northwest Regional Office of the Department of Ecology, 4350 - 150th Avenue N.E., Redmond, Washington 98052. Monitoring shall be started on the issuance date of this permit and the first report is due 45 days thereafter.

55. MONITORING AND REPORTING (Continued)

b. Records Retention

The permittee shall retain for a minimum of 3 years all records of monitoring activities and results, including all reports of recording from continuous monitoring instrumentation. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or when requested by the director.

c. Recording of Results

For each measurement or sample taken, the permittee shall record the following information: (1) the date, exact place, and time of sampling; (2) the dates the analyses were performed; (3) who performed the analyses; (4) the analytical techniques or methods used; and (5) the results of all analyses.

d. Representative Sampling

Samples and measurements taken to meet the requirements of this condition shall be representative of the volume and nature of the monitored discharge including representative sampling of any unusual discharge or discharge conditions affecting effluent quality.

e. Test Procedures

All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall, unless approved otherwise in writing by the Department, conform to the Guidelines Establishing Test Procedures for the Analysis of Pollutants, contained in 40 CFR Part 136, as published in the Federal Register on December 1, 1976, or the latest revision thereof, which references the following publications:

1. American Public Health Association, Standard Methods for the Examination of Water and Wastewaters.
2. American Society for Testing and Materials, A.S.T.M. Standards, Part 31, Water, Atmospheric Analysis.
3. Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes.

The laboratory providing analytical services shall provide suitable evidence that its procedures for pentachlorophenol analysis conform to the best current practice as determined by the Federal Environmental Protection Agency and that the level of precision achieved can reliably detect the value specified in Condition S2 and S3 above.

- f. The department may establish specific monitoring requirements beyond those identified in this permit by permit modification or administrative order.

S6. BEST MANAGEMENT PRACTICES PLAN

- a. The Best Management Practices Plan mentioned in Condition S4 shall be prepared in accordance with the requirements of title 40 Code of Federal Regulations, part 112, part 125, subpart K, and part 151 (as proposed August 24, 1978). This plan shall establish specific objectives for the containment, control and cleanup of oil, toxic or hazardous material discharges due to spillage, leaks, plant site runoff, solid waste handling, or other events which may cause such discharges. The plan shall address as a minimum the following areas:
  1. Statement of policy
  2. Spill control committee
  3. Material inventory and storage and handling areas
  4. Material compatibility
  5. In-plant transfer areas
  6. Loading and unloading areas
  7. Potential of each component for release due to:
    - a. equipment failure
    - b. improper operation
    - c. weather events
  8. Where experience indicates a reasonable potential for release from a component, predict:
    - a. direction
    - b. rate of flow
    - c. total quantity
    - d. methods of containment, recovery and cleanup
  9. Plant site runoff
  10. Waste solids and liquids storage, handling and disposal
  11. Employee training
  12. Reporting and notification procedures
  13. Inspections including the periodic examination of the structural integrity of material storage and transfer facilities
  14. Preventative maintenance
  15. Housekeeping
  16. Security
- b. The plan may include the Solid Waste Plan as required in Condition S8 and any updated Spill Prevention Control and Countermeasure Plan.
- c. Any proposed modifications to the plan shall be submitted to the Department of Ecology for review and approval.



97. OPERATION AND MAINTENANCE

- a. After July 1, 1986 there shall be no discharge of process wastewater to state ground or surface waters.
- b. After July 1, 1986 all process wastewater shall be recycled for reuse or evaporated.
- c. Consistent with the specification of the product, the pretreatment and treatment cycles in the treating cylinder shall be operated to minimize drippage from finished stock.
- d. Dripping from finished stock which is unavoidable shall drain into the process wastewater treatment system.
- e. Oil/water separators and yard traps used for oil recovery shall have solids and oil removed at frequent enough intervals and oil sorbent material replaced as necessary to meet the effluent limits specified in Conditions S1, S2, and S3.
- f. All spills of oil, toxic material or other substances which result in noncompliance or may result in noncompliance with the terms of this permit shall be reported immediately to the Department of Ecology in accordance with Condition G4.
- g. The use of oil dispersant chemicals in wastewater discharges is prohibited except when explicitly approved by the Department of Ecology.

S8. SOLID WASTE DISPOSAL

- a. The permittee shall handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface waters.
- b. The permittee shall not permit leachate from its solid waste material to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effect on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.
- c. By November 1, 1984, the permittee shall submit to the department a plan for the handling and disposal of all solid waste material generated at the plant site. All such plans shall be reviewed and approved by the department to insure compliance with provisions a. and b. above. The permittee shall comply with the plan as approved by the department. This plan may be included in the Best Management Practices Plan as required in Condition S4 and described in Condition S6.
- d. Accumulated waste solids in the retort, sludges in the treating fluid tanks, evaporation units, oil/water separators, spent sorbents and any other waste solids containing pentachlorophenol or other toxic substances shall be stored, handled and disposed of in accordance with the State Hazardous Waste Disposal Act (chapter 70.105 Revised Code of Washington) and the State Dangerous Waste Regulations (chapter 173-303 Washington Administrative Code).
- e. Any deviation from or addition to the solid waste handling plan as approved shall first be submitted to the department for review and approval.

S9. OTHER REQUIREMENTS

- a. Sanitary wastes shall be discharged to the municipal sanitary sewer system.
- b. Kiln condensate, if present, shall be discharged to the municipal sanitary sewer system.
- c. This permit shall be modified to comply with any applicable effluent limitations promulgated after the issuance of this permit by state or federal law to control oil or toxic discharges.

GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
- a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized water discharges;
  - b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - c. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge subject to any applicable toxic pollutant effluent standard under Section 307 (a) of the Clean Water Act, or which could constitute a threat to human health, welfare, or the environment, 40 CFR Part 122 requires that the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement of a case-by-case basis.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:

- a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the Clean Water Act and authorized by administrative order;
- b. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
- c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special condition);
- d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:

- a. To enter upon the permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
- b. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;
- c. To inspect at reasonable times any monitoring equipment or method required in the permit;
- d. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
- e. To sample at reasonable times any discharge of pollutants.

- G7. The permittee shall submit a new application or supplement to the previous application where facility expansions, production increases, or process modifications will (1) result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.
- G8. After notice and opportunity for public hearing, this permit may be modified, terminated, or revoked during its term for cause as follows:
- a. Violation of any term or condition of the permit;
  - b. Failure of the permittee to disclose fully all relevant facts or misrepresentation of any relevant facts by the permittee in the application or during the permit issuance process;
  - c. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit;
  - d. Information indicating that the permitted discharge poses a threat to human health or welfare;
  - e. A change in ownership or control of the source; or
  - f. Other cause listed in 40 CFR Part 122.62 and 122.63.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

- G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. or 40 CFR Part 122.62 must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the department shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.
- G11. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.
- G12. All other requirements of 40 CFR 122.41 and 122.42 are incorporated into this permit by reference.
- G13. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

Issuance Date: JUN 20 1988  
Expiration Date: JUN 20 1989

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In compliance with the provisions of  
Chapter 90.48 Revised Code of Washington as amended  
and  
The Clean Water Act as amended  
Public Law 95-217

~~FRANKS~~ BROOKS MANUFACTURING CO.  
Brooks Lumber Division  
P.O. Box 7  
Bellingham, Washington 98227

RECEIVED  
JUN 26 1988

Plant Location:

Iowa and Pacific  
Bellingham, Washington

Receiving Water:

Whatcom Creek Drainage and  
Bellingham Bay

Industry Type:

Wood Preserving

Discharge Location:

Latitude: 48° 45' 28"

Longitude: 122° 27' 23"

Waterway Segment Number:

01-01-02

is authorized to discharge in accordance with the special  
and general conditions which follow.

Donald P. Dubois  
Assistant Director  
Department of Ecology (I)

SPECIAL CONDITIONS

S1. EFFLUENT LIMITATIONS (Process wastewater)

Beginning on the issuance date of this permit and lasting through the date of expiration, the permittee is authorized to discharge all process wastewater to a spray evaporation system. Process wastewater is defined as all drainage and condensate from the treating cylinder, all drippage from the pumps and valves associated with providing treating fluid to the treating cylinder, all drippage from the concrete pad in front of the treating cylinder and any other oil or oil/water mixture containing pentachlorophenol or other wood preservative substances.

S2. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (Treating plant runoff)

Beginning on the issuance date of this permit and lasting through the expiration date of this permit, the permittee is authorized to discharge treated treating plant runoff to the City of Bellingham sanitary system subject to the following limitations and monitoring requirements.

EFFLUENT LIMITATIONS		MONITORING REQUIREMENTS	
<u>Parameters</u>	<u>Daily Maximum</u>	<u>Minimum Frequency</u>	<u>Sample Type</u>
Total oil	100 mg/l	Quarterly	Grab
Pentachlorophenol	None detected	Quarterly	Grab

Treating plant storm water is defined as all drainage and oil and oil/water mixtures originating within the bermed treating plant area proper exclusive of process wastewater as defined in condition S1 above.

Daily average is defined as the average of the measured values obtained over a calendar year's time.

Daily maximum is defined as the greatest allowable value for any calendar day consisting of the average of at least three grab samples taken at equal intervals during the period of discharge with the first sample taken during the first hour of discharge. None detected is defined for the purposes of and for the duration of this permit as less than 0.1 µg/l

SPECIAL CONDITIONS

## S3. EFFLUENT LIMITATIONS (Manufacturing plant runoff)

beginning on the issuance date of this permit and lasting through the expiration date of this permit, the permittee is authorized to discharge treated manufacturing plant runoff to the City of Bellingham stormwater system subject to the following limitations.

## EFFLUENT LIMITATIONS

<u>Parameters</u>	<u>Daily Average</u>	<u>Daily Maximum</u>
Total oil	10 mg/l No visible sheen	15 mg/l No visible sheen
Pentachlorophenol		None detected

Manufacturing plant runoff is defined as all drainage oil and oil/water mixtures originating within the permittee's manufacturing and storage area exclusive of the areas described in conditions S1 and S2 above.

None detected is defined for the purposes of and for the duration of this permit as less than 0.1 µg/l.

Daily average is defined as the average of the measured values obtained over a calendar year's time.

Daily maximum is defined as the greatest allowable value for any calendar day. *Spec*

## S4. SCHEDULE OF COMPLIANCE

- a. The permittee shall achieve compliance with the effluent limitations specified for discharge in accordance with the following schedule:
  1. On or before November 1, 1984 the permittee shall submit to the Department of Ecology for review and approval a Best Management Practices Plan. The plan shall address the items listed in condition S6 below.
  2. On or before November 1, 1985 the Best Management Practices Plan as approved by the Department of Ecology shall be completely implemented.
- b. The permittee is expected to meet this compliance schedule. No later than 14 calendar days following a date identified above, the permittee shall submit to the appropriate regional office of the department a notice of compliance or noncompliance with the specifications required in the schedule. *Spec*



## S5. MONITORING AND REPORTING

The permittee shall monitor the operations and efficiency of all treatment and control facilities and the quantity and quality of the waste discharged. A record of all such data shall be maintained. The permittee shall monitor the parameters as specified in Condition S2 of this permit.

a. Reporting

S 5.2 = 9-15-84 Fr

Monitoring results obtained during the previous three months shall be summarized and reported on a form provided or approved by the department, to be submitted no later than the 15th day of the month following the completed reporting period. The report shall be sent to the Northwest Regional Office of the Department of Ecology, 4350 150th Avenue N.E., Redmond, Washington 98052. Monitoring shall be started on the issuance date of this permit and the first report is due three and one half months thereafter.

b. Records Retention

The permittee shall retain for a minimum of 3 years all records of monitoring activities and results, including all reports of recordings from continuous monitoring instrumentation. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or when requested by the Director.

c. Recording of Results

For each measurement or sample taken, the permittee shall record the following information: (1) the date, exact place, and time of sampling; (2) the dates the analyses were performed; (3) who performed the analyses; (4) the analytical techniques or methods used; and (5) the results of all analyses.

SS. MONITORING AND REPORTING

e. Test Procedures

All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall, unless approved otherwise in writing by the Department, conform to the Guidelines Establishing Test Procedures for the Analysis of Pollutants, contained in 40 CFR Part 136, as published in the Federal Register on December 1, 1976, or the latest revision thereof, which references the following publications:

1. American Public Health Association, Standard Methods for the Examination of Water and Wastewaters.
2. American Society for Testing and Materials, A.S.T.M. Standards, Part 31, Water, Atmospheric Analysis.
3. Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes.

The laboratory providing analytical services shall provide suitable evidence that its procedures for pentachlorophenol analysis conform to the best current practice as determined by the Federal Environmental Protection Agency and that the level of precision achieved can reliably detect the value specified in condition S2 above.

- f. The department may establish specific monitoring requirements beyond those identified in this permit by permit modification or administrative order.

S6. BEST MANAGEMENT PRACTICES PLAN

- a. The Best Management Practices Plan mentioned in Condition S4 shall be prepared in accordance with the requirements of Title 40 Code of Federal Regulations, part 112, part 125, subpart K, and part 151 (as proposed August 24, 1978). This plan shall establish specific objectives for the containment, control and cleanup of oil, toxic or hazardous material discharges due to spillage, leaks, plant site runoff, solid waste handling, or other events which may cause such discharges. The plan shall address as a minimum the following areas:
  1. Statement of policy
  2. Spill control committee
  3. Material inventory, and storage and handling areas
  4. Material compatibility
  5. In plant transfer areas
  6. Loading and unloading areas
  7. Potential of each component for release due to:
    - a. equipment failure
    - b. improper operation
    - c. weather events
  8. Where experience indicates a reasonable potential for release from a component, predict:
    - a. direction
    - b. rate of flow
    - c. total quantity
    - d. methods of containment, recovery and cleanup
  9. Plant site runoff
  10. Waste solids and liquids storage, handling and disposal
  11. Employee training
  12. Reporting and notification procedures
  13. Inspections including the periodic examination of the structural integrity of material storage and transfer facilities
  14. Preventative maintenance
  15. Housekeeping
  16. Security
- b. The plan may include the Solid Waste Plan as required in condition S8 and any updated Spill Prevention Control and Countermeasure Plan.
- c. Any proposed modifications to the plan shall be submitted to the Department of Ecology for review and approval.

57. OPERATION AND MAINTENANCE

- a. There shall be no discharge of process wastewater to state ground or surface waters.
- b. All process wastewater shall be recycled for reuse or evaporated.
- c. Consistent with the specification of the product, the pretreatment and treatment cycles in the treating cyclinder shall be operated to minimize drippage from finished stock.
- d. Drippage from finished stock which is unavoidable shall drain into the process wastewater treatment system.
- e. Oil/water separators and yard traps used for oil recovery shall have solids and oil removed at frequent enough intervals and oil sorbent material replaced as necessary to meet the effluent limits specified in conditions S1, S2 and S3.
- f. All spills of oil, toxic material or other substances which result in noncompliance or may result in noncompliance with the terms of this permit shall be reported immediately to the Department of Ecology in accordance with condition G4.
- g. The use of oil dispersant chemicals in wastewater discharges is prohibited except when explicitly approved by the Department of Ecology.

§ 2. c - 11-1-84 SWP 2.2

58. SOLID WASTE DISPOSAL

- a. The permittee shall handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface waters.
- b. The permittee shall not permit leachate from its solid waste material to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effect on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.
- c. By November 1, 1984, the permittee shall submit to the department a plan for the handling and disposal of all solid waste material generated at the plant site. All such plans shall be reviewed and approved by the department to insure compliance with provisions a. and b. above. The permittee shall comply with the plan as approved by the department. This plan may be included in the Best Management Practices Plan as required in Condition S4 and described in Condition S6.

S8. SOLID WASTE DISPOSAL (Continued)

- d. Accumulated waste solids in the retort, sludges in the treating fluid tanks, evaporation units, oil/water separators, spent sorbents and any other waste solids containing pentachlorophenol or other toxic substances shall be stored, handled and disposed of in accordance with the State Hazardous Waste Disposal Act (Chapter 70.105 Revised Code of Washington) and the State Dangerous Waste Regulations (Chapter 173-303 Washington Administrative Code).
- e. Any deviation from or addition to the solid waste handling plan as approved shall first be submitted to the department for review and approval.

S9. OTHER REQUIREMENTS

- a. Sanitary wastes shall be discharged to the municipal sanitary sewer system.
- b. Kiln condensate shall be discharged to the municipal sanitary sewer system.
- c. Boiler blowdown shall be discharged to the municipal sanitary sewer system.
- d. This permit shall be modified to comply with any applicable effluent limitation promulgated after the issuance of this permit by state or federal law to control oil or toxic discharges.

GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
- a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized water discharges;
  - b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - c. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge subject to any applicable toxic pollutant effluent standard under Section 307 (a) of the Clean Water Act, or which could constitute a threat to human health, welfare, or the environment, 40 CFR Part 122 requires that the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement of a case-by-case basis.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

- G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:
- a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the Clean Water Act and authorized by administrative order;
  - b. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
  - c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special condition);
  - d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

- G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:
- a. To enter upon the permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
  - b. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;
  - c. To inspect at reasonable times any monitoring equipment or method required in the permit;
  - d. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
  - e. To sample at reasonable times any discharge of pollutants.

- G7. The permittee shall submit a new application or supplement to the previous application where facility expansions, production increases, or process modifications will (1) result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.
- G8. After notice and opportunity for public hearing, this permit may be modified, terminated, or revoked during its term for cause as follows:
- a. Violation of any term or condition of the permit;
  - b. Failure of the permittee to disclose fully all relevant facts or misrepresentation of any relevant facts by the permittee in the application or during the permit issuance process;
  - c. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit;
  - d. Information indicating that the permitted discharge poses a threat to human health or welfare;
  - e. A change in ownership or control of the source; or
  - f. Other cause listed in 40 CFR Part 122.62 and 122.63.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

- G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. or 40 CFR Part 122.62 must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the department shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.
- G11. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.
- G12. All other requirements of 40 CFR 122.41 and 122.42 are incorporated into this permit by reference.
- G13. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.



Issuance Date: MAR 2 1983

Expiration Date: MAR 2 1988

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In compliance with the provisions of  
Chapter 90.48 Revised Code of Washington as amended  
and  
The Clean Water Act as amended  
Public Law 95-217

COLUMBIA CEMENT CORPORATION  
P.O. BOX 37  
Bellingham, Washington 98225

Plant Location:

Marine Drive  
Bellingham, WA 98225

Receiving Water:

Bellingham Bay

Industry Type :

Cement Manufacturing

Discharge Location:

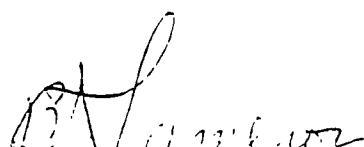
Latitude: 48°45'58"N

Longitude: 122°31'24"W

Waterway Segment Number:

01-01-02

is authorized to discharge in accordance with the special  
and general conditions which follow.

  
\_\_\_\_\_  
Bruce A. Cameron  
Assistant Director  
Department of Ecology ( )

SPECIAL CONDITIONS

## Sla. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on the date of issuance of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge process wastewater to Bellingham Bay at the permitted discharge location subject to the following limitations and monitoring requirements:

<u>Parameters</u>	<u>EFFLUENT LIMITATIONS</u>		<u>MONITORING REQUIREMENTS</u>	
	<u>Daily Average</u>	<u>Daily Maximum</u>	<u>Minimum Frequency</u>	<u>Sample Type</u>
Flow	300 m <sup>3</sup> /d (80,000 gpd)	500 m <sup>3</sup> /d (130,000 gpd)	Daily	Calculated
Total Suspended Solids		0.005*	Weekly	Composite
Temperature	Not to exceed 3° C rise above inlet temperature		Weekly	Grab
pH	Within the range 6.0 - 9.0		Weekly	Grab

The daily average is defined as the average of the measured values obtained over a calendar month's time. The daily maximum is defined as the greatest allowable value for any calendar day.

A composite sample shall be comprised of four or more sub-samples characteristic of the effluent for a calendar day.

- \* The permissible loading rates are expressed as kilograms of pollutant per 1,000 kilograms of product (pounds of pollutant per 1,000 lbs. of product.)

SPECIAL CONDITIONS

## S1b. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on the date of issuance of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge truck wash water to Bellingham Bay at the permitted discharge location subject to the following limitations and monitoring requirements:

<u>Parameters</u>	<u>EFFLUENT LIMITATIONS</u>		<u>MONITORING REQUIREMENTS</u>	
	<u>Daily Average</u>	<u>Daily Maximum</u>	<u>Minimum Frequency</u>	<u>Sample Type</u>
Flow	6 m <sup>3</sup> /d (1500 gpd)	23 m <sup>3</sup> /d (6000 gpd)	Daily	Calculate
Total Suspended Solids			Weekly	Composite
pH	Within the range 6.0 - 9.0		Weekly	Grab

The daily average is defined as the average of the measured values obtained over a calendar month's time. The daily maximum is defined as the greatest allowable value for any calendar day.

A composite sample shall be comprised of four or more sub-samples characteristic of the effluent for a calendar day.

## S2. MONITORING AND REPORTING

The permittee shall monitor the operation and efficiency of all treatment and control facilities and the quantity and quality of the waste discharged. A record of all such data shall be maintained. The permittee shall monitor the parameters as specified in Condition S1(a) and S1(b) of this permit.

a. Reporting

Monitoring results obtained during the previous three months shall be summarized and reported on a form provided by the department, to be submitted no later than the 15th day of the month following the completed reporting period.

The report shall be sent to the Northwest Regional Office of the Department of Ecology, 4350 - 150th Avenue N.E., Redmond, Washington 98052. Monitoring shall be started on the permit issuance date and the first report is due 3-½ months later.

b. Records Retention

The permittee shall retain for a minimum of three years all records of monitoring activities and results, including all reports of recordings from continuous monitoring instrumentation. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or when requested by the Director.

c. Recording of Results

For each measurement or sample taken, the permittee shall record the following information: (1) the date, exact place, and time of sampling; (2) the dates the analyses were performed; (3) who performed the analyses; (4) the analytical techniques or methods used; and (5) the results of all analyses.

d. Representative Sampling

Samples and measurements taken to meet the requirements of this condition shall be representative of the volume and nature of the monitored discharge.

e. Test Procedures

All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall, unless approved otherwise in writing by the Department, conform to the Guidelines Establishing Test Procedures for the Analysis of Pollutants, contained in 40 CFR 136, as published in the Federal Register on December 1, 1976, or the latest revision thereof, which currently references the following publications:

1. American Public Health Association, Standard Methods for the Examination of Water and Wastewaters.
2. American Society for Testing and Materials, A.S.T.M. Standards, Part 31, Water, Atmospheric Analysis.
3. Environmental Protection Agency, Methods for Chemicals Analysis of Water and Wastes.

S3. SOLID WASTE DISPOSAL

- a. The permittee shall handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface waters.
- b. The permittee shall not permit leachate from its solid waste material to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effect on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.

S4. OPERATION AND MAINTENANCE

- a. Wash, waste process, cooling and contaminated runoff water, except from truck wash area, shall be collected and discharged to a series of two or more settling basins for reuse.
- b. The settling basins shall be continuously maintained to provide adequate detention time to effectively remove fines from the wastewater.
- c. No detergents shall be used in the truck washing operations.
- d. Cement transfer operations and facilities shall be properly maintained so as to prevent any discharge of cement, directly or indirectly, to Bellingham Bay.

S5. OTHER REQUIREMENTS

- a. Sanitary wastes are to be disposed of in accordance with the regulations of the Bellingham-Whatcom Health District.

GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
  - a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized waste discharges;
  - b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - c. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge subject to any applicable toxic pollutant effluent standard under Section 307 (a) of the Clean Water Act, or which could constitute a threat to human health, welfare, or the environment, 40 CFR Part 122 requires that the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement on a case-by-case basis.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

- G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:
- a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the Clean Water Act and authorized by administrative order;
  - b. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
  - c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special conditions);
  - d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

- G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:
- a. To enter upon the permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
  - b. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;
  - c. To inspect at reasonable times any monitoring equipment or method required in the permit;
  - d. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
  - e. To sample at reasonable times any discharge of pollutants.
- G7. The permittee shall submit a new application or supplement to the previous application where facility expansions, production increases, or process

modifications will (1) result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.

G8. After notice and opportunity for public hearing, this permit may be modified, terminated, or revoked during its term for cause as follows:

- a. Violation of any term or condition of the permit;
- b. Failure of the permittee to disclose fully all relevant facts or misrepresentation of any relevant facts by the permittee in the application or during the permit issuance process;
- c. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit;
- d. Information indicating that the permitted discharge poses a threat to human health or welfare;
- e. A change in ownership or control of the source; or
- f. Other cause listed in 40 CFR Part 122.15 and 122.16.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

- G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. or 40 CFR Part 122.15 must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the department shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.
- G11. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.
- G12. All other requirements of 40 CFR Part 122.7, 122.60, and 122.61 are incorporated into this permit by reference.
- G13. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.



Issuance Date: JUN 26 1987

Expiration Date: JUN 26 1992

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WASTE DISCHARGE PERMITState of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In Compliance with the Provisions of  
The State of Washington Water Pollution Control Law  
Chapter 90.48 Revised Code of Washington  
and  
The Federal Water Pollution Control Act  
(The Clean Water Act)  
Title 33 United States Code, Section 1251 et. seq.

PUBLIC UTILITY DISTRICT NO. 1  
OF  
WHATCOM COUNTY  
215 Mason Building  
Bellingham, Washington 98225

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Plant Location:Ferndale Road  
Ferndale, WashingtonReceiving Water:

Nooksack River

Industry Type:

Water Treatment Plant

Discharge Location:

Latitude: 48° 50' 20"N

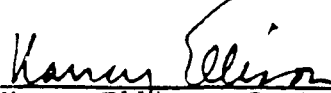
Longitude: 122° 35' 30"W

Waterway Segment Number:

01-01-04

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is authorized to discharge in accordance with the special and general conditions  
which follow.

  
Nancy Ellison, Regional Manager  
Northwest Regional Office  
Department of Ecology

SPECIAL CONDITIONS

S1. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Beginning on the issuance date of this permit and lasting through the expiration date of this permit, the permittee is authorized to discharge settled decant water to the Nooksack River at the discharge location specified on page one of this permit subject to the following effluent limitations and monitoring requirements:

EFFLUENT LIMITATIONS		MONITORING REQUIREMENTS	
<u>Parameter</u>	<u>Daily Maximum</u>	<u>Minimum Frequency</u>	<u>Sample Type</u>
Flow	9000 m <sup>3</sup> /d (2.4 MGD)	Weekly	Daily Total
Settleable Solids	0.1 ml/l	Weekly	Composite*
pH	Within the range of 6.0 - 9.0	Weekly	Grab

The daily maximum is defined as the greatest allowable value for any calendar day.

\* Composite sampling consists of four grab samples equally spread over the backwash cycle. Effluent limitations are net value allowable above that of the intake water.

S2. MONITORING AND REPORTING

A. Reporting

The permittee shall monitor the parameters as specified in Condition S1. of this permit and report the results for each three month period. The reports shall be submitted no later than the 15th day of the month following the completed reporting period and shall be on forms supplied or approved by the department and sent to the Northwest Regional Office of the Washington State Department of Ecology, 4350 - 150th Avenue NE, Redmond, Washington 98052.

If the permittee monitors any pollutant more frequently than required by this permit such results shall be recorded and reported in accordance with these instructions.

S2. MONITORING AND REPORTING (Cont.)

B. Records Retention

The permittee shall retain for a minimum of three years all records of monitoring activities and results, including all reports of recordings from continuous monitoring instrumentation. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or when requested by the director of the department.

C. Recording of Results

For each measurement or sample taken, the permittee shall record the following information: (1) the date, exact place, and time of sampling; (2) the dates the analyses were performed; (3) who performed the analyses; (4) the analytical techniques or methods used; and (5) the results of all analyses.

D. Representative Sampling

Samples and measurements taken to meet the requirements of this condition shall be representative of the volume and nature of the monitored discharge, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance related conditions affecting effluent quality.

E. Test Procedures

All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall, unless approved otherwise in writing by the department, conform to the Guidelines Establishing Test Procedures for the Analysis of Pollutants, contained in 40 CFR Part 136.

F. Addition Testing

The department may establish specific treatment plans, receiving water, sediment and biological monitoring requirements beyond those identified in this permit by permit modification or administrative order.

S3. RESIDUAL SOLIDS HANDLING

- A. The permittee shall handle, utilize and dispose of all residual solids in such a manner as to prevent its entry into state ground or surface waters.
- B. The permittee shall not permit leachate from its residual solids to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effect on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.

#### GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
  - A. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized water discharges;
  - B. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - C. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge subject to any applicable toxic pollutant effluent standard under Section 307 (a) of the Clean Water Act, or which could constitute a threat to human health, welfare, or the environment, 40 CFR Part 122 requires that the information specified in items G4.A., G4.B., and G4.C., above, shall be provided not later than 24 hours from the time the

G4. (Cont.)

permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement on a case-by-case basis.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:

- A. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance related activities essential to meet the requirements of the Clean Water Act and authorized by administrative order;
- B. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
- C. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special condition);
- D. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

- G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:
- A. To enter upon the permittee's premises where a discharge source is located or where records must be kept under the terms and conditions of the permit;
  - B. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;
  - C. To inspect at reasonable times any monitoring equipment or method required in the permit;
  - D. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
  - E. To sample at reasonable times any discharge of pollutants.
- G7. The permittee shall submit a new application or supplement to the previous application where facility expansions, production increases, or process modifications will (1) result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.
- G8. After notice and opportunity for public hearing, this permit may be modified, terminated, or revoked during its term for cause as follows:
- A. Violation of any term or condition of the permit;
  - B. Failure of the permittee to disclose fully all relevant facts or misrepresentation of any relevant facts by the permittee in the application or during the permit issuance process;
  - C. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit;
  - D. Information indicating that the permitted discharge poses a threat to human health or welfare;
  - E. A change in ownership or control of the source; or
  - F. Other cause listed in 40 CFR Part 122.62 and 122.63. Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

- G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. or 40 CFR Part 122.62 must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the department shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.
- G11. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.
- G12. All other requirements of 40 CFR 122.41 and 122.42 are incorporated into this permit by reference.
- G13. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.



Permit No. WA-003029-5 (A)  
Issuance Date 2-20-76  
Expiration Date 6-30-81

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In Compliance with the provisions of  
Chapter 90.48 RCW as amended  
and  
The Federal Water Pollution Control Act Amendment of 1972  
Public Law 92-500

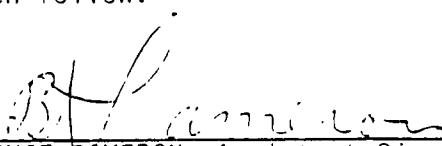
WASHINGTON STATE DEPARTMENT OF GAME  
600 North Capitol Way  
Olympia, Washington 98504

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Hatchery Name:	Bellingham Hatchery	Receiving Water:	Whatcom Creek
Location:	Whatcom Falls Park Bellingham, WA 98225	Discharge Locations:	T38N, R3E, S28 SE¼
Hatchery Type:	FISH CULTURE	Waterway Segment No.:	01-01-03

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is authorized to discharge in accordance with the special  
and general conditions which follow.

  
\_\_\_\_\_  
BRUCE CAMERON, Assistant Director  
Department of Ecology (1)

SPECIAL CONDITIONS

## S1. INTERIM EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on the date of issuance of this permit and lasting through June 30, 1977, the permittee is authorized to discharge subject to the following limitations and monitoring requirements:

<u>Parameter</u>	<u>EFFLUENT LIMITATIONS</u>		<u>MONITORING REQUIREMENTS</u>	
	<u>Daily Average</u>	<u>Daily Maximum</u>	<u>Minimum Frequency</u>	<u>Sample Type</u>
Flow	gal/day	NA	weekly	daily total
Settleable Solids	NA	NA	weekly	grab

Grab samples shall be obtained during cleaning operations.

The pounds of fish on hand and pounds of food fed shall be reported for each month.

## S2. FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

After June 30, 1977 and lasting through the expiration date of this permit, the permittee is authorized to discharge subject to the limitations as specified below.

Beginning on this date all known available and reasonable methods of treatment necessary to achieve effluent levels specified herein will be required before discharge to state waters.

<u>Parameter</u>	<u>FINAL EFFLUENT LIMITATIONS</u>		
	<u>Daily Average</u>	<u>Daily Maximum</u>	<u>Sample Type</u>
Flow	3.600 mgd	----	daily total
Settleable Solids*	0.1 ml/l	0.2 ml/l	grab
Suspended Solids	515 lbs/day	679 lbs/day	composite

\* Grab samples shall be obtained during cleaning operations.

S2. FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (Continued)

The daily average is defined as the average of the measured values obtained over a calendar month's time.

The daily maximum is defined as the maximum value obtained during any calendar day.

Effluent limitations are net values allowable above that of the intake water.

A composite sample is comprised of four or more sub-samples characteristic of the effluent during a daytime workshift. When sampling two or more outfalls, each grab sample is sized in proportion to the flow being sampled before combining with the other samples.

The department will establish a monitoring schedule, applying after installation of the required improvements, prior to that date. The schedule will include all aspects of the interim schedule, and also additional testing to include efficiency of the treatment facility, as determined by the department.

S3. SCHEDULE OF COMPLIANCE

- a. The permittee shall install a settling pond, or equivalent treatment, for the cleaning wastewater, which provides for 85 percent removal of the suspended solids, or shall install a settling basin for the total hatchery flow. In either case, the permittee shall attain compliance with the effluent limitations in accordance with the following schedule:

Complete construction and attain compliance with final limitations by June 30, 1977.

- b. The permittee shall provide the appropriate regional office of the department with written notice of compliance or noncompliance with the interim or final requirements not later than 14 days after each date set forth above.

#### S4. MONITORING AND REPORTING

The permittee shall monitor the operation of all treatment and control facilities and the quantity and quality of the waste discharged. A record of all such data shall be maintained. The permittee shall monitor the parameters as specified in Condition S2 of this permit.

##### a. Reporting

Monitoring results obtained during the previous month shall be reported on the Department of Ecology reporting form and submitted no later than the 15th day of the month following the completed reporting period. Monitoring shall be started September 1, 1975 and the first report is due October 15, 1975.

If the permittee monitors any pollutant more frequently than required by the permit, he shall submit the results together with the monthly report.

##### b. Sampling Procedures

The permittee shall submit to the aforementioned regional office a summary of the sampling and analysis program it will use when transmitting the first monitoring report. The summary is to be a detailed description of the sampling procedures, sample analysis techniques, and exact location of sampling stations shown by sketch.

##### c. Records Retention

The permittee shall retain for a minimum of three years all records of monitoring activities and results, including all reports of recordings from continuous monitoring instrumentation. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or when requested by the Director.

##### d. Recording of Results

The permittee shall record each measurement or sample taken pursuant to the requirements of this permit for the following information: (1) the date, exact place, and time of sampling; (2) the dates the analysis were performed; (3) who performed the analyses; (4) the analytical techniques or methods used; and (5) the results of all analyses.

S4. MONITORING AND REPORTING (Continued)

e. Representative Sampling

Samples and measurements taken to meet the requirements of this condition shall be representative of the volume and nature of the monitored discharge.

f. Test Procedures

All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall, unless approved otherwise in writing by the department, conform to:

American Public Health Association, Standard Methods for the Examination of Water and Wastewaters, latest addition, or Guidelines Establishing Test Procedures for the Analysis of Pollutants, contained in 40 CFR Part 136, as published in the Federal Register.

S5. OTHER REQUIREMENTS

- a. Waterborne silt, sand, and other debris deposited on the premises shall not be deposited back into a watercourse.
- b. Permittee shall handle and dispose of all solid waste materials in such a manner as to prevent their entry into state ground or surface water.
- c. Fish mortalities and spawned fish shall not be disposed to a watercourse.
- d. After June 30, 1977, blood and wastes resulting from spawning operations shall not be allowed to enter a watercourse but shall be disposed on land or by other means. Implementation shall be according to the compliance schedule of Condition S3.

GENERAL CONDITIONS

- G1. All discharges and activities authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that identified and authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. Any anticipated facility expansion, production increase or process modification which will result in a new or increased discharge of pollutants must be reported to the department by submission of a new application or supplement thereto; or, if such discharge will not violate effluent limitations specified herein, by submission to the department a notice of such new or increased discharge.
- G3. The diversion or bypass of any discharge from facilities utilized by the permittee to maintain compliance with the terms and conditions of this permit is prohibited, except (a) where unavoidable to prevent loss of life or severe property damage, or (b) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the terms and conditions of this permit. The permittee shall immediately notify the department in writing of each such diversion or bypass in accordance with the procedure specified in Condition G4.
- G4. In the event, the permittee is unable to comply with any of the conditions of this permit because of a breakdown of equipment or facilities, an accident caused by human error or negligence, or any other cause, such as an act of nature, the permittee shall:
- a. Immediately take action to stop, contain, and clean up the unauthorized discharges and correct the problem.
  - b. Immediately notify the department so that an investigation can be made to evaluate the impact and the corrective actions taken and determine additional action that must be taken.
  - c. Submit a detailed written report to the department describing the breakdown, the actual quantity and quality of resulting waste discharges, corrective action taken, steps taken to prevent a recurrence, and any other pertinent information.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

- G5. The permittee shall at all times maintain in good working order and efficiently operate all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.
- G6. After notice and opportunity for a hearing, this permit may be modified, suspended or revoked in whole or in part during its term for cause including, but not limited to the following:
- a. Violation of any terms or conditions of this permit;
  - b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts;
  - c. A change in the condition of the receiving waters or any other condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.
- G7. The permittee shall, at all reasonable times, allow authorized representatives of the department:
- a. To enter upon the permittee's premises for the purpose of inspecting and investigating condition relating to the pollution of, or possible pollution of, any of the waters of the state, or for the purpose of investigating compliance with any of the terms of this permit;
  - b. To have access to and copy and records required to be kept under the terms and conditions of this permit;
  - c. To inspect any monitoring equipment or monitoring method required by this permit; or,
  - d. To sample any discharge of pollutants.
- G8. If a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307 (a) of the Federal Act for a toxic pollutant which is present in the discharge authorized herein and such standard or prohibition is more stringent than any limitation upon such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee shall be so notified. Section 307 (a) requires that the Administrator of the Environmental Protection Agency shall promulgate effluent standards (or prohibition) for toxic pollutants which he has listed as such.
- G9. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable Federal, State, or local statutes, ordinances, or regulations.

Issuance Date: MAY 17 1983

Expiration Date: MAY 17 1988

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In compliance with the provisions of  
Chapter 90.48 RCW as amended  
and  
The Clean Water Act as amended  
Public Law 95-217

WASHINGTON STATE DEPARTMENT OF FISHERIES  
Room 115, General Administration building  
Olympia, Washington 98504

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Hatchery Name:

Nooksack State Salmon Hatchery

Location:

Glacier Star Route E

Hatchery Type:

Fish Culture

Receiving Water:

Kendall Creek

Discharge Location:


T39N, R5E, Section 3, S<sub>2</sub>

Waterway Segment No.:

01-01-05

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is authorized to discharge in accordance with the special  
and general conditions which follow.

  
\_\_\_\_\_  
Bruce A. Cameron  
Assistant Director  
Department of Ecology ( )



## S1. FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

After issuance, and lasting until the expiration date of this permit, the permittee is authorized to discharge treated wastewater to Kendall Creek subject to the following limitations as specified below:

Beginning on this date, no organic solids settled out in fish culturing facilities shall be resuspended and discharged with the tailwaters nor otherwise discharged to surface waters as a result of discretionary management practices without first undergoing treatment by sedimentation or its equivalent.

## a. Cleaning Wastewater Treatment Facility

The design and operation of the treatment process shall provide for 85 percent removal of the suspended solids contained in the cleaning wastewater. Monitoring of the influent and effluent by the permittee will be required to determine compliance.

## b. Effluent Limitations

<u>Parameter</u>	<u>EFFLUENT LIMITATIONS</u>		<u>MONITORING REQUIREMENTS</u>	
	<u>Daily Average</u>	<u>Daily Maximum</u>	<u>Minimum Frequency</u>	<u>Sample Type</u>
Flow	18.8 mgd	27.4 mgd	Weekly	Daily total
Settleable Solids*	0.1 ml/l	0.2 ml/l	Weekly	Grab*
Suspended Solids	3,344 lbs/day (composite sample)	4,408 lbs/day	N/A	N/A
Suspended Solids	-----	15 mg/l (grab sample)	N/A	N/A

\*Grab samples shall be obtained during cleaning operations.

In addition, the pounds of fish on hand and pounds of food fed shall be reported for each month.

The daily average is defined as the average of the measured values obtained over a calendar month's time. The daily maximum is defined as the greatest allowable value obtained during any calendar day.

Effluent limitations are net values allowable above that of the intake water.

A composite sample is comprised of four or more sub-samples characteristic of the effluent during a daytime workshift. When sampling two or more outfalls, each grab sample is sized in proportion to the flow being sampled before combining with the other samples.

## S2. MONITORING AND REPORTING

The permittee shall monitor the operations and efficiency of all treatment and control facilities and the quantity and quality of the waste discharged. A record of all such data shall be maintained. The permittee shall monitor the parameters as specified in Condition S1 of this permit.

### a. Reporting

Monitoring results obtained during the previous three months shall be submitted no later than the 15th day of the month following the completed reporting period. The report shall be sent to the Northwest Regional Office of the Department of Ecology, 4350 - 150th Avenue N.E., Redmond, Washington 98052.

### b. Records Retention

The permittee shall retain for a minimum of three years all records of monitoring activities and results, include all reports of recordings from continuous monitoring instrumentation. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or when requested by the director.

### c. Recording of Results

For each measurement or sample taken, the permittee shall record the following information: (1) the date, exact place, and time of sampling; (2) the dates the analyses were performed; (3) who performed the analyses; (4) the analytical techniques or methods used; and (5) the results of all analyses.

### d. Representative Sampling

Samples and measurements taken to meet the requirements of this condition shall be representative of the volume and nature of the monitored discharge.

### e. Test Procedures

All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall, unless approved otherwise in writing by the department, conform to the Guidelines Establishing Test Procedures for the Analysis of Pollutants contained in 40 CFR 136, as published in the Federal Register on December 1, 1976, or the latest revision thereof, which currently references the following publications:

S2. MONITORING AND REPORTING (Continued)

e. Test Procedures (Continued)

1. American Public Health Association, Standard Methods for the Examination of Water and Wastewaters.
2. American Society for Testing and Materials, A.S.T.M. Standards, Part 31, Water, Atmospheric Analysis.
3. Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes.

S3. RELEASE PONDS - EFFLUENT LIMITATIONS

When a release pond is drained the flow shall be controlled such that the settleable solids in the discharge does not exceed 3.3 ml/liter at any time.

The permittee shall monitor the discharge during draining operations by taking daily grab samples which are representative of the discharge that day. The samples shall be analyzed for settleable solids and the results reported in the regular monthly report.

S4. SOLID WASTE DISPOSAL

- a. The permittee shall handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface waters.
- b. The permittee shall not permit leachate from its solid waste material to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effect on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.

S5. OTHER REQUIREMENTS

- a. Waterborne silt, sand, and other debris deposited on the premises shall not be deposited back into a watercourse.
- b. Fish mortalities and spawned fish shall not be disposed to a watercourse.

GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
- a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized waste discharges;
  - b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - c. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge subject to any applicable toxic pollutant effluent standard under Section 307 (a) of the Clean Water Act, or which could constitute a threat to human health, welfare, or the environment, 40 CFR Part 122 requires that the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement on a case-by-case basis.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

- G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:
- a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the Clean Water Act and authorized by administrative order;
  - b. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
  - c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special conditions);
  - d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

- G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:
- a. To enter upon the permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;
  - b. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;
  - c. To inspect at reasonable times any monitoring equipment or method required in the permit;
  - d. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;
  - e. To sample at reasonable times any discharge of pollutants.
- G7. The permittee shall submit a new application or supplement to the previous application where facility expansions, production increases, or process

modifications will (1) result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.

- G8. After notice and opportunity for public hearing, this permit may be modified, terminated, or revoked during its term for cause as follows:
- a. Violation of any term or condition of the permit;
  - b. Failure of the permittee to disclose fully all relevant facts or misrepresentation of any relevant facts by the permittee in the application or during the permit issuance process;
  - c. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit;
  - d. Information indicating that the permitted discharge poses a threat to human health or welfare;
  - e. A change in ownership or control of the source; or
  - f. Other cause listed in 40 CFR Part 122.15 and 122.16.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

- G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. or 40 CFR Part 122.15 must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the department shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.
- G11. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.
- G12. All other requirements of 40 CFR Part 122.7, 122.60, and 122.61 are incorporated into this permit by reference.
- G13. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

Issuance Date: June 27, 1985  
Expiration Date: June 27, 1990

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
WASTE DISCHARGE PERMIT

State of Washington  
DEPARTMENT OF ECOLOGY  
Olympia, Washington 98504

In compliance with the provisions of  
Chapter 90.48 RCW as amended  
and  
The Clean Water Act as amended  
Public Law 95-217

Georgia-Pacific Corporation  
P. O. Box 1236  
Bellingham, Washington 98227

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Plant Location

Laural St. & Cornwall Ave.  
Bellingham, Washington

Receiving Water

Bellingham Bay

Industry Type

Sulfite Pulp, Paper and  
Chemical Complex

Discharge Location

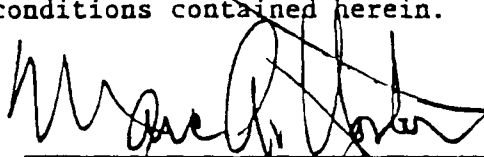
Bellingham Bay

Waterway Segment Number

01-01-03

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The above-named corporation is authorized to discharge at the location described in accordance with the conditions contained herein.



Marc A. Horton  
Assistant Director  
Department of Ecology

# BASIS OF EFFLUENT LIMITATIONS

The limitations of Condition S1 are based on guidelines published November 18, 1982 under 40 CFR Part 430 by the Environmental Protection Agency (EPA) for Best Practicable Technology (BPT) and Best Available Technology (BAT) for sulfite pulp mills. As EPA has not published applicable guidelines for Best Conventional Technology (BCT), these limitations are established in this permit by Best Engineering Judgment (BEJ) of the Department of Ecology as being equal to BPT. Limitations for an unclassified pulping process, identified as Permachem, are also established by BEJ. The limitations are calculated for Condition S1 by applying unit allocations, tabulated below, to pulp production rates of 618 tons per day for sulfite pulp and 54 tons per day for Permachem pulp for the 12-month period ending February 1985.

	BOD lbs per ton		TSS lbs per ton	
	Daily Average	Daily Maximum	Daily Average	Daily Maximum
ACID SULFITE, DRUM WASH				
Surface Condensers, BPT	31.0	59.5	47.3	87.9
Allocation @ 43%	13.3	25.6	20.3	37.8
Barometric Condenser, BPT	33.8	65.0	56.2	104.4
Allocation @ 57%	19.3	37.1	32.0	59.5
TOTAL SULFITE, BPT	32.6	62.7	52.3	97.3
PERMACHEM, BEJ	24.6	47.3	24.2	45.0

BCT and BAT limitations for chlorine plants were published by EPA on June 29, 1982. Effluent from the chlorine plant is pumped to the aerated lagoon where it merges for discharge with pulp mill wastewater. Results of a monitoring study conducted under the superseded permit showed that, except for mercury, chlorine plant limitations were satisfied by monitoring and meeting pulp mill limitations on the combined effluent. Monitoring for mercury is conducted on the discharge from the mercury treatment facility prior to merging with other wastewater. The mercury BAT limitations are based on a chlorine production rate of 235 tons per day and unit limitations of 0.2 lbs of mercury per 1,000 tons of chlorine as a daily average and 0.46 lbs of mercury per thousand tons of chlorine as a daily maximum.



SPECIAL CONDITIONS

**51. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS**

The permittee is authorized to discharge from Outfall No. 009 Subject to the following limitations and monitoring requirements:

<u>Parameter</u>	<u>EFFLUENT LIMITATIONS</u> Pounds per day (kg/day)		<u>MONITORING REQUIREMENTS</u> <sup>3</sup>	
	<u>Daily Average</u> <sup>2</sup>	<u>Daily Maximum</u>	<u>Minimum Frequency</u>	<u>Sample Type</u>
Biochemical Oxygen Demand (5-day)	21,500 (9,800)	41,300 (18,800)	Daily	24-hour composite <sup>4</sup>
Total Suspended Solids	33,600 (15,300)	62,600 (28,500)	Daily	24-hour composite
pH <sup>1</sup>	within the range of 5.0 to 9.0		Continuous	Instantaneous
D-147 Total Mercury	0.05 (0.023)	0.11 (0.05)	Daily	24-hour composite
Temperature, °F	---	---	Continuous	Instantaneous
Flow (mgd)	---	---	Continuous	Instantaneous
Production, tons/day				
Sulfite pulp	---	---	Monthly Average	---
Chemi-mechanical pulp	---	---	Monthly Average	---

Notes:

<sup>1</sup> All excursions outside the 5.0 or 9.0 pH range shall be considered violations, i.e., 40 CFR 401.17 shall not apply to this discharge.

<sup>2</sup> The daily average is defined as the average of the measured values obtained over a calendar month's time.

<sup>3</sup> Monitoring shall be conducted on the total discharge through Outfall No. 009, except for mercury, which shall be monitored at the effluent from the mercury treatment facility.

<sup>4</sup> Composite sample shall be refrigerated during collection.

## S2. MONITORING AND REPORTING

The permittee shall monitor the parameters as specified in Condition S1 and shall comply with the following additional requirements.

### a. Representative Sampling

Samples and measurements taken to meet the requirements of this permit shall be representative of the volume and nature of the discharge.

### b. Test Procedures

All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall, unless approved otherwise in writing by the department, conform to the guidelines establishing testing procedures for the analysis of pollutants contained in 40 CFR, Part 136, as published in the Federal Register.

### c. Recording of Results

The following information shall be recorded for each sampling or measurement: (1) date, time, and place of sampling; (2) date of analysis; (3) name of analyst; (4) analytical technique or method used; and (5) results of analysis.

### d. Records Retention

All records of monitoring including reports, analytical results, and instrument recordings shall be retained for at least three years. This period of retention may be extended by request of the department.

### e. Reporting

Monitoring results obtained during a month shall be summarized on a report form provided by the department. The report shall be mailed to the following address no later than 15 days after the end of the month:

Department of Ecology  
Industrial Section  
Mail Stop PV-11  
Olympia, Washington 98504

## S3. OTHER REQUIREMENTS

### a. Toxicity Limitation

Samples of discharge through Outfall No. 009 shall show a salmonid survival rate of at least 80 percent in a 96-hour bioassay of 65 percent effluent concentration. Testing shall

be conducted semi-annually in accordance with the Department of Ecology Acute Toxicity Test Method (1974), or an approved equivalent method. The department may temporarily require more frequent testing if a bioassay shows less than 80 percent survival, or if process or treatment modifications cause a change in effluent composition.

b. Treatment System Operating Plan

Within six months after the issue date of this permit, a wastewater treatment system operating plan shall be submitted to the Department of Ecology for approval. The plan shall describe the following operational modes:

- (1) A baseline mode which describes the treatment system operating parameters and procedures used to meet the limitations of Conditions S1 at the production levels used to establish these limitations.
- (2) A sub-baseline mode which describes the treatment system operating parameters and procedures needed to maintain the treatment system design efficiency at production levels less than those identified for the baseline mode.

Following approval of the plan by the Department of Ecology the permittee shall operate the treatment system at all times in accordance with the approval plan.

c. Spill Prevention, Containment and Countermeasure Plan

Within six months after the issue date of this permit, the permittee shall prepare and submit for the Department of Ecology's review and approval, an updated Spill Prevention, Containment, and Countermeasure Plan for the facilities covered in this permit. The updated plan shall supersede the plan approved November 20, 1979 by the Department of Ecology. Such plan shall include information and procedures relative to the prevention of spills and unplanned discharge of oil and liquid chemicals as follows:

- (1) A description of the reporting system which will be used to alert responsible facility management and appropriate legal authorities.
- (2) A description of preventive facilities (including overall facility plot) which prevent, contain, or treat spills and unplanned discharges.
- (3) A list of all oil and liquid chemicals use, processed, or stored at the facility which may be spilled into permitted discharge and a facility plot showing the location of storage facilities.

- (4) A facility plot showing all surface drainage routes.
- (5) For purposes of this subsection, plans and manuals required by the following may be included:
  - (a) CFR Title 33, Chapter I, subchapter O, Part 154, dated December 21, 1972.
  - (b) CFR Title 40, Chapter I, subchapter D, Part 112, dated December 11, 1973.

The permittee shall comply with the plan as approved by the Department of Ecology. No change in the plan shall be implemented by permittee without written approval by the Department of Ecology.

d. Thermal Discharge Limitation

Discharge by permittee shall not cause measurable temperature increase (0.5°F) outside the dilution zone described below which results in water temperature in excess of that permittee by Chapter 173-201 WAC for the applicable water quality classification.

- (1) Boundaries in the vertical plane shall be one foot below the receiving water surface and one foot above the bottom.
- (2) The lateral distance on either side of the diffuser centerline shall be 200 feet.
- (3) The longitudinal distance on either end of the diffuser shall be 200 feet.

e. Solid Waste Control

- (1) This condition applies to all solid wastes not covered by Chapter 173-303 WAC, Dangerous Waste Regulations.
- (2) All solid waste material shall be handled and disposed of in a manner that prevents its entry into state ground or surface water.
- (3) The permittee shall not allow leachate from solid waste materials to enter state ground or surface water without providing all known, available, and reasonable methods of treatment, nor allow such leachate to cause any adverse effect on state ground or surface water.
- (4) The solid waste control plan approved by the Department of Ecology on June 14, 1977 shall be reviewed by permittee for updating purposes. Within six months after the issue date of this permit, an updated plan shall be submitted to the Department of Ecology for approval. The updated plan

shall include all solid wastes except those covered by Chapter 173-303 WAC, Dangerous Waste Regulations. No change in the updated plan shall be implemented by permittee without written approval by the Department of Ecology.

- (5) The permittee shall maintain the impervious asphalt covering over the mercury contaminated sludge deposit located on permittee's log storage property adjacent to the chlor/alkali plant. The deposit contains about 7,000 tons of chemfix sludge with a mercury concentration of about 0.17 percent. A plot plan of the pavement over the deposit is shown in permittee's Drawing No. C4546, received by the Department of Ecology on July 29, 1977. The deposit is located within those portions of Blocks 188, 189, 200, and 201 of the plot of New Whatcom Tidelands and those portions of Bay St. (vacated) and Myrtle St. (vacated) lying within a rectangle area of 220 feet by 480 feet described as follows: from the centerpoint of the intersection of Bay St. and Myrtle St. to a distance of 400 feet southwest and 80 feet northeast along the centerline of Bay St., all property northwest of the Bay St. centerline for a distance of 160 feet and all property southeast of the Bay St. centerline for a distance of 60 feet. No project involving excavation of the chemfix sludge deposit shall be undertaken without written approval of the Department of Ecology. The above site description and maintenance requirements shall be included in succeeding discharge permits as long as the deposit exists.

f. Biocide Certification

Within 30 days after the issue date of this permit, the permittee shall provide written certification to the Department of Ecology that biocides containing chlorophenols are not used.

g. Disposal of Sanitary Sewage

All sanitary sewage shall be discharged to the treatment facilities of the City of Bellingham for treatment and disposal.

h. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Federal Water Pollution Control Act as amended.

i. Foam Control

The effluent shall not cause any significant visible foam in the receiving water.

j. Chip Spillage

The operations of unloading, conveying, and storage of wood chips and hog fuel shall be performed in a manner that prevents spillage into the water of significant amounts of chips or hog fuel.

### GENERAL CONDITIONS

- G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than, or at a level in excess of, that authorized by this permit shall constitute a violation of the terms and conditions of this permit.
- G2. The permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment, and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the terms and conditions of this permit.
- G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.
- G4. If, for any reason, the permittee does not comply with, or will be unable to comply with, any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:
- a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized waste discharges;
  - b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and
  - c. Steps taken, or to be taken, to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge subject to any applicable toxic pollutant effluent standard under Section 307(a) of the Clean Water Act, or which could constitute a threat to human health, welfare, or the environment, 40 CFR Part 122 requires that the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later

than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement on a case-by-case basis.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:

- a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the Clean Water Act and authorized by administrative order;
- b. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or temporary reduction or termination of production;
- c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special conditions);
- d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.



- G6. The permittee shall allow an authorized representative of the department, upon the presentation of credentials and such other documents as may be required by law:
- a. To enter upon the premises where a discharge is located or where any records must be kept under the terms and conditions of this permit;
  - b. To have access to and copy at reasonable times any records that must be kept under the terms of the permit;
  - c. To inspect at reasonable times any monitoring equipment or method of monitoring required in the permit;
  - d. To inspect at reasonable times any collection, treatment, or discharge facilities; and
  - e. To sample at reasonable times any discharge of pollutants.
- G7. The permittee shall submit a new application or supplement to the previous application where facility expansions, production increases, or process modifications will (1) result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or (2) violates the terms and conditions of this permit.
- G8. After notice and opportunity for public hearing, this permit may be modified, terminated, or revoked during its term for cause as follows:
- a. Violation of any terms or conditions of the permit;
  - b. Failure of the permittee to disclose fully all relevant facts or misrepresentations of any relevant facts by the permittee during the permit issuance process;
  - c. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit;
  - d. Information indicating that the permitted discharge poses a threat to human health or welfare;
  - e. A change in ownership or control of the source; or
  - f. Other causes listed in 40 CFR Part 122.62 and 122.63.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

- G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under condition G8. or 40 CFR Part 122.62 must report such plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.
- G10. If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the department shall institute proceedings to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.
- G11. Prior to constructing or modifying any waste water control facilities, detailed plans shall be submitted to the department for approval in accordance with Chapter 173-240 WAC. Facilities shall be constructed and operated in accordance with the approved plan.
- G12. All other requirements of 40 CFR Part 122.41 and 122.42 are incorporated into this permit by reference.
- G13. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.
- G14. The department may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

## FACT SHEET

Regulatory Action: The Department of Ecology plans to reissue National Pollutant Discharge Elimination System (NPDES) Permit No. WA 000109-1 for the pulp, paper and chemical mill operated by the applicant listed below.

Applicant: Georgia-Pacific Corporation  
Post Office Box 1236  
Bellingham, Washington 98227

Mill Location and Operation: The mill is located in Bellingham on the waterfront of Bellingham Bay. The primary pulp and paper mill products are 620 tons per day of sulfite pulp and 250 tons per day of tissue paper. Pulp mill byproducts and chemicals produced include ethyl alcohol, concentrated lignin products, 50 tons per day of sulfuric acid, 220 tons per day of chlorine and 250 tons per day of caustic soda.

Wastewater Treatment and Discharge: Mill wastewater receives primary clarification and secondary biological treatment before discharging at a rate of forty million gallons per day into the Class A water of Bellingham Bay. The discharge is through an outfall diffuser 2,000 feet long in a water depth of 40 feet about 6,000 feet southwest of the aerated lagoon.

Effluent Limitations: Effluent limitations are proposed primarily on the basis of guidelines published by the Environmental Protection Agency. These limitations on an average daily basis for the Georgia-Pacific mill are as follows:

Biochemical Oxygen Demand	21,900 lbs. per day
Total Suspended Solids	35,100 lbs. per day
Total Mercury	0.05 lbs. per day
pH	5.0 to 9.0

Other Permit Conditions: Other proposed conditions include the following requirements:

1. Routine monitoring and reporting of discharge characteristics to show compliance with effluent limitations including a bioassay based limitation.
2. Maintain and comply with approved plans for spill control and solid waste control.
3. Develop operating plans for wastewater treatment facilities to show that facilities are efficiently operated at various production loadings.

GEORGIA-PACIFIC CORPORATION  
PULP AND PAPER MILL, BELLINGHAM  
NPDES PERMIT SUMMARY

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The date of public notice was January 23, 1985 and EPA approval was March 28, 1985. A concern was expressed in the EPA approval letter regarding our method of determining effluent limitations for a chemi-mechanical pulping process identified by G-P as Permachem pulp. EPA had agreed this process did not fit the guideline categories and that limitations would have to be established by Best Engineering Judgment.

Additional monitoring of Permachem wastewater was conducted by G-P and samples were split with our lab. A BOD raw waste load was established from this study but the method of determining treatment efficiency was questioned by EPA. After several meetings with EPA and G-P, agreement was reached on revised limitations for Permachem pulp.

Over 90 percent of the pulp produced and the BOD generated is from sulfite pulping. Consequently, the contribution from Permachem has little effect on mill total raw waste load. The BOD and TSS limitations are slightly tighter than the expiring permit. As compliance with these limitations has been somewhat marginal, G-P will have to continue efforts to control loading and maintain adequate treatment efficiency.