Appendix A: Ecological Risk Assessment Guidance

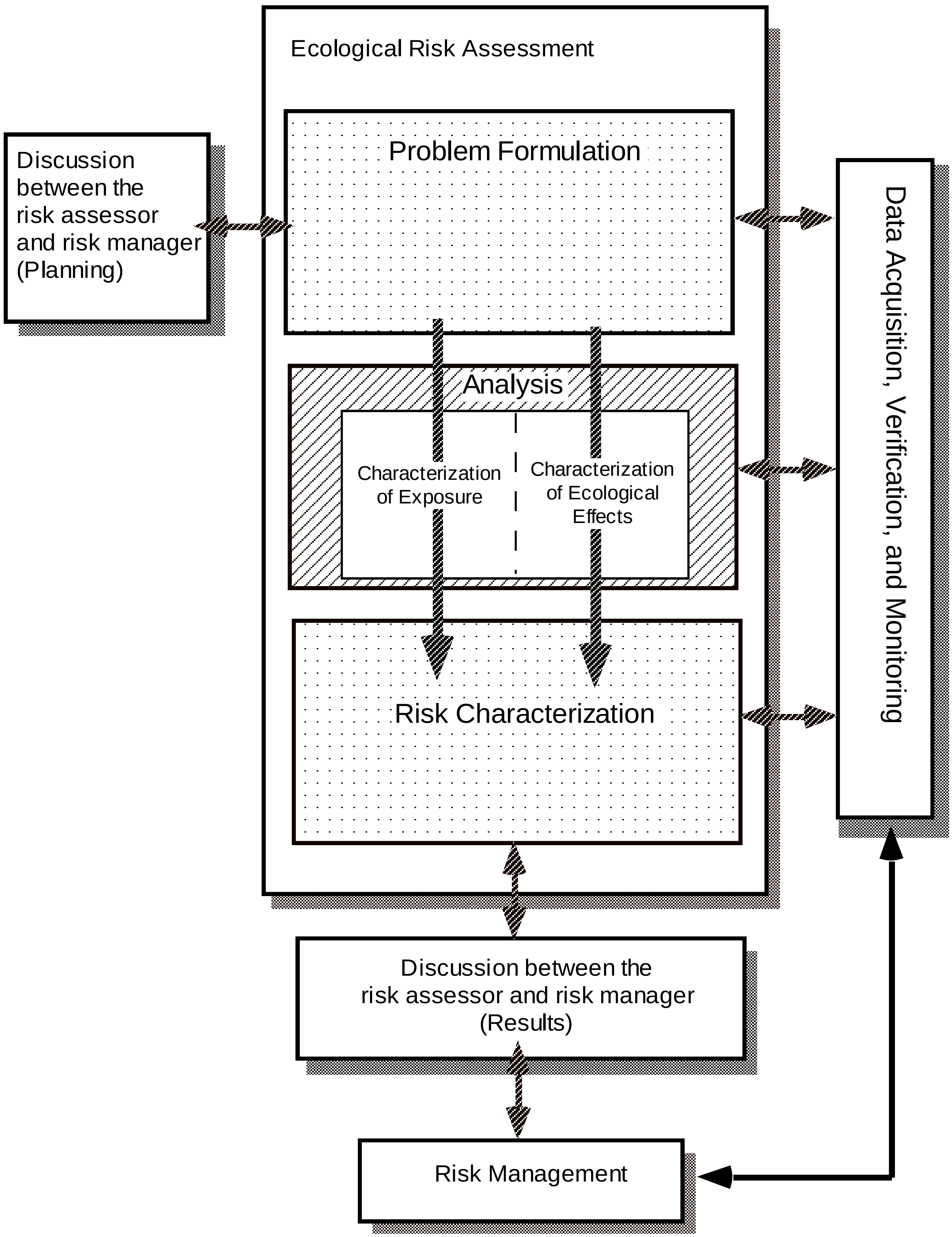
Introduction to Ecological Risk Assessment

The ecological risk assessment (EcoRA) framework used by our research group is based on guidance provided by the United States Environmental Protection Agency (U.S. EPA, 1992), some important additions have been made in the field of EcoRA. These additions are now part of a United Nations program for predicting impacts caused by multiple simultaneous stressors (International Environmental Technology Centre, 1996). The EcoRA framework and related works attempt to incorporate refinements to an older risk assessment ideology and apply these changes to the determination of EcoRA. The resulting framework is delineated in **Figure A-1**. The risk assessment process is characterized by a problem formulation, an analysis containing characterizations of exposure and effects, and a risk characterization process. Several outlying boxes serve to emphasize the importance of discussions during the problem formulation process between the risk assessor and the risk manager. The risk assessor is usually the scientist that performs the risk assessment, while the risk manager can be a government policy-maker or simply the person for whom the risk assessment is being performed. The outlying boxes in the framework indicate the critical nature of the acquisition of new data, verification of the risk assessment, and monitoring. The next few sections detail each aspect of this ecological risk assessment framework.

Problem Formulation

The problem formulation phase of a risk assessment is the first phase of an iterative process. This critical first step defines the question under consideration and directly influences the scientific validity and policy-making usefulness of the risk assessment. The process is comprised of several parts: discussion between the risk assessor and risk manager; endpoint selection; stressor characteristics; identification of the ecological structures potentially at risk; ecological effects; conceptual modeling; and input from data acquisition, verification and monitoring (**Figure A-2**).

The discussion between the risk assessor and risk manager is crucial in helping to set the criteria of the ecological risk assessment. These criteria are based on endpoint selection. Endpoints are created by societal goals and scientific reality for the scope of the project. Often societal goals are presented in ambiguous terms, such as protection of endangered species, protection of a fishery, or the preservation of the structure and function of an ecological system. The interaction between the risk assessor and the risk manager can help to consolidate these goals into definable endpoints of a risk assessment. The risk manager may choose to include concerned parties or the public to further consolidate the goals of the risk assessment. In a risk assessment such as we have performed for Port Valdez, the risk management is shared between a variety of public, private, and governmental groups. Depending upon the specific situation, many of the risk management suggestions and decisions are made by the State of Alaska, Region 10 of the U.S. EPA, the Alyeska Pipeline Service Company, the City of Valdez, and the Regional Citizens' Advisory Council.



Ecological Risk Assessment Framework

Figure A-1 Schematic of the Framework for Ecological Risk Assessment (U.S. EPA, 1992).

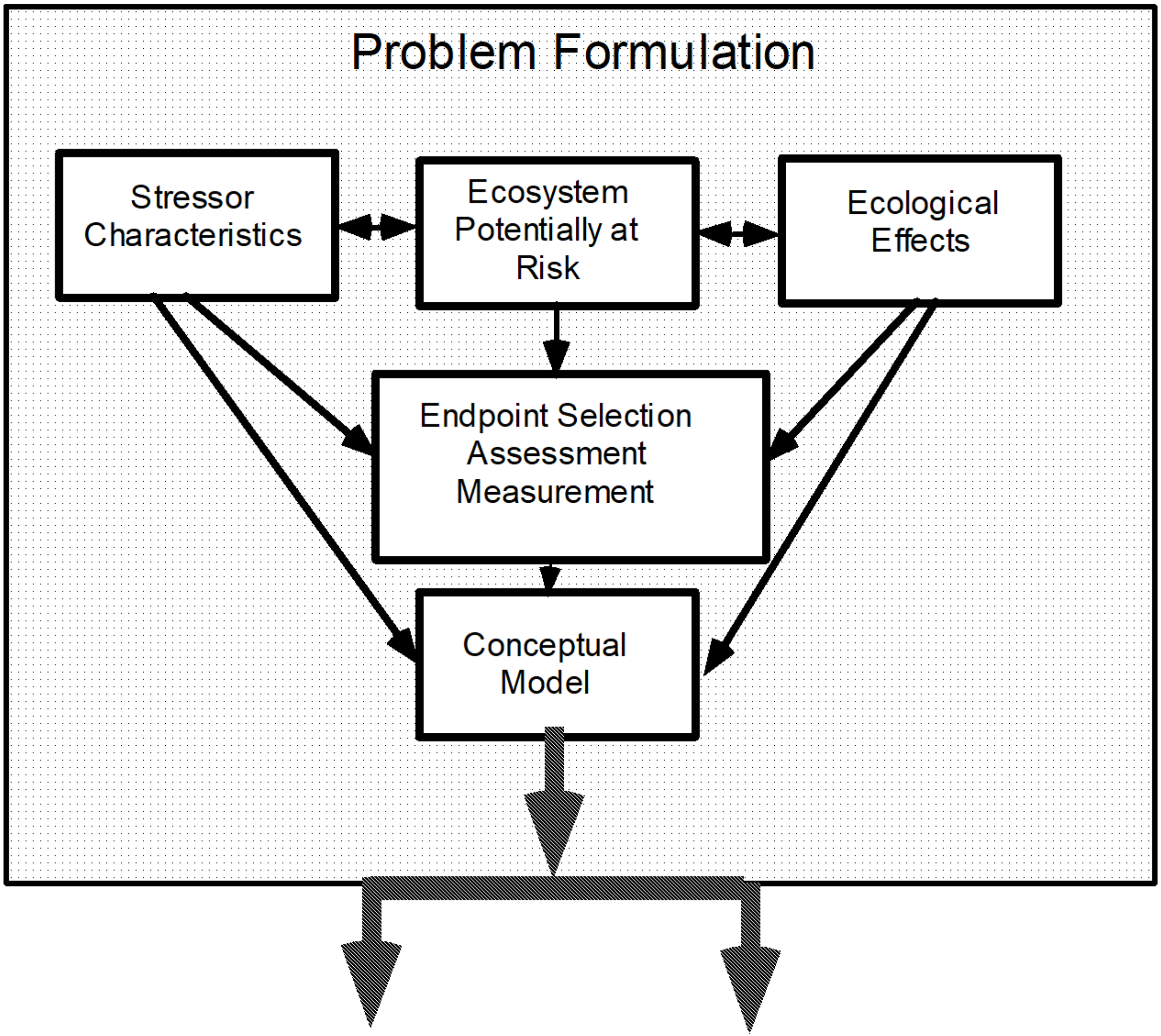


Figure A-2 *Problem Formulation.* This part of the risk assessment is critical because of the selection of assessment and measurement endpoints. The ability to choose these endpoints generally relies upon professional judgment and the evaluation of the current state of the art. However, a priori selection of assessment and measurement endpoints may lock the risk assessor away from consideration of unexpected impacts.

Assessment and Measurement Endpoints

Endpoint selection is a critical phase of the risk assessment, as it sets the stage for the remainder of the process. Any component from virtually any level of biological organization or structural form can be used as an endpoint. Over the last several years two types of endpoints have emerged: assessment and measurement endpoints. **Assessment endpoints** serve as goals to focus the risk assessment and are usually a direct reflection of societal values for a particular system, in our case Port Valdez. Assessment endpoints should accurately describe the characteristics of the environment to be protected. In selecting these endpoints ecological relevance, policy goals as defined by societal values, and susceptibility to the stressor should

be considered. Effects to assessment endpoints often are not directly measured. Instead, effects to measurement endpoints are used to extrapolate to the assessment endpoints. **Measurement endpoints** are measurable factors that respond to the stressor and describe characteristics that are essential to the assessment endpoint. Measurement endpoints can be any aspect
of the ecological system that provides information about the status of the assessment endpoint. Examples range from the measurement of biochemical responses to changes in community structure and function. The more complete the understanding of the relationship between the assessment endpoint and the measurement, the more accurate the prediction of impacts will be.

The design and selection of measurement endpoints should be based on the following criteria:

- relevance to assessment endpoints
- measurement of indirect effects
- sensitivity and response time
- signal to noise ratio
- consistency with assessment endpoint exposure scenarios
- diagnostic ability
- practicality

Measurement Endpoint Selection

The most direct measurement endpoints are those that reflect the actual mechanisms causing an effect (*e.g.*, a measure of the inhibition of a protein causing dysfunction in an organism, or the mortality rate of organisms resulting in a population decline for a species under protection). Many environmental characteristics used as measurement endpoints may correlate with an effect, without necessarily causing it. Although the application of these characteristics as endpoints is reasonable, it is important to remember that some intermediate relationship exists.

For a measurement endpoint to be useful, it must be exposed to the stressor in a manner similar to that of the assessment endpoint. For example, the presence of hydrocarbons in flatfish bile, a commonly used indicator of oil exposure, would not be a good measurement endpoint to assess salmon survival. Flatfish, which feed off the bottom sediment, are exposed to the stressor differently than salmon which feed in the water. Methodological consistency is important when an organism is used as a surrogate for the assessment endpoint or if a laboratory test is being used to examine toxicity in the environment. However, these measurement endpoints do not necessarily address secondary, or indirect effects. Other components of the environment that influence the assessment endpoint may be exposed by means other than that measured in the surrogate organism or in the laboratory (*e.g.*, measuring toxicity to waterfowl in the laboratory does not measure the nutritional deficiency caused by a simultaneous toxicity to the invertebrates on which they feed). A useful measurement endpoint will predict the severity of effects occurring in the assessment endpoint.

Finally, all risk assessments are limited by scientific capabilities to make accurate measurements in the laboratory and the field. A measurement endpoint that cannot realistically be measured adds to error in the assessment. Physical and chemical parameters of the system are perhaps the easiest to measure, but may indicate very little about effects to specific organisms. Data collected on population dynamics, genetic background, and species interactions tend to be more difficult, but are often the more important parameters to measure. Trade-offs must also be considered in the scientific approach. In many cases the precision and accuracy of a few measurement endpoints may not be as important as obtaining many measurements that are more general and qualitative. This is why data acquisition, verification, and monitoring remain an essential part of the risk assessment process, even after the initial assessment is completed.

Stressor and Effects Characteristics

The stressor characteristics are central to the understanding of potential risk to the chosen endpoints. Stressors can be biological, physical, or chemical in nature. Chemical stressors such as toxins, contaminants, or pollutants are often the only stressors considered in an ecological risk assessment. However, biological and physical stressors can result in impacts just as, if not more, harmful than chemical stressors. Examples of **biological stressors** include the introduction of a new species or the application of biodegradative microorganisms for oil spill clean-up. **Physical stressors** consist of events such as a change in temperature, ionizing or non-ionizing radiation, or geological processes. **Chemical stressors** include such materials as pesticides, industrial effluents, or waste streams from manufacturing processes. In the following discussion chemical stressors provide the typical example, but different classes of stressors often occur together. A multitude of stressors is certainly the case in an open system like that of Port Valdez.

Stressors vary not only in their composition but in other characteristics derived in part from their use patterns. These characteristics are usually listed as intensity (concentration, dose, or magnitude), duration, frequency, timing, and scale. Duration, frequency, and timing address the temporal characteristics of the contamination, while scale addresses the spatial characteristics.

One of the more difficult objectives to address in the problem formulation is the identification of the ecological components potentially at risk. Although a risk assessment process may be initiated by the discovery of a contaminated site, the potential effects can extend beyond that locale. The ability of the air and water to transport materials can result in impacts occurring in a variety of areas. For example, pesticides applied to crops can find their way into ponds and streams adjacent to agricultural fields, causing effects to aquatic and terrestrial life. Even when stressors occur on a large scale, not all components are affected equally. For example, increased ultra-violet light intensity may be more damaging to systems at higher latitudes or elevations. Without the scientific knowledge determining this relationship, these areas might not be identified for special consideration in the problem formulation. There is the potential therefore, that stressors in Port Valdez have been overlooked because of a lack of information.

Ecological effects are broadly defined as any impact upon any organizational level of the ecological system (*e.g.*, DNA, individual organisms, or communities). **Figure A-4** lists some of the potential interactions between a foreign substance and a living system. Numerous interactions between the stressor and the ecological system exist and each should be considered as precursors to possible ecological effects. Examples of such interactions include biotransformation and degradation of one substance to another substance, bioaccumulation in the tissues of an organism, acute and chronic toxicity, reproductive effects, predator-prey interactions, production of organic material through photosynthesis, community metabolism, biomass production, community resilience and connectivity, and evolutionary processes. These interactions represent direct impacts on the environment, but often describe effects of the environment on the stressor as well (*e.g.*, biotransformation and biodegradation). Understanding these relationships is crucial if an accurate assessment of ecological effects is to be reached.

The history of a system is a characteristic that is often overlooked, although it directly affects the types of species found and their response to stressors. Geographic relationships to nearby systems that exist in the present or existed in the past, are other key characteristics influencing species migration and population dynamics resulting from stressor impacts. These characteristics are in turn influenced by the size of the ecological system. Larger systems are more likely to influence other systems, and potentially support a greater number and a more diverse collection of both resident and migratory species.

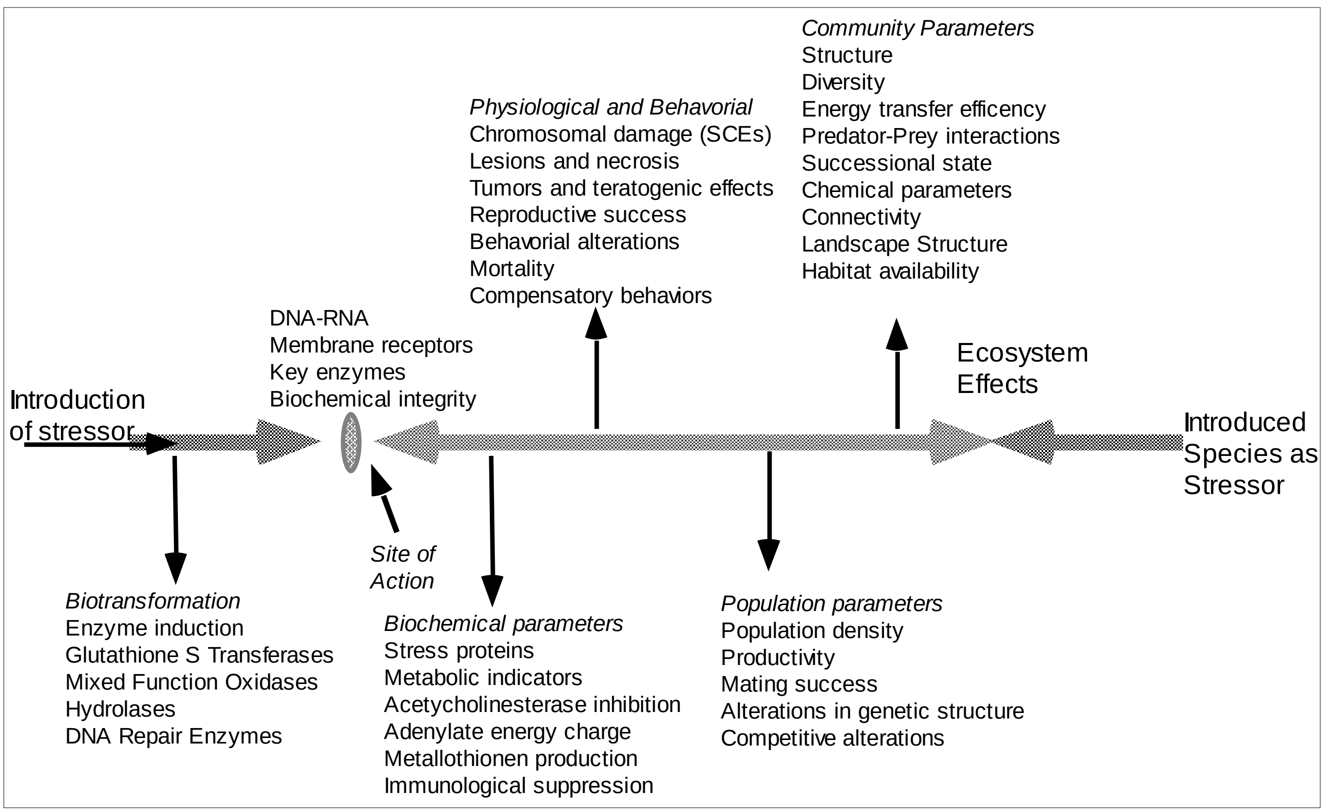


Figure A-3 Possible interactions of a stressor at the molecular, organism, population, community or ecosystem levels.

The Conceptual Model

The **conceptual model** of the risk assessment is the framework into which the data are placed. The conceptual model displays the interactions between the assessment endpoints and the environment. The environment would include possible stressors and other natural influences. Like the selection of endpoints, the selection of a useful conceptual model is crucial to the success or failure of the risk assessment process. In some cases a simple single species model may be appropriate. Typically, models in ecological risk assessment are comprised of many parts and attempt to deal with the variability and plasticity of natural systems. Exposure to stressors may come from many different sources. The risk each stressor poses to specific organisms in an area may depend on biological characteristics (*e.g.*, migratory and breeding habits.) Many organisms may be rare or have specialized traits allowing them to survive in their environment.

Data Acquisition and Verification

As crucial as the above steps are, they are all subject to revision based upon the acquisition of additional data and verification that the endpoints selected do in fact perform as expected. If the process has proven useful in predicting ecological risks, further refinements of the conceptual model will increase the accuracy and precision of these predictions. The data acquisition, verification, and monitoring segment of risk assessment is what makes it a scientific process as opposed to a religious or philosophical debate. As a process, analysis and continued testing of the measurement endpoint responses and their power to predict the assessment endpoints are essential to the development of better methodologies. An ecological risk assessment is never more than an incomplete attempt to identify, assess, and predict the significance of events in the environment. Continued examination of the ecology, the anthropogenic activities, and their numerous and complex interactions is essential to gain an understanding of these events.

The Analysis Phase

Following the Problem Formulation phase of the risk assessment is the analysis phase (**Figure A-4**). Characterization of the environment of concern is central to this process and is often the most difficult and time-consuming step. When restoration of a damaged area is the issue, a functional ecological system may no longer exist, and a surrogate system would be used to understand the interactions and processes expected in the environment. Delineating the boundaries of the environment of concern is often difficult. For Port Valdez, we have defined the system by the presence of a semi-enclosed body of water, although we certainly recognize that it is closely connected to Prince William Sound and the surrounding terrestrial system. In addition to the size and composition of the system, the resources to be protected, their response to the environment, and their role in the system need to be understood. Many animals exhibit behavioral responses to some change in their environment that can preclude successful reproduction or alter migratory patterns. These effects would not be detected if knowledge about the organism, as well as disturbed environments were unavailable.

In ecological risk assessment both the exposure and effect are incorporated into the analysis component. However, organisms degrade, detoxify, store, and even use contaminants or foreign substances as resources. Conversely, characteristics of the pollutants and components of the environment (*e.g.*, water and sediments) can affect the ability of organisms to modify or destroy chemical stressors. Exposures and effects are treated separately in the analysis process, mostly for convenience. The reality of the intimate interaction between the chemical, physical, and biological components of the ecological system should not be forgotten.

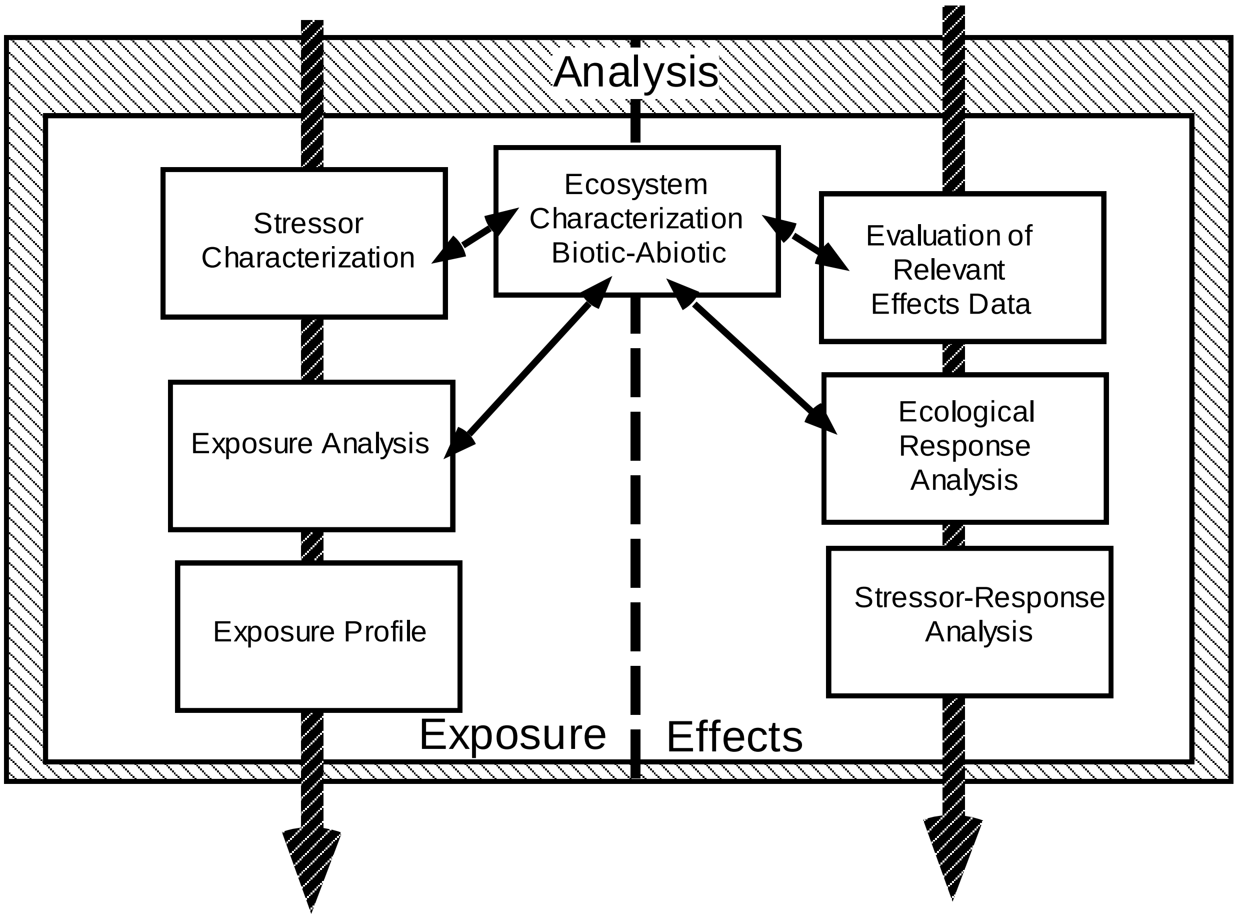


Figure A.4 *Analysis.* Although separated into different sides of the analysis box, exposure and ecological responses are intimately connected. Often the biological response to a toxicant alters the exposure for a different compartment of the ecological structure.

Exposure Analysis

The analysis of exposure includes the determination of the environmental concentration range or, if available, the actual dose received by the biota of a particular stressor. Although simple in concept, determining or predicting the environmental concentration range can be quite difficult. Heterogeneity in the environment and in the release of the stressors typically results in a wide range of possible exposure and therefore much uncertainty.

The first step leading to an exposure is the end-of-pipe discharge, deposition, or some other release into the environment. This event is determined by the use patterns of the substance released or the manufacturing processes involved. In some cases the statistics concerning the production, use, and waste discharge of a potential stressor are well documented by government agencies. Manufacturers may also document the processes and constituents contributing to their waste streams. The documentation is best for chemicals that are highly toxic and considered a threat to human health. Government agencies regulate effluents for toxicity and composition, and set controls for the components considered most harmful. Problems occurring in spite of these controls often result from past practices, illegal dumping of toxic materials, or accidents. In these instances very little may be known about the nature of the contamination.

As the substance enters the ecological system it is almost immediately affected or changed by both the living and non-living components of the receiving system. Many of the factors controlling the persistence and distribution of the stressor are specific to the characteristics of the receiving environment. The history of the environment as contained in the genetic make-up of the populations, and the presence of additional stressors, will alter any interactions between the stressors and the ecological components. The goal of the exposure analysis is to determine the release rate, the persistence, and the availability of the stressors within the ecological system.

The most common way to determine exposure is to use analytical chemistry for measuring concentrations in the substrates and media as well as the organisms within the environment. Analytical procedures have been developed for a number of chemicals and the detection ranges are often in the µg/L range. Analytical procedures, however, may not detect the degradation products and do not quantify the actual exposure of the material to the various biological components. The analysis of tissue samples of representative biota gives a more accurate picture of exposure to materials that are not rapidly detoxified or eliminated. Since exposure can occur through different modes and at varying rates through those modes the total burden upon the organism is difficult to estimate. Many models attempt to predict the fate and subsequent exposure to a stressor within a given environmental scenario. Models, however, are simplifications of our imperfect understanding of exposure and should be tested whenever possible against comparable datasets and field verifications. The exposure analysis attempts to quantify the temporal and spatial distribution of the stressor. With this information it should prove possible to develop distribution curves that, when overlapped, predict the exposure of a given stressor to a given receptor.

Dose and concentration probabilities are the typical units used for exposures in environmental toxicology, but do not apply to many of the physical and biological stressors. It may be possible to choose endpoints that can be measured in dose or concentration units for non-chemical stressors. In most cases, exposure to a biological or physical stressor may have to be measured with other units (*e.g.*, depth of solid wastes, deposits on sediments, or the number of non-native fish in a stream).

Characterization of Ecological Effects

The characterization of ecological effects is perhaps the most critical aspect of the risk assessment process. Various degrees of confidence exist in our ability to measure the relationship between a dose and the response of an organism. Toxicity measured under set conditions in a laboratory can be made with a great deal of accuracy. Unfortunately, as the conditions become more realistic (*e.g.*, includes more than one species and multiple routes of exposure), the ability to measure the effects decreases.

Evaluation of relevant effects data has long been left to professional judgment with applicability to the endpoints selected during problem formulation. Criteria used to judge the significance of the data usually include quality, number of replicates, repeatability, relevance to the selected endpoints, and realism of study conditions when compared to the natural environment.

Data from several sources are usually compiled and compared. If available, acute and chronic data for the toxicity of the stressor to one or more species are collected. Reliable toxicity data are usually limited to a few species and there may be no toxicity data for the species of interest in the assessment endpoint. This situation often occurs with threatened or endangered species, where collection or use of the organism is prohibited. Even a small scale toxicity test involves relatively large numbers of animals to acquire data of sufficient quality. Finally, long-term effects are not well understood especially with low quantities of stressors, as are found in Port Valdez.

Stressor-Response Profile

Combining the exposure analysis with the ecological effects data results in the Stressor-Response Profile. This profile attempts to match impacts with the levels of stressor input under study. Relationships between the stressor and the measurement endpoint are evaluated with a consideration to how this interaction affects the assessment endpoint. This process is rarely straightforward. Occasionally, a model is used to specifically state the relationship between the measurement and assessment endpoint; when this relationship is not specifically stated it is then left to professional judgment.

The stressor-response profile is in some ways analogous to a chemical dose and an organism's response, expanded to the community and ecosystem level. Since many of the responses quantified in the analysis are extrapolations from other data or based on models, it is important to delineate the uncertainties, qualifications and assumptions made at each step.

One of the greatest difficulties in evaluating the stressor-response relationship for an ecological risk assessment is the fact that systems are influenced by many stressors. A response in the environment could easily result from the influence of multiple stressors. Laboratory organisms are generally healthy, but laboratory conditions do not mimic the availability of nutrients, behavioral opportunities, or many other factors characterizing an ecological structure. Field studies are affected by many climatological and structural stressors that are separate from the anthropogenic stressor. Additionally, most laboratories use reference materials (*e.g.*, water and sediments) from nearby environments considered "clean." However, most environments within range of a laboratory have been subjected to some anthropogenic contamination, confounding even the best designed study. Knowledge of the ecological dynamics associated with the system are crucial for realistic extrapolations to effects in the local populations.

Data Acquisition, Verification, and Monitoring

This part of the ecological risk assessment framework is critical. Basic research on the effects of stressors to ecological structures, improvement in test methods, molecular mechanisms, and improvements in modeling provide critical input to this stage of the risk assessment. Much of this work is done outside of a specific assessment and is in a state of constant change. Flexibility designed into a specific risk assessment allows technological improvements in the scientific field to be incorporated.

Risk Characterization and Integration

Risk Characterization is the final stage of the assessment process (Figure A.5). This phase of a risk assessment integrates risk estimation and risk description. The overall process combines the ecological effects with the environmental concentration of a stressor to provide a likelihood of effects occurring given the distribution of the stressor within the system. The probability of toxic impacts is analogous to the weather forecaster's prediction of rain. For instance, today there is a 50 percent chance of rain in the local area. This means that, given the conditions observed, experience predicts that the chance of rain is 50 out of 100 trials. Notice that this does not predict rain over half of the forecast area, but that under these conditions the prediction will be right 50% of the time, and 50% of the time it will be wrong. Toxicology attempts to make similar predictions about the probability of an effect given the conditions of chemical type, concentration, and ecological structure. This predictive process is still as much an art as is weather forecasting.

Uncertainty

Uncertainty in risk assessment comes from three general sources: the inherent randomness of the environment and ecological processes; ignorance or lack of complete understanding of the environment and ecological processes; and error in the scientific approach and assessment (Suter, 1993). For example, the movement or migration of fish fry in the water is affected by random events such as wind and current action. There will be error in trying to establish exposure of fish fry based on their migration. In some instances the conceptual model and the assessment and measurement endpoints associated with it may be inaccurate descriptions of the system under investigation. A risk assessment is based on the current understanding of the local ecology. Fundamental misunderstandings or ignorance of ecological structure and processes introduce error or uncertainty to the assessment. Only with rigorous monitoring and follow-up validation of the risk assessment is it possible to reduce these errors and thus reduce uncertainty.

Finally, the quality and source of the data incorporated into the risk assessment again contributes to the uncertainty associated with the risk assessment. Laboratory toxicity data routinely vary according to the strain or test organism used. Models have an associated uncertainty although this is not always quantified. Field studies are particularly difficult to interpret and are subject to much interference from the natural environment. One of the most perplexing areas of uncertainty is the necessity of using data from studies that were not originally designed to address the question fundamental to the risk assessment. The design of each study is specific to the intended purpose of that study. The practice of using data collected for a separate purpose introduces uncertainty in the adequacy of the study design to answer the specific risk assessment question.

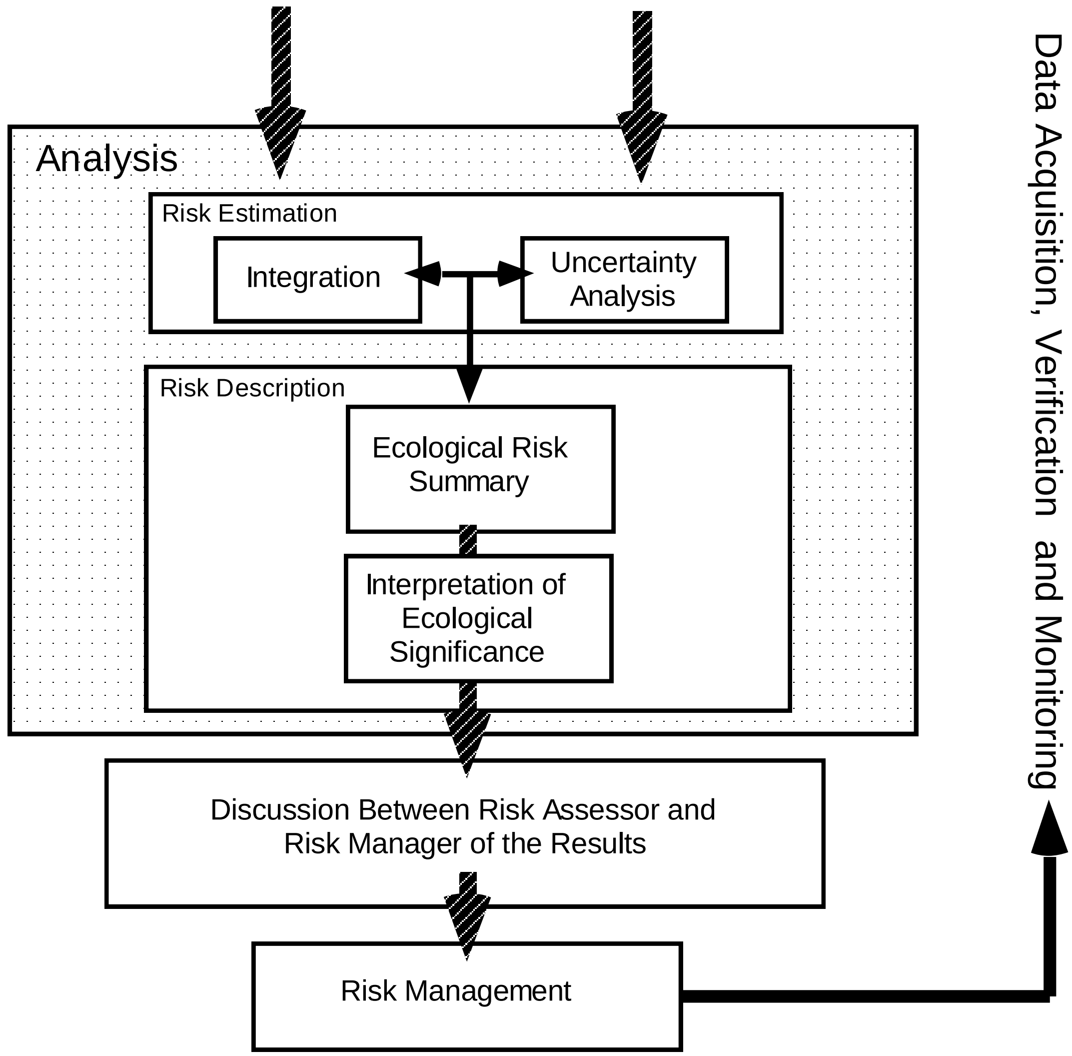


Figure A-5 *Risk Characterization*. This compartment is comprised of the risk estimation and risk description boxes. The integration of the exposure and effects data from the analysis compartment is reconciled in the risk estimation process.

Risk Description

The two aspects of the risk description are an ecological risk summary and the interpretation of ecological significance. Although this division is somewhat artificial, it can be paraphrased as: what are the potential effects and do I believe them, and how big a problem is this really going to be?

The Ecological Risk Summary summarizes the risk estimation results and the uncertainties. The crucial aspects to this section are the decisions made about the accuracy of the risk estimation. These decisions consider:

* Sufficiency of the data
* Corroborative information

* Evidence of causality

Sufficiency of the data relates to the quality of the data and its completeness. Much of the discussion revolves around the quality and appropriateness of the research conducted or cited in the formation of the risk assessment.

Corroborative information is provided by data derived from similar studies with similar stressors that tend to support the conclusions of the risk assessment. Similarity to other datasets and conclusions of related studies enhance the credibility of the current risk assessment. However, dissimilarity to previous conclusions or ecological theory does not mean that the current study is flawed; it may mean that the previous work is not as similar as originally thought or that the overall paradigm is incorrect.

In addition, an interpretation of ecological significance is produced that details probable magnitudes, temporal and spatial heterogeneity, and the probability of each of these events and characteristics. The best approach may be the establishment of a list of properties that the system is required to have in the future.

Finally a report is made to the risk manager detailing the important aspects of the risk assessment. The range of impacts, uncertainties in the data and the probabilities, and the stressor-response function are of crucial importance. These factors are then taken into consideration with social, economic, and political realities in the management of risks.

References

International Environmental Technology Centre. 1996. Environmental Risk Assessment for Sustainable Cities. Technical Publication Series. 3. United Nations Environmental Programme, Osaka/Shiga. 57 pp.

Suter, G.W., (Ed.). 1993. Ecological Risk Assessment. Lewis Publishers, Chelsea, MI. 538 pp.

U.S. EPA. 1992. Framework for Ecological Risk Assessment. EPA/630/R-92/001. U.S. Environmental Protection Agency, Washington, D.C. 41 pp.

Appendix B: Species Lists for Port Valdez

There are numerous species in Port Valdez besides those specifically mentioned or discussed in the EcoRA. All organisms play an interconnecting role in the biological and physical dynamics of the Port environment. We identified species which may occur in the Port by combining the species lists from past biological surveys or studies conducted in the area. After collating this information, we split the species lists into the following groups

- Mammals: Terrestrial and Marine (page B2)
- Birds: Raptors, Seabirds, Waterfowl, Shorebirds, and Others (pages B3–B6)
- Fishes: Pelagic and Benthic (pages B7–B8)
- Mudflat Flora and Fauna: Plants, Invertebrates, and Fishes (page B9)
- Rocky Shoreline Flora and Fauna: Plants, Invertebrates, and Fishes (pages B10–B17)
- Shallow Subtidal Flora and Fauna: Plants, Invertebrates, and Fishes (pages B18–B22)
- Deep Benthic Fauna: Invertebrates and Fishes (pages B23–B35)
- Open Water Flora and Fauna: Phytoplankton and Zooplankton (pages B36–B39)

Plants, invertebrates, and some fishes were grouped by the habitat in which they were found. Mammals, birds, and fishes were included as groups because these organisms frequently move between different habitats and were often not associated with a single habitat type. Within each list we grouped the species by the most representative phylogenetic taxa. Any common names that were known or appeared in a reference were also included as an indication of the types of commonly-known organisms represented in the group. Scientific names and spellings were taken directly from the references. Since revisions in taxonomy occur, the species name in use at the time of the study may have changed. Misidentification and misspellings may also have occurred in the original studies. For instance, many studies refer to the presence of the mussel, *Mytilus edulis*, in the Port. Blanchard and Feder (*In Press*) have recently stated that this species is probably *Mytilus trossulus.* Other possible errors resulting from compilation of several studies include: listing an unidentified species that may actually be identified in the list (based on a separate study); and listing one unidentified species which may actually represent more than one species.

These lists represent species that are common and uncommon in the Port. However, there are undoubtedly species that have not yet been identified. Specifically, little attention has been given to phytoplankton, zooplankton, pelagic fishes, and bottom fishes.

Mammals

	Species name	Common name
Marine	*Balaenoptera acutorostrata*	minke whale
	Balaenoptera physalus	fin whale
	Enhydra lutris	sea otter
	Eumetopias jubatus	Steller's sea lion
	Megaptera novaeangliae	humpback whale
	Orcinus orca	killer whale
	Phoca vitulina	harbor seal
	Phocoenoides dalli	Dall's porpoise
Terrestrial	*Canis latrans*	coyote
	Lutra canadensis	river otter
	Lynx canadensis	lynx
	Martes americana	marten
	Microtus oeconomus	tundra vole
	Mustela rixosa	Least weasel
	Mustela vison	mink
	Mustla erminae	ermine
	Sorex sp.	shrews
	Tamiasciurius hudsanicus	red squirrel
	Ursis americanus	black bear
	Ursis horribilis	grizzly bear

References: Hogan and Colgate, 1980; McRoy and Stoker, 1969

Birds

	Species name	Common name
Raptors	*Aquila chrysaetos*	Golden Eagle
	Circus cyaneus	Northern Harrier
	Haliaeetus leucocephalus	Bald Eagles
	Accipiter gentilis	Goshawk
	Accipiter striatus	Sharp-shinned Hawk
	Falco peregrinus	Peregrine Falcon
	Falco sparverius	American Kestrel
Alcids	*Brachyramphus brevirostris*	Kittlitz's Murrelet
	Brachyramphus marmoratus	Marbled Murrelet
	Cepphus columba	Pigeon Guillemot
	Uria aalge	Common Murre
	Uria sp.	murres
Gulls, Terns & Kittiwakes	*Larus argentatus*	Herring Gull
	Larus canus	Mew Gull
	Larus glaucescens	Glaucous-winged Gull
	Larus philadelphia	Bonaparte's Gull
	Larus sp.	gull
	Rissa tridactyla	Black-legged Kittiwake
	Sterna paradisaea	Arctic Tern
	Sterna sp.	terns
Fish Divers	*Ceryle alcyon*	Belted Kingfisher
	Gavia adamsii	Yellow-billed Loon
	Gavia arctica	Arctic Loon
	Gavia immer	Common Loon
	Gavia stellata	Red-throated Loon
	Mergus merganser	Common Merganser
	Mergus serrator	Red-Breasted Merganser
	Phalacrocorax auritus	Double-Crested Cormorant
	Phalacrocorax pelagicus	Pelagic Cormorant
	Podiceps auritus	Horned Grebe
	Podiceps grisegena	Red-necked Grebe
Diving Ducks	*Aythya affinis*	Lesser Scaup
	Aythya marila	Greater Scaup
	Aythya sp.	Diving Ducks
	Bucephala clangula	Common Goldeneye
	Bucephala islandica	Barrow's Goldeneye
	Bucephala islandica	Bufflehead
	Clangula hyemalis	Oldsquaw
	Histrionicus histrionicus	Harlequin Ducks
	Melanitta fusca	White-winged Scoter
	Melanitta nigra	Black Scoter

Birds

	Species name	Common name
	Melanitta perspicillata	Surf Scoter
Dabbler Ducks	*Anas acuta*	Northern Pintail
	Anas Americana	American Wigeon
	Anas clypeata	Northern Shoveler
	Anas carolinensis	Green-winged Teal
	Anas discors	Blue-winged Teal
	Anas platyrhynchos	Mallard
	Anas sp.	Dabbling Duck
	Anas strepera	Gadwall
	Anser albifrons	White Fronted Goose
	Anser caerulescens	Snow Goose
	Branta bernicla	Brant
	Branta canadensis	Canada Goose
	Cygnus columbianus	Tundra Swan
	Olor buccinator	Trumpeter Swan
Shorebirds	*Actitis macularia*	Spotted Sandpiper
	Anthus spinoletta	Water Pipet
	Ardea herodias	Great Blue Heron
	Arenaria interpres	Ruddy Turnstone
	Calidris mauri	Western Sandpiper
	Calidris melanotos	Pectoral Sandpiper
	Calidris minutilla	Least Sandpiper
	Calidris ptilocnemis	Rock Sandpipers
	Calidris pusilla	Semipalmated Sandpiper
	Charadrius semipalmatus	Semipalmated Plover
	Cinclus mexicanus	American Dipper
	Corvus caurinus	Northwestern Crow
	Crovus corax	Common Raven
	Cyanocitta stelleri	Steller's Jay
	Gallinago gallinago	Common Snipe
	Grus canadensis	Sandhill Crane
	Haematopus bachmani	Black Oystercatcher
	Heteroscelus incanus	Wandering Tattler
	Hirundo pyrrhonata	Cliff Swallow
	Limnodromus griseus	Short-billed Dowitcher
	Limnodromus scolopaceus	Long-billed Dowitcher
	Limosa haemastica	Hudsonian Godwit
	Numenius phaeopus	Whimbrel
	Numenius tahitiensis	Bristle-thighed Curlew
	Phalaropus lobatus	Northern Phalarope
	Phalaropus lobatus	Red Necked Phalarope
	Pica pica	Black-billed Magpie
	Pluvialis squatarola	Black-bellied Plover
	Regulus calendula	Ruby-crowned Kinglet

Birds

	Species name	Common name
	Regulus satrapa	Golden-crowned Kinglet
	Seiurus noveboracensis	Northern Waterthrush
	Tachycineta thalassina	Violet-green Swallow
	Tringa flavipes	Lesser Yellowlegs
	Tringa melanoleuca	Greater Yellowlegs
Upland Birds	*Agelaius phoeniceus*	Red-winged Blackbird
	Bombycilla garrulus	Bohemian Waxwing
	Calcarius lapponicus	Lapland Longspur
	Carduelis flammea	Common Redpoll
	Carduelis pinus	Pine Siskin
	Catharus guttatus	Hermit Thrush
	Catharus minimus	Gray-cheeked Thrush
	Catharus ustulatus	Swainson's Thrush
	Certhia familiaris	Brown Creeper
	Dendroica coronata	Yellow-rumped Warbler
	Dendroica petechia	Yellow Warbler
	Dendroica striata	Blackpoll Warbler
	Empidonax alnorum	Alder Flycatcher
	Empidonax difficilis	Western Flycatcher
	Euphagus carolinas	Rusty Blackbird
	Iridoprocne bicolor	Tree Swallow
	Ixoreus naevius	Varied Thrush
	Junco hyemalis	Slate Colored Junco
	Lagopus lagopus	Willow Ptarmigan
	Loxia lencoptera	White-winged Crossbill
	Melospiza lincolnii	Lincoln's Sparrow
	Melospiza melodia	Song Sparrow
	Nuttallornis borealis	Olive-sided Flycatcher
	Parus atricapillus	Black-capped Chickadee
	Parus hudsonicus	Boreal Chickadee
	Parus rufescens	Chestnut-backed Chickadee
	Passerculus sandwichensis	Savannah Sparrow
	Passerella iliaca	Fox Sparrow
	Picoides pubescens	Downy Woodpecker
	Pinicola enucleator	Pine Grosbeak
	Plectrophenax nivalis	Snow Bunting
	Selasphorus	Rufous Hummingbird
	Spizella arborea	Tree Sparrow
	Turdus migratorius	American Robin
	Vermivora celata	Orange-crowned Warbler
	Wilsonia pusilla	Wilson's Warbler
	Zonotrichia atricapilla	Golden-crowned Sparrow
	Zonotrichia leucophrys	White-crowned Sparrow

References: Shaw, D.G. and M.J. Hameedi, 1988; Matt Kinnery, pers. comm., 1995; Hogan and Colgate, 1980; Hemming and Erikson, 1979.

Fishes

	Species name	Common name
Anadromous fishes	*Salvelinus malma*	Dolly Varden
	Oncorhynchus tshawytscha	king salmon
	Oncorhynchus nerka	red salmon
	Oncorhynchus keta	chum salmon
	Oncorhynchus gorbuscha	pink salmon
	Oncorhynchus kisutch	silver salmon
	Oncorhynchus clarki	cutthroat trout
Pelagic fishes	*Aspidophoroides bartoni*	aleutian alligatorfish
	Asterotheca infraspinata	spinycheek starsnout
	Clupea harengus pallasi	Pacific herring
	Dasycottus setiger	spinyhead sculpin
	Hemitripterus bolini	bigmouth sculpin
	Lumpenella longirostris	longsnout blenny
	Lumpenus sagitta	pacific snakeblenny
	Lycodes brevipes	shortfin eelpout
	Malacocottus kincaidi	blackfin sculpin
	Osmeridae, unidentified species	smelt
	Pungitius sp.	stickleback
	Sebastes auriculatus	brown rockfish
	Sebastes caurinus	copper rockfish
	Sebastes ciliatus	dusky rockfish
	Sebastes maliger	quillback rockfish
	Sebastes ruberrimus	yelloweye rockfish
	Sebastes sp.	rockfish
	Thaleichthys pacificus	eulachon
	Triglops pingeli	ribbed sculpin
Benthic fishes	*Atheresthes stomias*	arrowtooth flounder
	Cottidae, unidentified species	sculpin
	Eleginus gracilis	saffron cod
	Glyptocephalus zachirus	rex sole
	Hippoglossoides elassodon	flathead sole
	Hippoglossus stenolepis	Pacific Halibut
	Limanda aspersa	yellowfin sole
	Lumpenella longirostris	longsnout prickleback
	Malacocottus kincaidi	blackfin sculpin
	Ophiodon elongatus	lingcod
	Pholis laeta	crescent gunnel
	Platichthys stellatus	starry flounder
	Raja sp.	skates
	Sebastodes alutus	Pacific ocean perch
	Theragra chalcogramma	walleye pollock
	Xiphister mucosus	rock prickleback

References: Feder and Paul, 1977; Roth and Whitmore, 1990; Smith and Stoker, 1969; Howe *et al.*, 1995; Nauman and Kernodle, 1976; Hogan and Colgate, 1980.

Mudflats

	Taxa	Species name	Common name
Invertebrates	Cnidaria		
	Anthozoa		hydroids, anemones
		Protohydra sp.	
	Platyhelminthes		flatworms
		unidentified species	
	Tardigrada		water bears
		Hypsibius appelloefi	
	Annelida		
	Polychaeta		polychaete worms
		Barantolla americana	
		Capitella capitata	
		Eteone longa	
		Euchone analis	
		Exogone lourei	
		Fabricia sabella	
		Glycera capitata	
		Glycinde picta	
		Haploscoloplos panamensis	
		Haploscoloplos sp.	
		Heteromastus sp.	
		Laonome kroyeri	
		Lumbrineris luti	
		Microphthalmus sczelkowii	
		Owenia fusiformis	
		Pholoe minuta	
		Polydora quadrilobata	
		Potamilla sp.	
		Prionospio steenstrupi	
		Pygospio elegans	
		Syllis sp.	
		Tharyx monilaris	
		Tharyx multifilis	
	Echiurida		echiurid worms
		Echiurus echiurus	spoon worm
	Mollusca		
	Gastropoda		snails, limpets, others
		Aglaja diomedea	sea slug
		Aglaja sp.	
		Cingula katherinae	
		Littorina sitkana	periwinkle

Mudflats

Taxa		Species name	Common name
	Bivalvia		clams, mussels, others
		Axinopsida serricata	clam
		Clinocardium nuttallii	Nutall's cockle
		Macoma balthica	small clam
		Macoma brota	frail macoma
		Mya arenaria	soft shelled clam
		Mya truncata	truncated soft shell clam
		Mytilus trossulus	mussel
		Orobitella rugifera	
		Serripes groenlandicus	Greenland cockle
Arthropoda			
	Ostracoda		ostracods
		unidentified species	
	Copepoda		copepods
		Danielssenia typica	
		Halectinosoma finmarchicum	
		Halectinosoma gothiceps	
		Harpacticus superflexus	
		Harpacticus uniremis	
		Nannopus palustris	
		Paradactylopodia latipes	
		Rhizothrix sp.	
		Stenhelia sp.	
		unidentified species	
	Cumacea		cumaceans
		cf. Cumella vulgaris	
		Eudorella sp.	
		Heterolaophonte sp.	
		Leptocuma sp.	
		Mesochra pygmaea	
		Microarthridion littorale	
		Paralaophonte perplexa	
		Tisbe inflata	
		unidentified species	
	Amphipoda		amphipods
		unidentified species	
	Arachnida		spiders and others
		mite, unidentified species	
		unidentified species	

References: Lees, *et al*., 1979; Feder, *et al*., 1976; Feder and Paul, 1980; Anthony, 1995; Blanchard and Feder, *In press.*

Rocky Shoreline

	Taxa	Species name	Common name
Protozoans	Protozoa		
	Foraminifera		forams
		Elphidium frigidum	
		unidentified species	
Algae	Chlorophyta		green algae
		Acrosiphonia arcta	
		Acrosiphonia coalita	
		Acrosiphonia sp.	
		Blidingia minima	
		Chaetomorpha cannabina	
		Cladophora albida	
		Cladophora gracilis	
		Cladophora sericea	
		Endocladia sp.	
		Endocladia muricata	
		Enteromorpha compressa	
		Enteromorpha crinita	
		Enteromorpha intestinalis	
		Enteromorpha linza	
		Enteromorpha sp.	
		Kornmannia zostericola	
		Monostroma arcticum	
		Monostroma fuscum	
		Monostroma/Ulva sp.	
		Monostroma grevillei	
		Rhizoclonium implexum	
		Rhizoclonium riparium	
		Rhizoclonium sp.	
		Spongomorpha saxatalis	
		Ulothrix flacca	
		Ulothrix sp.	
		Ulothrix complex	
		Ulva fenestrata	
		Ulva lactuca	
		Ulva sp.	
		Ulvaria obscura	
	Chrysophyta		diatoms
		Amphiprora sp.	
		Biddulphia aurita	
		Cocconeis sp.	
		Diploneis sp.	
		Gyrosigma sp.	
		Licmophora sp.	
		Melosira moniliformis	

Rocky Shoreline

Taxa	Species name	Common name
	Melosira nummuloides	
	Navicula sp.	
	Nitzschia sp.	
	Thalassionema nitzschioides	
Phaeophyta		brown algae
	Alaria sp.	
	Argarum cribrosum	
	Chordaria flagelliformis	
	Chordaria flagelliformis	
	Chordaria gracilis	
	Coilodesme cf. bulligera	
	Costaria costata	
	Desmarestia aculeata	
	Desmarestia viridis	
	Desmarestia sp.	
	Dictyosiphon foeniculaceus	
	Echiuris ec hiuris alaskensis	
	Ectocarpus parvus	
	Ectocarpus siliculosus	
	Elachista lubrica	
	Fucus distichus	rockweed
	Laminaria groenlandica	kelp
	Laminaria saccharina	kelp
	Laminaria yezoensis	kelp
	Leathesia difformis	
	Melanosiphon intestinalis	
	Petalonia fascia	
	Pylaiella littoralis	
	Pylaiella littoralis	
	Ralfsia sp.	
	Scytosiphon lomentaria	
	Soranthera ulvoidea	
	Sphacelaria subfusca	
	Spongonema tomentosum	
Rhodophyta		red algae
	Achrochaetium sp.	
	Acrochaetiaceae	
	Ahnfeltia gigartinoides	
	Ahnfeltia plicata	
	Antithamnionella pacifica	
	Bossiella sp.	
	Callophyllis sp.	
	Ceramium gardneri	
	Chondrus sp.	

Rocky Shoreline

Taxa	Species name	Common name
	Constantinea sp.	
	Constantinea subilifera	
	Corallina vancouveriensis	
	Cryptonema obovata	
	Cryptonemia borealis	
	Cryptonemia sp.	
	Cryptosiphonia woodii	
	Delesseriaceae, unidentified species	
	Dumontia incrassata	
	Dumontia simplex	
	Erythrotrichia carnea	
	Gigartina papillata	
	Gigartinaceae, unidentified species	
	Gigratina papillata complex	
	Gloiopeltis furcata	
	Halosaccion firmum	
	Halosaccion glandiforme	
	Halosaccion sp.	
	Halymenia sp.	
	Hildenbrandia prototypus	
	Iridaea sp.	
	Lithothamnaceae, unidentified species	
	Microcladia borealis	
	Microcladia sp.	
	Monostroma sp.	
	Nemalion eliminthoides	
	Neodilsea integra	
	Odonthalia floccosa	
	Odonthalia kamtschatica	
	Palmaria palmata	
	Phycodrys riggii	
	Polysiphonia brodiaei	
	Polysiphonia hendryi	
	Polysiphonia pacifica	
	Porphyra cf. thuretii	
	Porphyra sp.	
	Pterosphonia/Polysiphonia sp.	
	Pterosiphonia bipinnata	
	Ptilota filicina	
	Ptilota serrata	
	Ptilota tenuis	
	Rhodomela larix	
	Rhodomela lycopodioides	
	Rhodomelaceae, unidentified species	
	Scagelia occidentale	
	Schizymenia borealis	

Rocky Shoreline

	Taxa	Species name	Common name
		Tenarea dispar	
		Tokidadendron bullata	
		*Toladadendron*sp.	
Other Plants		unidentified grass	
		unidentified moss	
		Verrucaria maura	lichen
		Verrucaria mucosa	lichen
		unidentified black lichen	
		unidentified brown lichen	
		unidentified white lichen	
		unidentified green lichen	
		Zostera marina	eel grass
Invertebrates	Cnidaria		hydroids, anemones
		Anthopleura artemesia	
	Platyheliminthes		flat worms
	Turbellaria		
		unidentified species	
	Aschheminthes		
	Nematoda		round worms
		unidentified species	
	Annelida		
	Polychaeta		polychaete worms
		Capitella capitata	
		Cistenides brevicoma	
		Eteone longa	
		Exogone gemmifera	
		Glycinde picta	
		Haploscoloplos panamensis	
		Haploscoloplos sp.	
		Harmothoe imbricata	
		Heteromastus filiformis	
		Lumbrineris zonata	
		Nereis sp.	
		Nereis vexillosa	
		Owenia fusiformis	
		Pectinaria sp.	
		Pholoe minuta	
		Polydora quadrilobata	
		Sphaerosyllis erinaceus	
		Spirorbis sp.	bristle worm
		Syllidae, unidentified species	

Rocky Shoreline

Taxa		Species name	Common name
		Tharyx sp.	
		Typosyllis alternata	
		Typosyllis hyalina	
		Typosyllis sp.	
Mollusca			
	Polyplacophora		chitons
		Schizoplax brandtii	
		Tonicella lineata	lined chiton
	Gastropoda		snails, limpets, others
		Acanthodoris pilosa	sea slug
		Acmaea mitra	limpet
		Aglaja diomedea	sea slug
		Alvania compacta	
		Amphissa columbiana	snail
		Cingula katherinae	
		Cryptobranchia sp.	limpet
		Gastropteron pacificum	winged sea slug
		Hermissenda crassicornis	sea slug
		Lacuna carinata	snail
		Lacuna marmorata	snail
		Lacuna vincta	snail
		Littorina scutulata	periwinkle
		Littorina sitkana	periwinkle
		Lottia borealis	limpet
		Lottia pelta	limpet
		Margarites pupillus	limpet
		Naticidae, unidentified species	snail
		Natica clausa	moon snail
		Nucella lamellosa	dog whelk
		Rissoella translucens	snail
		Tectura fenestrata	limpet
		Tectura persona	limpet
		Tectura scutum	limpet
	Bivalvia		clams, mussels, other
		Crenella cf. grisea	
		Hiatella arctica	nestler clam
		Macoma balthica	balthic clam
		Modiolus modiolus	
		Mytilus trossulus	blue mussel
		Pododesmus macroschisma	rock jingle
		Protothaca staminea	
		Tellina salmonella	button clam

Rocky Shoreline

Taxa	Species name	Common name
Arthropoda		
Ostracoda		ostracods
	Leptocythere sp.	seed shrimp
Copepoda		copepods
	Halectinosoma finmarchicum	
	Halectinosoma sp.	
	Heterolaophonte cf. mendax	
	Harpacticus spp.	
	Mesocha pygmea	
	unidentified species	
Cirripedia		barnacles
	Balanus glandula	acorn barnacles
	Balanus crenatus	acorn barnacles
	Semibalanus balanoides	acorn barnacles
	Semibalanus cariosus	acorn barnacles
Cumacea		cumaceans
	Campylaspis cf. affinis	
	Leucon nasica	
Isopoda		isopods
	Gnorimosphaeroma oregonensis	
	unidentified species	
	Limnoria algarum	
	Pentidotea wosensenskii	
Amphipoda		amphipods
	Ampithoe sp.	
	unidentified species	
Decapoda		crabs, shrimp
	Pagurus hirsutiusculus hirsutiusculus	hermit crab
	Hemigrapsus oregonensis	rock crabs
	Heptacarpus brevirostris	shrimp
	Pandalus hypsinotus	
Arachnida		spiders and others
	Halobisium occidentale	
	Halacaridae, unidentified species	
	Copidognathus sp.	marine mite
Insecta		insects
	Clunio sp.	midges
	Diaulota sp.	
Echinodermata		
Asteroidea		sea stars
	Dermasterias imbricata	leather star
	Evasterias troschelii	
	Leptasterias sp.	
	Pycnopodia helianthoides	sunflower star
	Solaster sp.	

Rocky Shoreline

	Taxa		Species name	Common name
		Echinoidea		sea urchins
			Strongylocentrotus droebachiensis	
Vertebrates	Chordata			chordates
			Myoxocephalus sp.	
	Vertebrata			
		Pisces		fishes
			Anoplarchus purpurescens	
			Aspidophoroides bortoni	
			Pholis laeta	
			Xiphister mucosus	
			Cottidae, unidentified species	sculpins

References: Feder *et al.,* 1992; Feder, 1990; Feder and Keiser, 1980; Feder *et al.,* 1976; Calvin and Lindstrom, 1980; Anthony, 1995; Feder and Blanchard, *In press.*

Shallow Subtidal

	Taxa	Species name	Common name
Invertebrates	Cnidaria		anemones
	Anthozoa		
		unidentified species	
	Rhynchocoela		ribbon worms
	Anopla		
		Cerebratulus sp.	
		unidentified species	
	Aschelminthes		
	Priapulida		
		unidentified species	
	Phoronida		phoronid worms
		unidentified species	
	Annelida		
	Polychaeta		polychaete worms
		Ampharete finmarchia	
		Ampharete sp.	
		Ampharetidae, unidentified species	
		Amphicteis scaphobranchiata	
		Amphicteis sp.	
		Anaitides groenlandica	
		Anaitides sp.	
		Apistobranchidae, unidentified species	
		Apistobranchus ornatus	
		Arabellidae, unidentified species	
		Aricidea sp.	
		Barantolla americana	
		Capitella capitata	
		Capitellidae, unidentified species	
		Chaetopteridae, unidentified species	
		Cirratulidae, unidnetified species	
		Cistenides granulata	
		Cossura sp.	
		Dorvillea pseudorubrovittata	
		Dorvillea sp.	
		Eteone longa	
		Eteone sp.	
		Euchone sp.	
		Exogone sp.	
		Glycera capitata	
		Glycinde sp.	
		Goniadidae, unidentified species	
		Gyptis brevipalpa	

Shallow Subtidal

Taxa	Species name	Common name
	Haploscoloplos panamensis	
	Hesionidae, unidentified species	
	Lumbrineris luti	
	Lumbrineris sp.	
	Lysippe labiata	
	Magelona longicornis	
	Melinna cristata	
	Melinna elisabethae	
	Myriochele oculata	
	Nephtys paradoxa	
	Nephtys punctata	
	Nephtys sp.	
	Nereis procera	
	Nereis sp.	
	Ophelia limacina	
	Opheliidae, unidentified species	
	Ophelina acuminata	
	Orbiniidae, unidentified species	
	Owenia fusiformis	
	Peisidice aspera	
	Pholoe minuta	
	Phyllodocidae unidentified species	
	Pista cristata	
	Polydora quadrilobata	
	Polydora sp.	
	Praxillella gracilis	
	Prionospio cirrifera	
	Prionospio sp.	
	Prionospio steenstrupi	
	Pygospio elegans	
	Sabellidae, unidentified species	
	Scoloplos armiger	
	Sphaerosyllis erinaceus	
	Spio sp.	
	Spionidae, unidentified species	
	Sternaspis scutata	
	Syllidae, unidentified species	
	Syllis sp.	
	Tauberia gracilis	
	Terebellidae, unidentified species	
	Terebellides stroemi	
	Typosyllis alternata	
	Typosyllis sp.	
Mollusca		
Aplacophora		

Shallow Subtidal

Taxa		Species name	Common name
		Chaetoderma robusta	
	Gastropoda		snails, limpets, others
		Alia gausapata	
		Alvinia sp.	
		Cylichna alba	
		Cylichnella culcitella	
		Cylichnidae unidentified species	
		Gastropteron pacificum	
		Nassarius mendicus	snail
		Natica clausa	snail
		Odostomia sp.	snail
		Oenopota sp.	
		Retusa obtusa	
		Turbonilla sp.	
		Turridae, unidentified species	
	Scaphopoda		tooth shells
		Dentalium sp.	
	Bivalvia		clams, mussels, others
		Axinopsida serricata	small clam
		Axinopsida sp.	
		Cardiidae, unidentified species	
		Cardiomya planetica	
		Cardiomya sp.	
		Chlamys rubida	Hind's scallop
		Clinocardium blandum	
		Clinocardium californiense	
		Clinocardium nuttallii	clam
		Clinocardium sp.	
		Lyonsia bracteata	
		Macoma brota	frail macoma
		Macoma calcarea	clam
		Macoma obliqua	clam
		Macoma sp.	
		Mya arenaria	
		Mya sp.	
		Mysella tumida	
		Mytilidae, unidentified species	mussels
		Mytilus trossulus	mussel
		Nucula tenuis	
		Nuculana fossa	
		Pandora filosa	
		Pandora sp.	
		Pododesmus macroschisma	rock jingle
		Protothaca staminea	
		Saxidomus gigantea	clam
		Serripes groenlandicus	Greenland cockle

Shallow Subtidal

Taxa	Species name	Common name
	Thyasira gouldi	
	Thyasiridae, unidentified species	
	Veneridae, unidentified species	
	Yoldia sp.	
	Yoldia thraciaeformis	
Arthropoda		
Cirripedia		barnacles
	Balanomorpha unidentified species	
Cumacea		cumaceans
	Campylaspis sp.	
	Cumacea, unidentified species	
	Diastylis alaskensis	
	Diastylis glabra pacifica	
	Eudorella emarginata	
	Eudorella sp.	
	Eudorellopsis integra	
	Lamprops sp.	
Amphipoda		amphipods
	Caprellidae, unidentified species	
	Guernea sp.	
	Photis sp.	
	Pleustidae, unidentified species	
	Westwoodilla caecula	
Decapoda		shrimp and crabs
	Crangon communis	shrimp
	Hyas lyratus	lyre crab
	Pandalus hypsinotus	shrimp
	Pandalus platyceros	shrimip
	Pinnixa occidentalis	pea crab
	Pinnixa sp.	crab
	Telemessus cheiragonus	helmet crab
Echinodermata		
Echinoidea		sea urchins
	Strongylocentrotus droebachiensis	green sea srchin
Asteroidea		sea stars
	Dermasterias imbricata	leather sea star
	Evasterias troschelii	
	Orthasterias koehleri	red banded sea star
	Pycnopodia helianthoides	sunflower star
Ophiuroidea		brittle stars
	unidentified species	

Shallow Subtidal

	Taxa	Species name	Common name
Vertebrates	Vertebrata		
	Pisces		fishes
		Cottidae, unidentified species	sculpins

References: Lees *et al.,* 1979; Feder and Blanchard, 1995a, 1995b; Anthony, 1995; Blanchard and Feder, *In press.*

Deep Benthic

	Taxa	Species Name	Common Name
Invertebrates	Porifera		
		unidentified species	
	Cnidaria		hydroids, anemones
	Hydrozoa		
		Stegopoma plicatile	
		Venticillina verticillata	
		unidentified species	
	Anthozoa		
		Acanthoptilum ptile	
		Actinaria, unidentified species	
		Ceriantharia, unidentified species	
		Peachia sp.	
		Virgularia sp.	
		Virgulariidae, unidentified species	
	Rhynchocoela		ribbon worms
		Cerebratulus sp.	
		unidentified species	
	Aschelminthes		
	Nematoda		round worms
		unidentified species	
	Priapulida		
		Priapulus caudatus	
		unidentified species	
	Bryozoa		
		unidentified species	bryozoans
	Phoronida		phoronid worms
		unidentified species	
	Brachiopoda		
		Cancellothyrididae, unidentified species	
		Dallinidae	
		Laqueus californicus	
		Terebratulina sp.	
		Terebratulina unguicula	
	Annelida		
	Polychaeta		polychaete worms

Deep Benthic

Taxa	Species Name	Common Name
	Aglaophamus rubella anops	
	Amage cf. asiaticus	
	Amage cf. auicola	
	Amage perfecta	
	Amage sp.	
	Ammotrypane aulogaster	
	Ampharete acutifrons	
	Ampharete arctica	
	Ampharete sp.	
	Ampharetidae, unidentified species	
	Amphicteis glabra	
	Amphicteis gunneri	
	Amphicteis scaphobranchiata	
	Amphicteis sp.	
	Amphictene auricoma	
	Amphictene moorei	
	Amphitrite cirrata	
	Anaitides maculata	
	Anaitides mucosa	
	Anaitides sp.	
	Anaitids groenlandica	
	Anaspio boreus	
	Ancistrosyllis hamata	
	Anobothrus gracilis	
	Antinoella macrolepida	
	Antinoella sarsi	
	Antinoella sp.	
	Aphrodita sp.	
	Apistobranchus ornatus	
	Apistobranchus ornatus	
	Arabellidae, unidentified species	
	Arcteobea sp.	
	Arcteobea spinelytris	
	Aricidea jeffreysii	
	Aricidea lopezi	
	Aricidea neosuecica	
	Aricidea sp.	
	Aricidea suecica	
	cf. Armandia sp.	
	Artacama conifera	
	Artacamella hancocki	
	Asychis biceps	
	Asychis similis	
	Axiothella rubrocincta	
	Barantolla americana	
	Brada granulata	

Deep Benthic

Taxa	Species Name	Common Name
	Brada inhabilis	
	Brada sp.	
	Capitella capitata	
	Capitella capitata	
	Capitellidae, unidentified species	
	Chaetopterus variopedatus	
	Chaetozone setosa	
	Chitonopoma groenlandica	
	Chone gracilis	
	Chone sp.	
	Cirratulidae, unidentified species	
	Cistenides cf. soldatovi	
	Cistenides granulata	
	Cistenides sp.	
	Cossura longocirrata	
	Cossura sp.	
	Crucigera irregularis	
	Crucigera zygophora	
	Decamastus gracilis	
	Dorvillea pseudorubrovittata	
	Dorvillea randolfi	
	Dorvillea sp.	
	Drilonereis falcata minor	
	Enipo canadensis	
	Eteone barbata	
	Eteone longa	
	Eteone sp.	
	Euchone analis	
	Euchone hancocki	
	Euchone sp.	
	Eulalia levicornuta	
	Eulalia sp.	
	Eunice valens	
	Eunoe sp.	
	Euphrosine borealis	
	Eusyllis bloomstrandi	
	Eusyllis sp.	
	Exogone sp.	
	Exogone verugera	
	Fabricia sp.	
	Fabrisabella sp.	
	Flabelligera infundibularis	
	Flabelligera mastigophora	
	Flabelligeridae, unidentified species	
	Gattyana brunnea	
	Gattyana ciliata	

Deep Benthic

Taxa	Species Name	Common Name
	Gattyana cirrosa	
	Gattyana sp.	
	Gattyana treadwelli	
	Glycera capitata	
	Glycera nana	
	Glycera sp.	
	Glycinde picta	
	Glycinde sp.	
	Goniada annulata	
	Goniada maculata	
	Goniadidae, unidentified species	
	Gyptis brevipalpa	
	Haploscoloplos elongatus	
	Haploscoloplos panamensis	
	Harmothoe imbricata	
	Harmothoe sp.	
	Hesionidae, unidentified species	
	Hesperonoe complanata	
	Hesperonoe sp. *(Harmothoe)*	
	Heteromastus filiformis	
	Idanthrysus armatus	
	Idanthrysus sp.	
	Jasmineira pacifica	
	Lagisca rarispina	
	Lanassa nordenskioldi	
	Lanassa sp.	
	Lanassa venusta	
	Langerhansia cornuta	
	Laonice cirrata	
	Laonice pugettensis	
	Laonome kroyeri	
	Leiochone columbiana	
	Leitoscoloplos pugettensis	
	Lepidonotus caelorus	
	Lepidonotus squamatus	
	Lumbrinereis sp.	
	Lumbrineris similabris	
	Lumbrineris sp.	
	Lumbrineris zonata	
	Lysilla loveni	
	Lysippe labiata	
	Magelona japonica	
	Magelona longicornis	
	Maldane glebifex	
	Maldane sarsi	
	Maldane sp.	
	Maldanidae, unidentified species	

Deep Benthic

Taxa	Species Name	Common Name
	Mediomastus sp.	
	Melinna cristata	
	Melinna elisabethae	
	Melinna sp.	
	Myriochele heeri	
	Myriochele oculata	
	Myxicola infundibulum	
	Myxicola sp.	
	Nainereris sp.	
	Nephthys ciliata	
	Nephtys caeca	
	Nephtys cornuta	
	Nephtys cornuta cornuta	
	Nephtys cornuta franciscana	
	Nephtys punctata	
	Nephtys rickettsi	
	Nephtys sp.	
	Nereis paucidentata	
	Nereis procera	
	Nereis sp.	
	Nereis zonata	
	Ninoe gemmea	
	Notomastus tenuis	
	Notoproctus pacificus	
	Odontosyllis phosphorea	
	Odontosyllis sp.	
	Onuphis conchylega	
	Onuphis geophiliformis	
	Onuphis iridescens	
	Onuphis parva	
	Onuphis sp.	
	Ophelia limacina	
	Ophelina acuminata	
	Ophelina breviata	
	Ophelina sp.	
	Orbinidae, unidentified species	
	Owenia fusiformis	
	Paraonis gracilis	
	Paraphoxus sp.	
	Pectinaria auricola	
	Pectinaria brevicoma	
	Pectinaria sp.	
	Peisidice aspera	
	Pherusa papillata	
	Pherusa sp.	
	Pholoe minuta	
	Phyllodoce groenlandica	

Deep Benthic

Taxa	Species Name	Common Name
	Phyllodoce maculata	
	Phyllodoce sp.	
	Pionosyllis magnifica	
	Pista cristata	
	Pista fasciata	
	Pista sp.	
	Platynereis agassizi	
	Podarke pugettensis	
	Polycirrus medusa	
	Polycirrus sp.	
	Polydora socialis	
	Polydora sp.	
	Polynoe canadensis	
	Polynoe gracilis	
	Praxillella affinis	
	Praxillella gracilis	
	Praxillella praetermissa	
	Prionospio cirrifera	
	Prionospio malmgreni	
	Prionospio sp.	
	Prionospio steenstrupi	
	Protodorvillea sp.	
	Pseudopotamilla reniformis	
	Rhodine bitorquata	
	Scalibregma inflatum	
	Scoloplos armiger	
	Serpula vermicularis	
	Shaerodoropsis minuta	
	Sphaerodoropsis sphaerulifera	
	Sphaerodorum papillifer	
	Sphaerosyllis erinaceus	
	Sphaerosyllis sp.	
	Spio filicornis	
	Spiochaetopterus costarum	
	Spionidae, unidentified species	
	Spiophanes cf. berkeleyorum	
	Spiophanes kroyeri	
	Spirorbis sp.	
	Sternaspis scutata	
	Stylarioides papillata	
	Syllis alternata	
	Syllis armillaris	
	Syllis sclerolaema	
	Tauberia gracilis	
	Terebellidae, unidentified species	
	Terebellides stroemi	
	Tharyx monilaris	

Deep Benthic

Taxa		Species Name	Common Name
		Tharyx multifilis	
		Tharyx parvus	
		Tharyx sp.	
		Travisia sp.	
		Trichobranchus glacialis	
		Typosyllis alternata	
		Typosyllis armillaris	
		Typosyllis harti	
		Typosyllis sp.	
	Hirudinea		leeches
		unidentified species	
Sipuncula			spinuculan worms
		Sipunculus sp.	
		Golfingia margaritacea	
		Golfingia sp.	
		Golfingia vulgaris	
		Phascolion sp.	
		Phascolion strombi	
Echiurida			echiurid worms
		Echiurus echiurus alskensis	spoon worm
Mollusca			
	Aplacophora		
		Chaetoderma robusta	
	Gastropoda		snails, limpets, other
		Acmaea sp.	
		Admete couthouyi	
		Aeolidiidae, unidentified species	
		Alia gausapata	
		Alvinia sp.	
		Amphissa reticulata	
		Boreotrophon sp.	
		Cidarina cidaris	
		Corambe sp.	
		Cylichna alba	
		Cylichna attonsa	
		Cylichna sp.	
		Cylichnella harpa	
		Cylichnella sp.	
		Cylichnidae, unidentified species	
		Dendronotus subramosus	
		Diaphana minuta	
		Fuistriton oregonensis	
		Gastropteron pacificum	

Deep Benthic

Taxa	Species Name	Common Name
	cf. Hanimoea sp.	
	Lacuna carininata	
	Lepeta caeca	
	Lora sp.	
	Margarites sp.	
	Micranellum crebricinctum	
	Micranellum sp.	
	Mitrella gouldi	
	Nassarius mendicus	
	Natica clausa	
	Odostomia cassandra	
	Odostomia sp.	
	Oenopota sp.	
	Oenopota turricula	
	Ophisthobranchia, unidentified species	
	Polinices pallida	
	Puncturella cooperi	
	Puncturella galeata	
	Puncturella noachina	
	Puncturella sp.	
	Retusa sp.	
	Solariella obscura	
	Trichotropis borealis	
	Trichotropis cancellata	
	Trichotropis sp.	
	Trophonopsis lasius (subcirrata)	
	Trphonopsis sp.	
	Turbonilla sp.	
Scaphopoda		
	Cadulus aberrans	
	Dentalium pretiosum	
	Cadulus sp.	
	Cadulus stearnsi	
	Dentalium dalli	
	Dentalium sp.	
Bivalvia		clams, mussels, cockles, scallops
	Adontorhina cyclia	
	Adontorhina ferruginea	
	Astarte (polaris) compacta	
	Astarte alaskensis	
	Astarte esquimalti	
	Astarte sp.	
	Asthenothaerus adamsi	
	Axinopsida serricata	
	Axinopsida sp.	

Deep Benthic

Taxa	Species Name	Common Name
	Axinopsida viridis	
	Axinula ferruginosa	
	Bankia setacea	
	Cardiidae, unidentified species	
	Cardiomya pectinata	
	Cardiomya planetica	
	Cardiomya sp.	
	Chlamys rubida	
	Clinocardium californiense	
	Clinocardium ciliatum	
	Clinocardium sp.	
	Compsomyax subdiaphona	
	Crenella decussata	
	Cyclocardia sp.	
	Cyclocardia ventricosa	
	Cyclopecten sp.	
	Dacrydium pacificum	
	Delectopecten randolfi	
	Delectopecten sp.	
	Hiatella arctica	
	Limatula subauriculata	
	Lucina tenuisculpta	
	Lyonsia bracteata	
	Lyonsia norvegi	
	Macoma balthica	
	Macoma brota	
	Macoma calcarea	
	Macoma carlottensis	
	Macoma inconspicua	
	Macoma moesta	
	Macoma obliqua	
	Macoma sp.	
	Malletia cuneata	
	Modiolus modiolus	
	Musculus corrugatus	
	Musculus sp.	
	Mya priapus	
	Mya sp.	
	Mysella tumida	
	Mytilus edulis	
	Nucula tenuis	
	Nuculana fossa	
	Nuculana minuta	
	Nuculana pernula	
	Nuculana sp.	
	Odontogena borealis	
	Pandora filosa	

Deep Benthic

Taxa		Species Name	Common Name
		Pandora forresterensis	
		Pandora sp.	
		Pecten randolphii	
		Pecten sp.	
		Pododesmus macrochisma	
		Psephidia lordi	
		Pseudopithina compressa	
		Serripes groenlandicus	
		Thracia sp.	
		Thracia trapezoides	
		Thyasira flexuosa	
		Thyasira gouldi	
		Thyasiridae, unidentified species	
		Veneridae, unidentified species	
		Yoldia arctica	
		Yoldia beringiana	
		Yoldia hyperborea	
		Yoldia matyria	
		Yoldia myalis	
		Yoldia sp.	
		Yoldia thraciaeformis	
	Cephalopoda		octopus and squid
		Octopus, unidentified species	
Arthropoda			
	Ostracoda		ostracods
		unidentified species	
	Copepoda		copepods
		unidentified species	
	Cirripedia		barnacles
		Balanomorpha, unidentified species	
		Balanus crenatus	
		Balanus evermanni	
		Scalpellum sp.	
	Leptostraca		
		unidentified species	
	Cumacea		cumaceans
		Brachydiastylis resima	
		Cumella sp.	
		Diastylis glabra pacifica	
		Diastylis paraspinulosa	
		Diastylis sp.	
		Diastylopsis dawsoni	
		Eudorella emarginata	
		Eudorella sp.	
		Eudorellopsis integra	

Deep Benthic

Taxa		Species Name	Common Name
		Eudorellopsis sp.	
		Leucon nasica	
		Leucon sp.	
		unidentified species	
	Tanaidacea		
		unidentified species	
	Isopoda		isopods
		Gnathia elongata	
		Gnathia sp.	
	Amphipoda		amphipods
		Aceroides latipes	
		Ampelisca agassizi	
		Ampelisca birulai	
		Ampelisca furcigera	
		Ampelisca macrocephala	
		Ampelisca pugettica	
		Ampelisca sp.	
		Ampeliscida eschrichti	
		Ampeliscidae	
		unidentified species	
		Anisogammarus pugettensis	
		Anisogammarus sp.	
		Anonyx sp.	
		Arrhis luthkei	
		Bathymedon sp.	
		Byblis sp.	
		Caprellidae, unidentified species	
		Crybelocephalus sp.	
		Cyphocaris challengeri	
		Ericthonius hunteri	
		Gammaridae, unidentifies species	
		Guernea sp.	
		Haploops sp.	
		Haploops tubicola	
		Harpiniopsis sanpedroensis	
		Harpiniopsis sp.	
		Hippomedon sp.	
		Isaeidae, unidentified species	
		Lysianassidae, unidentified species	
		Maera loveni	
		Maera sp.	
		Melita sp.	
		Metopa sp.	
		Monoculodes diamesus	
		Monoculodes sp.	
		Neohela sp.	

Deep Benthic

Taxa		Species Name	Common Name
		Nicippe tumida	
		Oedicerotidae, unidentified species	
		Opisa sp.	
		Orchomene obtusa	
		Orchomene sp.	
		Pardaliscidae, unidentified species	
		Pleustidae, unidentified species	
		Protomedia sp.	
		Stenothoidae, unidentified species	
		Synopia sp.	
		Syrrhoe crenulata	
		Syrrhoe longifroms	
		Tiron sp.	
		Urothoe denticulata	
		unidentified species	
	Decapoda		crabs, shrimp
		Argis deutata	shrimp
		Cancer magister	Dungeness crab
		Chionoecetes bairdi	Tanner crab
		Crago intermedia	
		Crago resima	
		Crangon communis	
		Hippolytidae, unidentified species	
		Hyas lyratus	lyre crab
		Labidochirus splendescens	
		Lithodes aequispina	
		Pagurus aleuticus	hermit crab
		Pagurus cf. tenuimanus	crab
		Pagurus splendescens	crab
		Pandalopsis dispar	sidestripe shrimp
		Pandalus borealis	pink shrimp
		Pandalus hypsinotus	coonstripe shrimp
		Pandalus montagui tridens	shrimp
		Pandalus platyceros	spot shrimp
		Pinnixa schmitti	
		Pinnixa sp.	
		Xanthidae, unidentified species	
Echinodermata			
	Holothuroidea		sea cucumbers
		Cucumaria calcigera	
		Cucumaria sp.	
		Molpadia intermedia	
		Pentamera sp.	
		Thyone sp.	
		unidentified species	

Deep Benthic

	Taxa		Species Name	Common Name
		Echinoidea		sea urchins, sand dollars
			Brisaster townsendi	
			Stongylocentrotus drobachiensis	
			Strongylocentrotus sp.	
		Asteroidea		sea stars
			Ctenodiscus crispatus	mud star
			Leptychaster anomalus	
			Porcellanasteridae, unidentified species	
		Ophiuroidea		brittle stars
			Amphiodia craterodmeta	
			Diamphiodia craterodmeta	
			Ophiura quadrispina	
			Ophiura sarsi	
			Ophiura sp.	
			unidentified species	
	Hemichordata			acorn worms
		Enteropneusta		
			unidentified species	
	Urochordata			
		Ascidiacea		
			Ascidia prunum	
Vertebrates	Vertebrata			
		Pisces		fishes
			Raja sp.	
			Dasycottus setiger	spinyhead sculpin
			Glyptocephalus zachirus	rex sole
			Hemitripterus bolini	sculpin
			Hippoglossoides elassodon	flathead sole
			Lumpenella longirostris	longsnout blenny
			Lumpenus sagitta	pacific snakeblenny
			Lycodes brevipes	
			Sebastes ruberrimus	
			Sebastodes alutus	Pacific ocean perch
			Theragra chalcogramma	pollock

References: Smith and Stoker, 1969; Feder and Matheke, 1980; Feder and Blanchard, 1995; Feder *et al.,* 1973; Feder and Shaw, 1992; Feder and Shaw, 1993; Feder and Shaw, 1995; Feder and Shaw, 1996.

Open Water

Taxa	Species name	Common name
Phytoplankton	*Achnanthes* sp.	
	Actinoptychus undulatus	
	Amphiprora sp.	
	Asterionella japonica	
	Bacteriastrum delicatulum	
	Bacterosira fragilis	
	Biddulphia aurita	
	Biddulphia cf. striata	
	Cerataulina bergonii	
	cf. Chaetoceros affinis	
	Chaetoceros atlanticus	
	Chaetoceros brevis	
	Chaetoceros compressus	
	Chaetoceros concavicornus	
	Chaetoceros convolutus	
	Chaetoceros debilis	
	Chaetoceros decipiens	
	Chaetoceros didymus	
	Chaetoceros mitra	
	Chaetoceros pelagicus	
	Chaetoceros radicans	
	Chaetoceros socialis	
	Chaetoceros subsecundus	
	Chaetoceros teres	
	Chaetoceros sp.	
	Coscinodiscus centralis	
	cf. Coscinodiscus curvatulus	
	cf. Coscinodiscus excentricus	
	Coscinodiscus granii	
	Coscinodiscus oculis iridis	
	Coscinodiscus radiatus	
	Coscinodiscus sp.	
	Coscinosira (Thalassiosira) polychorda	
	Ditylum brightwellii	
	Eucampia zoodiacus	
	Fragilariopsis sp.	
	Grammatophora marina	
	Gyrosigma/Pleurosigma sp.	
	Leptocylindrus danicus	
	Licmophora sp.	
	Melosira moniliformis	
	Melosira sulcata	
	Navicula sp.	
	Nitzschia bilobata	
	Nitzschia closterium	
	Nitzschia paradoxa	
	Nitzschia pungens	

Open Water

	Taxa	Species name	Common name
		Nitzschia seriata	
		Nitzschia sp.	
		cf. Planktoniella sol	
		Pleurosigma sp.	
		Rhizosolenia alata	
		Rhizosolenia hebatata	
		Rhizosolenia robusta	
		Rhizosolenia stolterfothii	
		Rhizosolenia styliformis	
		Skeletonema costatum	
		Stephanopyxis nipponica	
		Stephanopyxis turris	
		Striatella unipunctata	
		Surirella sp.	
		cf. Tabellaria sp.	
		Thalassionema nitzschioides	
		Thalassiosira decipiens	
		Thalassiosira gravida	
		Thalassiosira nordenskioldii	
		cf. Thalassiosira rotula	
		Thalassiosira *sp.*	
		Thalassiothrix sp.	
		Ceratium fusus	
		Ceratium lineatum	
		Ceratium longipes	
		Ceratium tripos	
		Dinophysis sp.	
		Peridinium conicum	
		Peridinium depressum	
		Peridinium pallidum	
		Peridinium sp.	
Zooplankton	Cnidaria		hydroids, anemones, jellyfishes
		Aglantha digitale	
		medusae, unidentified species	
	Ctenophora		comb jellies
		Mertensia sp.	
	Chaetognatha		arrow worms
		Sagitta elegans	
		Eukrohnia hamata	
	Annelida		
	Polychaeta		polychaete worms
		Tompteris sp.	
		Polychaeta, unidentified species	

Open Water

Taxa	Species name	Common name
Mollusca		
Gastropoda		snails, limpets, others
	Clione limacina	
	Limacina helicina	
Arthropoda		
Amphipoda		amphipods
	Cyphocaris challengeri	
	Gammaridae, unidentified species	
	Hyperiidae, unidentified species	
Copepoda		copepods
	Acartia tumida	
	Acartia longiremis	
	Acartia sp.	
	Calanus columbia	
	Calanus marshallae	
	Calanus plumchrus	
	Calanus sp.	
	Candacia columbiiae	
	Centropages abdominalis	
	Chiridiella sp.	
	Chiridius sp.	
	Conchoecia sp.	
	Eucalanus bungii	
	Euchaeta elongata	
	Gaetanus sp.	
	Metridia sp.	
	Metridia longa	
	Metridia lucens	
	Metridia okhotensis	
	Metridia pacifica	
	Neocalanus plumchrus	
	Pseudocalanus sp.	
	Pseudocalanus elongatus	
	Tortanus discaudatus	
Decapoda		crabs and shrimp
	unidentified species	crab zoea
	unidentified species	shrimp larvae
Euphausiacea		krill shrimp
	Thysanoessa raschii	
Ostracoda		ostracods
	Conchoecia sp.	
Echinodermata		
	Bipinnaria larvae, unidentified species	sea star larvae

Open Water

Taxa	Species name	Common name
Chordata		chordates
	Oikopleura sp.	tunicate

References: Cooney *et al.,* 1973; Hood *et al.,* 1973; Cooney and Coyle, 1988; Jewett and Stark, 1994.

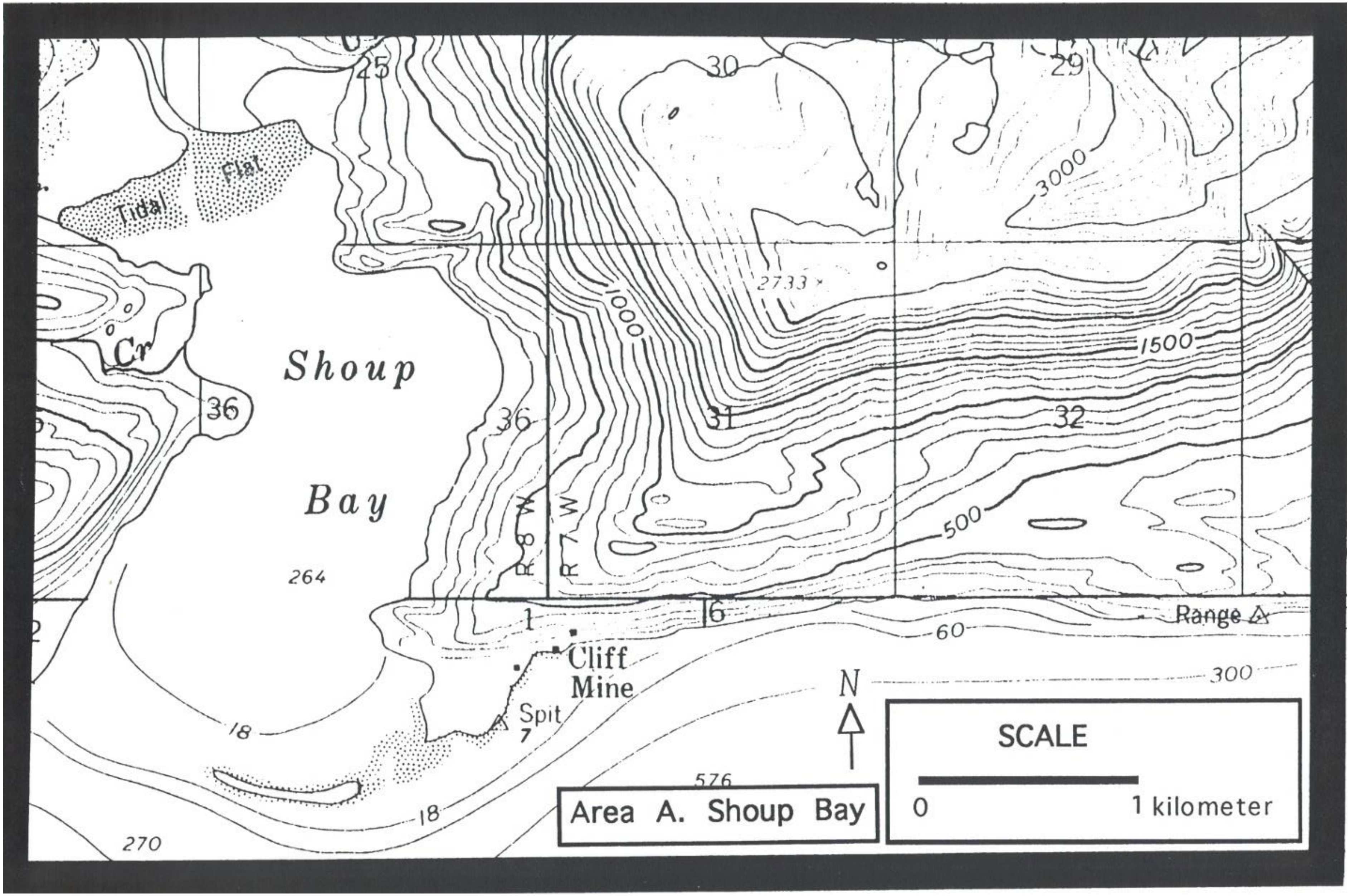
Appendix C: Sub-Area Characterizations

This section describes risk-related characteristics for each sub-area through a set of two charts. **1) Stressor Characterizations** and **2) Receptor Characterizations**. The first chart describes characteristics of the stressors that might be found in each sub-area: *source, fate and distribution, frequency,* and *additional information*. The second chart describes characteristics of some receptors that might be found in each sub-area: *distribution, seasonal presence or events, activity,* and *density.* Receptors are grouped according to the habitats in which they live, feed, or reproduce. These stressor and receptor characteristics contribute to the degree of exposure, and the severity of effects in each sub-area. References are cited in the charts by superscript numbers and listed at the end of this Appendix in numerical order. There is a separate reference list for Stressor Charts and for Receptor Charts.

The charts briefly summarize information available for the Port. Not all possible stressors and receptors could be directly addressed in this way. For instance little information was available for populations of benthic and intertidal fishes: these organisms may be under-represented. A more complete listing of the native species can be found in Appendix B. The charts also provide some examples of available data that are not meant as thorough characterizations, but as indicators of conditions in Port Valdez. For example, salmon counts were provided for only some streams and were made by Alaska's Department of Fish and Game. They were not intendeded to represent the salmon population size in the stream, but do provide some indication of yearly variation in the number of returning adults, and the differences between streams. The receptor charts include at least two years of pink salmon counts to show this variation (*i.e*., high numbers return in even years, whereas low numbers return in odd).

Each sub-area characterization is preceded by a topographical map of the sub-area and its approximate boundaries. The subtidal boundary of the shoreline sub-areas A, B, C, D, E, F, G, H, and I extends to a depth of approximately 40-50m (approximately 130-160 ft). The contour lines representing water depth are given in feet.

These charts are working tables developed during the information gathering stage of this project. They represent general information about the Port region, and specific information about each sub-area. The charts are meant to be a preliminary foundation for understanding stressor and receptor characteristics in the Port and differences between sub-areas. The information gathered here is the basis for the conceptual model (Section 5 of the document) and the numerical ranks chosen in the relative risk analysis (Section 6 of the document).



Area A. Shoup Bay

Sub-Area A: Shoup Bay

Stressor Characterization

Stressor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
		ANTHROPOGENIC STRESSORS		
hydrocarbons	normal boat operation and spills	water; deposition to sediment and shoreline	sporadic; increase in summer	_____
metals	contaminated runoff from lode mines	deposition to sediments; near stream mouths	increase in summer with snowmelt and runoff	inactive and active mines (gold; copper, lead, and zinc sulfides)[1]
disturbance	subsistence hunting for sea otters	areas of sea otter density	sporadic	kills in 1994: 23 adult males, 1 adult female, 5 subadult males[3]
	recreational and commercial boat traffic	off-shore waters	sporadic; increase in summer	activity is 1/3 that of other areas in the port[2]
straying salmon	hatchery pink salmon	wild salmon spawning habitat and gene pool; shoreline water and sediments	spawning season	number of straying hatchery salmon unknown
		NATURAL STRESSORS		
predation	increasing sea otter population	intertidal and subtidal invertebrates	all year	no sea otter population prior to 1973[2]
sediment	glacial runoff from Shoup Glacier Stream	water column and deposition to sediments	increase in summer with snowmelt and runoff	sediment deposition of: $5x10^5$kg/day in June $2x10^6$kg/day in Aug. $7x10^6$kg/day in Sept. $8x10^3$kg/day in Oct.[4]

Sub-Area A: Shoup Bay

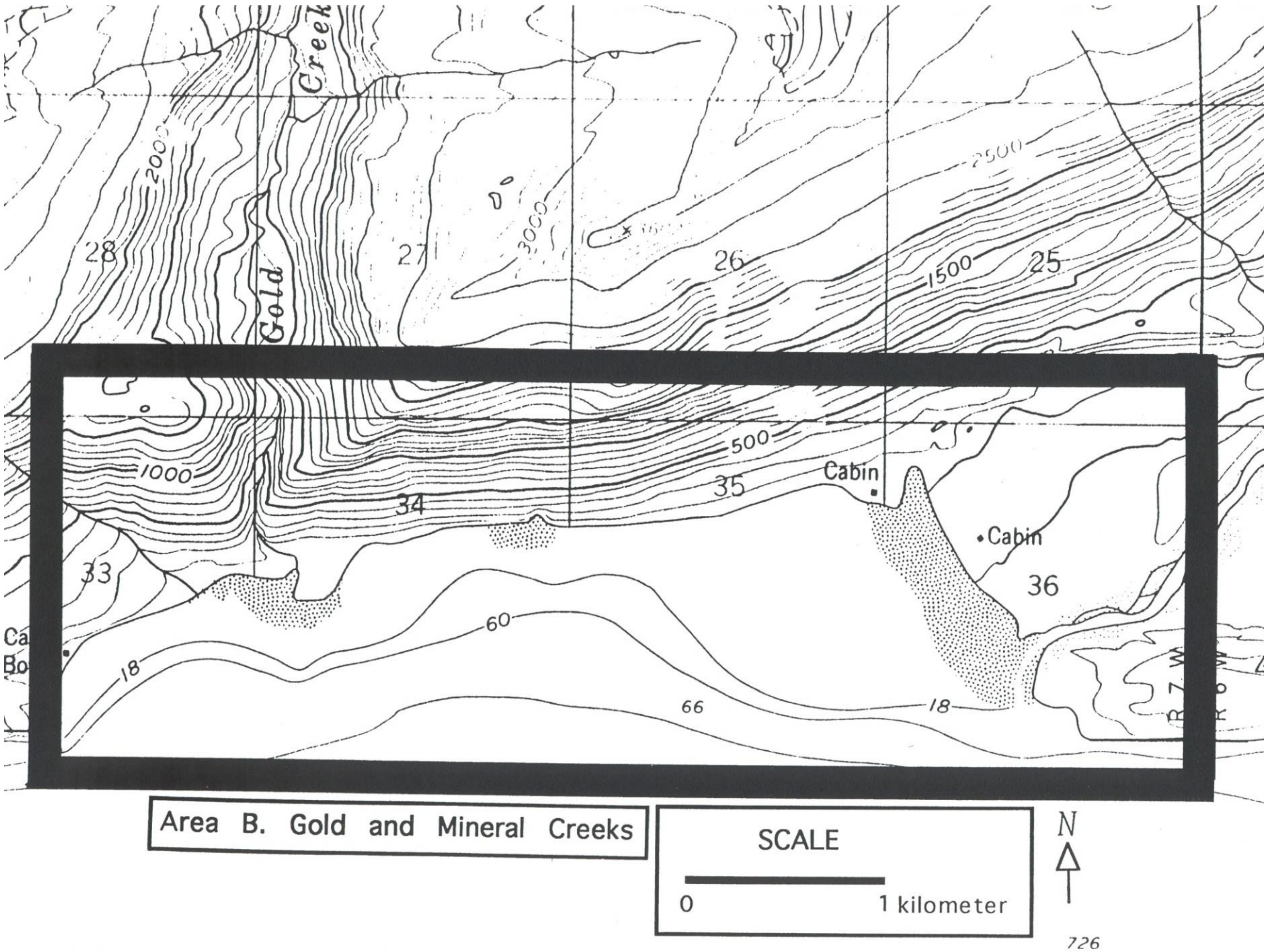
Receptor Characterization

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
ROCKY SHORELINE HABITAT				
sea otters	intertidal and subtidal up to 40 m depth	all year	feed on mussels, rock jingles, echiuran worms and clams	monthly average of 35[1]
kittiwakes	near glacier and on island in lagoon[3,7]	eggs laid May to June, hatching peaks at the end of June; chicks leave the nest in late July; migrate south in fall	feed on fishes; nesting on cliffs near glacier	120 nests; 84% hatching success; 68.2% breeding success[8]
rocky intertidal invertebrates	rocky shores along east and west sides of the bay	present all year; exposed to low salinities and high sediment deposition in summer	feeding, growth and reproduction	_____
macroalgae	rocky shores along east and west sides of the bay	present all year; some seasonals present in summer	growth and reproduction	_____
STREAM MOUTH HABITAT				
harbor seals	water; near spawning streams	all year	feed on spawning salmon and other fishes	small in comparison to areas outside port[2]; approx. 100 sighted port-wide during a day survey[3]
pink salmon	2 spawning streams (ADF&G #11520, 11530), spawn upstream or in intertidal areas[4]	adults return late June to mid-Oct.; fry hatch early to mid-winter and migrate out in late winter or spring[5]	spawn in intertidal or upstream; adults die within 2 weeks of spawning; fry feed for several weeks during outmigration; fry return in 2 yrs	small populations; females are known to produce about 1500-2000 eggs

Sub-Area A: Shoup Bay

Receptor Characterization (continued)

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
SPITS AND LOW-PROFILE BEACH HABITAT				
Canadian geese	near glacier and along spit at entrance to bay[3]	migratory geese in spring and fall; resident population present year round	possible nesting in Shoup Bay[6]	increases in spring and fall during migrations
terns	near glacier and along spit at entrance to bay[3,7]	eggs laid in May to June	nesting	119 nests; 43.4 to 53.8% hatching success[8]
gulls	along spit at entrance to bay	eggs laid in mid-May to mid-June; hatching mid-June to July	nesting; feed on spawning salmon; predators on kittiwake chicks	59 nests; 77.9% hatching success; 69.5% breeding success[8]
MUDFLAT HABITAT				
sediment infauna	small mudflat area at mouth of Shoup Glacier Stream	present all year	feeding, growth and reproduction	small mudflat compared to eastern Port
SHALLOW SUBTIDAL HABITAT				
subtidal plants and invertebrates	shallows near entrance to bay - may be rocky or soft bottomed	present all year	feeding, growth and reproduction	———
DEEP BENTHIC HABITAT				
sediment infauna	deep portions of the bay (up to 80m depth)	present all year	feeding, growth and reproduction	shallow compared to most of the port
bottom fishes	deep portions of the bay; some fishes and juveniles may move up into shallow areas	present all year	feeding, growth and reproduction	low density of bottom fishes in the Port compared to outer PWS



Area B. Gold and Mineral Creeks

Sub-Area B: Mineral and Gold Creeks

Stressor Characterization

Stressor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
ANTHROPOGENIC STRESSORS				
hydrocarbons	normal boat operation and spills	water; deposition to sediment and shoreline	sporadic; increase in summer	hydraulic oil, 1 small spill reported[5]
	air pollution	surface water and shoreline sediments	sporadic to all year; may depend on wind direction although this bay may be protected by surround terrain	increase during inversions
metals	contaminated runoff from mining on Mineral Creek	deposition to sediments	spring runoff	inactive and active placer mines (gold, lead sulfide)[1]
disturbance	recreational and commercial boats; noise and activity	off-shore waters	sporadic; increase in summer	boats traveling to or from the city may affect this area
straying salmon	hatchery pink salmon	wild salmon spawning habitat and gene pool; shoreline water and sediments	spawning season	number of straying hatchery salmon unknown
development	possible future residential or commercial development	habitat, water and sediments	spring and summer	no recent development; a subdivision and small housing area exist[7]
NATURAL STRESSORS				
sediment	glacial runoff from Mineral Creek	physical structure of bottom and intertidal sediment; spawning habitat	spring	sediment deposition of: $2x10^5$ kg/day in June $5x10^6$ kg/day in July $3x10^6$ kg/day in Aug. $9x10^6$ kg/day in Sept. $1x10^2$ kg/day in Oct.[4]
organic wastes	decomposition of adult salmon carcasses	sediments in spawning areas; increased organic carbon in sediments as food for deposit feeding organisms	spring after spawning runs	spawning salmon counted: 12,790 in 1994 7,720 in 1993[6]

Sub-Area B: Mineral and Gold Creeks

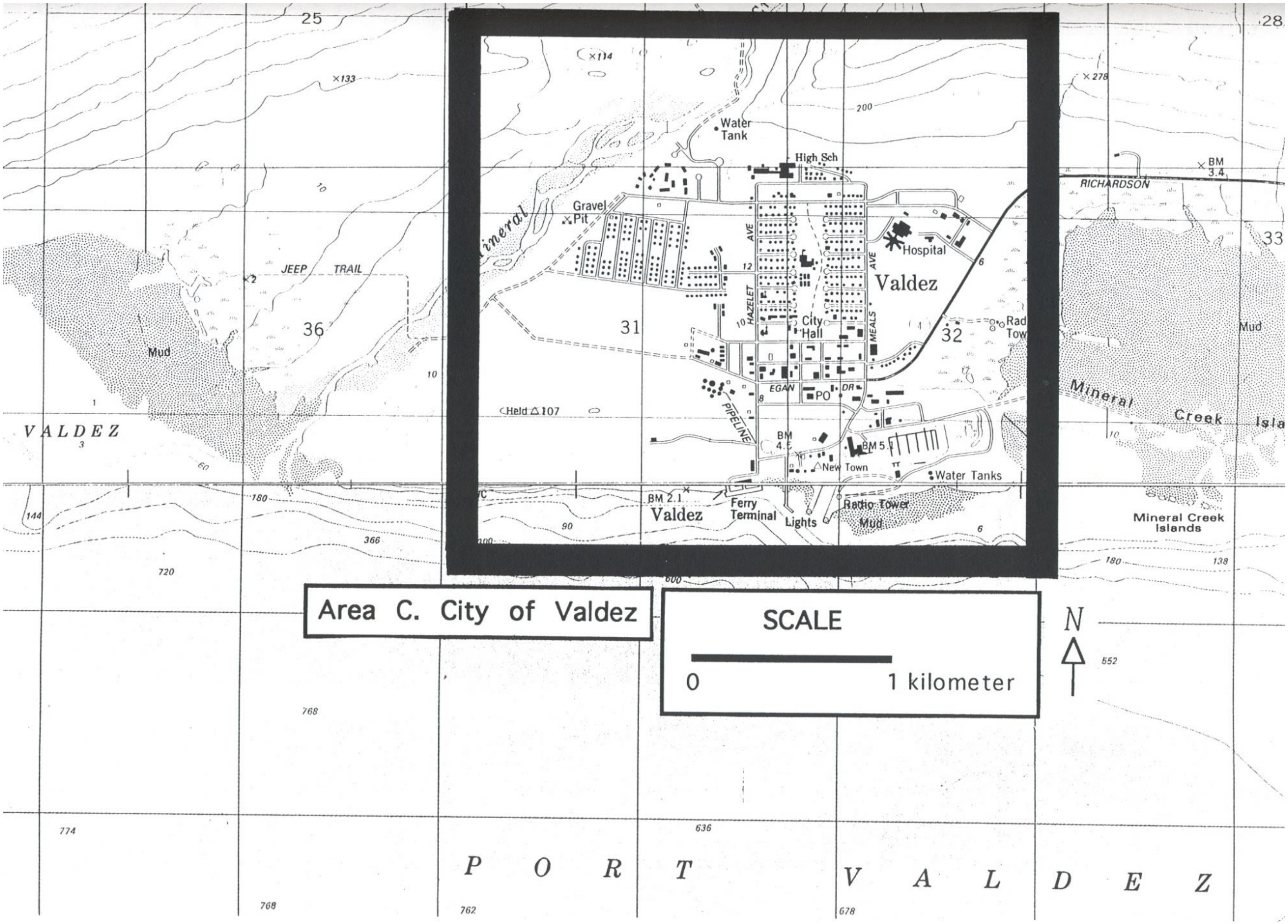
Receptor Characterization

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
MUDFLAT HABITAT and SHALLOW SUBTIDAL HABITAT				
terns	small ponds near mouth of Mineral Creek[7]	summer	feeding	average population of 28 at Mineral Creek May to Aug.[8]
waterfowl[8]	small ponds near mouth of Mineral Creek	greater numbers in winter	feeding	average population of 37 at Mineral Creek from May to Aug.
shorebirds[8]	along the shore and at small ponds on tidal flat	spring and fall migrations	feeding	average population of 22 from May to August
mussels	extensive mussel bed on Mineral Creek Flats	present all year; spawn in spring[10]	feeding, growth and reproduction	oldest (up to 13 years) and largest mussels in port
sediment infauna[10, 13, 25]	large mudflat at the base of the Mineral Creek delta; subtidal shelf in the embayment	present all year	feeding, growth and reproduction	along approx. 1.5 km of coast
harpacticoid copepods	intertidal and subtidal sediments; up to 3 cm deep in sediment[25]	all year; many carry eggs in winter and release young in summer[10]	feed on microalgae on mud surface; growth and reproduction	———
algae	macroalgae floating and attached; benthic diatoms growing on sediment surface and other substrates	macroalgae seasonal or all year; benthic diatoms bloom in summer	growth and reproduction	benthic diatoms provide food for harpacticoid copepods[9]

Sub-Area B: Mineral and Gold Creeks

Receptor Characterization (continued)

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
STREAM MOUTH HABITAT				
harbor seals	near spawning streams	present all year; may increase during spawning season	feed on adult salmon	small in comparison to areas outside port[2]; approx. 100 sighted port wide during a day survey[3]
pink salmon	5 spawning streams (ADF&G #11500, 11480, 11482, 11475, 11470)[4]	adults return late June to mid-Oct.; fry hatch early to mid-winter and migrate out in late winter or spring[5]	adults die within 2 weeks of spawning; fry feed for several weeks during outmigration; fry return in 2 yrs	adults counted in stream 11480: 1992 - 120 1993 - 1,450 1994 - 11,050[4]
chum salmon	5 spawning streams (ADF&G #11475, 11480, 11470, 11490, 11482)[4]	adults return July to Oct.; fry migrate out in summer	spawn in intertidal areas or upstream; fry migrate out of the Port and return after 3-6 yrs	adults counted in stream 11480: 1992 - 3,363 1993 - 6,620 1994 - 1,740[4]
silver salmon	1 spawning stream (ADF&G #11470)[4]	adults return Aug. to Nov.; juveniles migrate out in summer	spawn upstream in clear water tributaries and lakes; fry rear in freshwater and migrate out of the Port as juveniles	_____
Bald Eagle[8]	Mineral Creek and Gold Creek	first chick hatched found in June	nesting and breeding	nest density of 0.2 nests/km of shoreline Port-wide[8]
ROCKY SHORELINE, LOW-PROFILE BEACH HABITAT and SHALLOW SUBTIDAL HABITAT				
gulls	base of Mineral and Gold Creeks on beach[7]	summer; egg laying mid-May to mid-June; hatching mid-June to July	nesting; feed on spawning salmon	59 nests; 77.9% hatching success; average population of 220 at Mineral Creek from May to August[8]
mussels, barnacles and other intertidal invertebrates[10]	steep rocky areas between Shoup Bay and Gold Creek, and between Gold Creek and Mineral Creek	present all year	feeding, growth and reproduction	along approx. 6.5 km of coast
Fucus and other macroalgae	steep rocky areas and gravel beaches	present all year; some seasonal species present in summer	attached to rocks, other algae, or floating; growth and reproduction	densest on steeper shores


Area C. City of Valdez
SCALE
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1 kilometer
N
Water Tank
High Sch
Gravel Pit
Hospital
Valdez
City Hall
PO
EGAN
DR
PIPELINE
HAZELET
AVE
MEALS
New Town
Water Tanks
Ferry Terminal
Lights
Radio Tower
Mud
RICHARDSON
Mineral Creek
Mineral Creek Islands
JEEP TRAIL
VALDEZ
P O R T V A L D E Z

Sub-Area C: City of Valdez

Stressor Characterization

Receptor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
		ANTHROPOGENIC STRESSORS		
hydrocarbons	contaminated runoff from the city	near-shore sediments and water, especially in boat harbor	increase in summer with snowmelt and runoff	stormwater drains discharge into or near boat harbor
	normal boat operation and spills; fueling stations	boat harbor, docks and near-shore waters; deposition to sediment and shoreline	sporadic; increase in summer	diesel 76L, 4 spills hydraulic/lube oils, 3 small spills reported[5]
	spills during loading of jet fuel and marine diesel	air, shoreline and sediments near petroleum dock	sporadic; all year	jet fuel 227L, 1 spill[5]
	leaks from pipes or tanks; spills on land	soil or groundwater contamination - possible transport in runoff to nearshore waters and deposition to sediment	sporadic; summer	_____
	air pollution	surface water and shoreline sediments	all year to sporadic; may depend on wind direction	increase during inversions
metals	contaminated runoff from the city	near-shore sediments and water, especially in boat harbor	increase in summer with snowmelt and runoff	stormwater drains discharge into or near boat harbor
organotins	antifoulant paint (ships longer than 25 m)	sediments near docks; possible residual levels in boat harbor sediments	increase in summer; all year	banned on boats under 25m in 1988
surfactants and other chemicals	use in boat harbor or at docks	near-shore sediments and water, especially in boat harbor	all year	unknown, 1 small spill reported[5]

Sub-Area C: City of Valdez

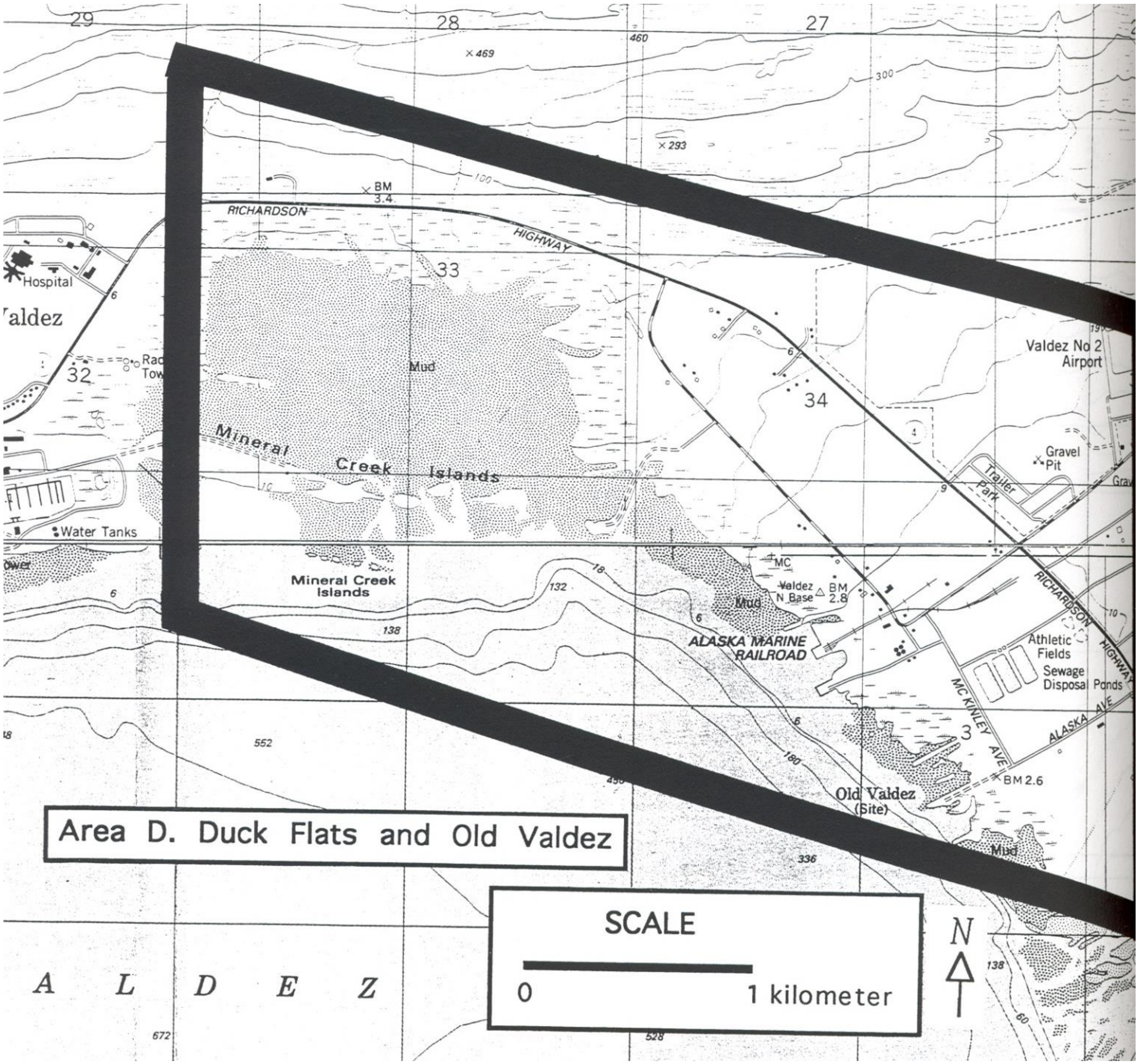
Stressor Characterization (continued)

Receptor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
		ANTHROPOGENIC STRESSORS		
organic matter	illegal discharge of sewage from boats	near-shore sediments and water, especially in boat harbor	sporadic; increase in summer	currently no station in Valdez for discharging boat sewage
	sportfish cleaning wastes	surface water and shoreline sediments, boat harbor	sporadic; summer	fish wastes from cleaning stations previously dumped in Small Boat Harbor; may now be barged to middle of the Port[11]
	seafood processing discharge	subtidal sediments; outside of boat harbor and city dock; discharge depths range from 18 to 60 m deep	continuous during operation but operation is seasonal (April-Oct.); largest discharges in June and July	only sub-area in which seafood processing plants discharge
	contaminated runoff	contamination of groundwater and groundwater runoff to port waters	increase with summer snowmelt and runoff	septic tanks in 1 subdivision 1/2 mile from downtown
disturbance	boat traffic and commercial activity	shoreline, near and off-shore waters	frequent; increase in summer	includes private vessels, state ferry, Coast Guard and SERVS vessels, and barges
	human activity, camping along shore	shoreline	sporadic to frequent; mostly summer	several campground near shoreline for cannery workers and visitors
development/ construction	dredging; construction or repair of docks, boat harbor, shoreline facilities	sediments; shoreline; water where dredging occurs; dredge disposal sites	rare	boat harbor needs little dredging; new SERVS dock built in 1995
non-native species	foreign vessels such as Japanese vessels loading seafood	depends on species	potential for introduction may increase during seafood processing season	especially problematic with foreign vessels from other cold water ports
		NATURAL STRESSORS		
predation	increasing sea otter population	intertidal and subtidal invertebrates; invertebrates attached to pilings	all year	no sea otter population prior to 1973[2]

Sub-Area C: City of Valdez

Receptor Characterization

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
		SHALLOW SUBTIDAL HABITAT		
sea otters[1]	in boat harbor and offshore	all year	feed on fishes and invertebrates; resting	few
harbor seals[2]	in boat harbor and offshore	all year	feed on fishes and invertebrates	few
terns[8]	south side of boat harbor along beach	summer	nesting; feed on fishes	12 nesting pairs found; 40% hatching success
gulls	boat harbor	all year	feed on fishes	scavengers; common in the City and around boat harbor
waterfowl[8]	north of the boat harbor along the edge of Duck Flats	nest in summer; concentrations of feeding ducks in winter	nest in marsh areas, especially dabbling ducks which nest close to water	only waterfowl nesting area identified along the coast in Port Valdez
pink and chum wild salmon fry	along shore (mostly within 10 m; observed in boat harbor with hatchery fry[18]	spring and summer	feed during migration out of port	schools of 10 to 100 pink and salmon observed
sediment infauna	in boat harbor and offshore sediments	present all year	feeding, growth and reproduction	_____
		ROCKY SHORELINE HABITAT		
mussels, barnacles, and other intertidal invertebrates	along shoreline and in boat harbor	present all year	some organisms attach to pilings and other structures; feeding, growth and reproduction	along approx. 3 km of coast
macroalgae	along rocky shoreline and beaches; in shallow water	present all year; some seasonal species in summer	attached to rocks, other algae, or floating; growth and reproduction	_____


Area D. Duck Flats and Old Valdez
SCALE
0
1 kilometer
N
RICHARDSON
HIGHWAY
Hospital
Water Tanks
Mud
Mineral Creek Islands
Mineral Creek Islands
ALASKA MARINE RAILROAD
Valdez No 2 Airport
Gravel Pit
Trailer Park
Athletic Fields
Sewage Disposal Ponds
MC KINLEY AVE
ALASKA AVE
Old Valdez (Site)
Valdez N Base
BM 2.8
BM 2.6
BM 3.4
A L D E Z

Sub-Area D: Duck Flats and Old Valdez

Stressor Characterization

Stressor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
ANTHROPOGENIC STRESSORS				
hydrocarbons	normal boat operation and spills, primarily at container dock	water; deposition to sediments and shoreline mudflats	sporadic; increased cruise ship activity in summer	diesel, 2 small spills hydraulic, 2 small spills[5]
	contaminated runoff from landfill leachate and upland industrial area	transported through surface and groundwater runoff	possible from spring thaw until autumn freeze	_____
	WWTP discharge in Sewage Lagoon Creek	transported counter-clockwise with surface current in the Port; deposition to sediments and shoreline mudflats	transported counter-clockwise with surface current	not monitored; no industrial influent or combined sewers[9]
	storage tanks damaged during the 1964 earthquake	groundwater; sediment and shoreline mudflats	diminishing	asphalt found along shoreline at various locations in the port[8]
	air pollution	surface water and shoreline sediments	all year	increase during inversions
metals	contaminated runoff from landfill leachate and industrial area	transported through surface and groundwater runoff	increase with summer snowmelt and runoff	_____
	WWTP discharge in Sewage Lagoon Creek	in sediments of the creek and transported into Port; transported counter-clockwise with surface current in the Port	continuous; all year; counter-clockwise current stronger in summer	not monitored; no industrial influent or combined sewers[9]
organotins	vessels greater than 25 m (barges and cruise ships at container dock)	water and sediment surrounding floating dock	more activity in the summer; all year	banned on boats under 25m in 1988; container dock not built until 1985
nutrients	WWTP discharge to Sewage Lagoon Creek	transported counter-clockwise with surface current in the Port; deposition to sediments and shoreline mudflats	continuous; all year; counter-clockwise current stronger in summer	monthly avg. BOD 8-41 mg/L[10]

Sub-Area D: Duck Flats and Old Valdez

Stressor Characterization (continued)

Stressor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
		ANTHROPOGENIC STRESSORS		
debris	loading and unloading logs and other wood products	water and sediment surrounding container dock	sporadic; all year	3 log barges/month; stay 20 to 30 hours[13]
	sand blasting dock	water and sediment surrounding container dock	rare	little escapes to water due to management practices
disturbance	activity at container dock; vessel traffic	Mineral Creek Islands	frequent; increase in summer	72 cruise ships/month; about 1 barge/week[13]
	shoreline activity	shoreline hiking and camping areas along west side of Duck Flats; Richardson Highway through north end of Duck Flats	sporadic to frequent; mostly summer	_____
straying salmon	hatchery pink salmon	wild salmon spawning habitat and gene pool; shoreline water and sediments	spawning season	number of straying hatchery salmon unknown
non-native species	hulls from vessels (cruise ships, barges) at the container dock	may spread to entire port, risk increase if the species could establish more easily in this area	all year	especially problematic with vessels from foreign cold water ports
		NATURAL STRESSORS		
nutrients from waste material	migratory and resident birds	mudflats and feeding areas	fall and spring migrations; ducks and geese feeding in winter	heavy use of the Duck Flats as a feeding area
organic matter	decomposition of adult salmon carcasses, brackish and marine plants	salmon spawning streams and stream outwash; throughout the flats and adjacent shallow subtidal shelf	summer	annual counts of 19,00 to 28,000 spawning salmon between 1992 and 1994[6]
sediment and turbidity	glacial runoff from Lowe River and Valdez Glacier Stream	river outwash areas and transport counter-clockwise into the Duck Flats area	spring and summer	heavy sediment loads from these rivers

Sub-Area D: Duck Flats and Old Valdez

Receptor Characterization

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
SALTMARSH HABITAT				
rooted marsh plants	saltmarsh along shoreline; partially submerged during high tide	all year	growth and reproduction; provide habitat; increase primary productivity of area and organic matter in the flats	unique habitat for Prince William Sound area[12]
harbor seals	outer islands	all year; maybe higher concentrations in summer when salmon are present	feed on spawning fishes and intertidal fishes such as the starry flounder; hauling out on islands	27 observed on seal rock[11]
pink salmon	7 spawning streams (ADF&G #11390, 11410, 11420, 11430, 11440, 11450, 11460)[4]	adults return and spawn in late June to mid-Oct.; fry hatch early to mid-winter and migrate out in late winter or spring[5]	spawn in intertidal or upstream; adults die within 2 weeks of spawning; fry feed for several weeks during outmigration; fry return in 2 yrs	adults counted in 11430/ 11450: 1992 - 11,980/ 4,330 1993 - 13,490/ 2,170 1994 - 17,863/ 9,350[4]
chum salmon	5 spawning streams (ADF&G #11390, 11420, 11430, 11440, 11450)[4]	adults return July to Oct.; fry migrate out in spring	spawn in intertidal or upstream; fry migrate out in spring and may spend several weeks in intertidal stream mouth[24]; return to the Port in 3-6 yrs	seen in schools of 10-500 adults counted in 11430/ 11450: 1992 - 359/ 3,615 1993 - 88/ 3,015 1994 - 301/ 3,597[4]
silver salmon	3 spawning streams (ADF&G #11420, 11430, 11450)[4]	adults return Aug. to Nov.	spawn upstream in clear water tributaries or lakes; fry rear in freshwater and migrate out of the Port as juveniles	_____
red salmon	2 spawning streams (ADF&G #11420, 11430)[4]	adults return July to August	spawn upstream in clear water usually near lakes; young may rear in lakes for several years	_____
wild salmon fry (and probably hatchery fry)	along shore[18]	seen in Duck Flats from mid-April to late May	feed in the mudflats and shelter in protective habitat	schools of 10 to 100 pink and salmon observed[18]; estimated 9,200 fry per day during migration[24]

Sub-Area D: Duck Flats and Old Valdez

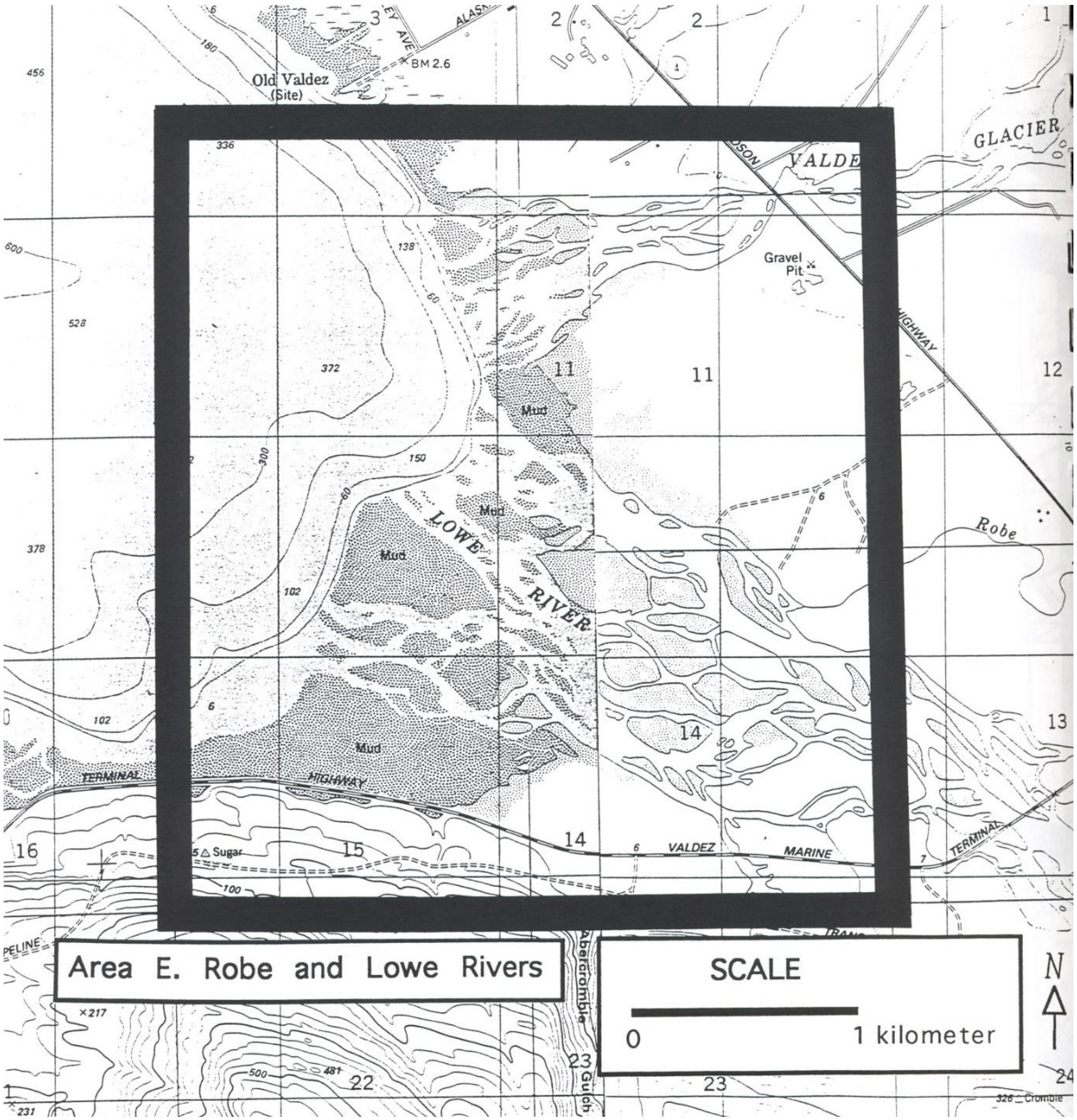
Receptor Characterization (continued)

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
		MUDFLAT and SHALLOW SUBTIDAL HABITAT		
intertidal bottom fishes	in mudflats	all year	feed on clams and invertebrates; impressions left in mud by Starry flounder[13]	_____
Canadian geese	all over the flats[8]	residents all year and migrating geese in the spring and fall	winter feeding; no nesting	less than 100 in the winter for 1977 and 1978
waterfowl	channels and small ponds with permanent water[12]	more abundant in winter than in summer; least abundant during nesting period; slight peak in spring	nest in saltmarsh and use the channels and ponds for brood rearing; feed at the edge of the mudflats and past the islands at the mussel beds; feeding is heaviest at receding tides	waterfowl comprise 67% of the migrant bird populations
shore birds	mudflats[7]	spring and fall migrations	feeding on invertebrates	_____
Tanner and Dungeness Crab	in soft bottom shallow subtidal areas[13]; Dungeness are rare now[23]	all year	juvenile Tanner Crabs may have used area for feeding and protection[13]	currently very few Dungeness Crab in the Port
clams (*M. balthica)*	intertidal sediments	all year	feeds on organic matter at sediment surface and in water	dense clam population in this area
mussels	mussel spat common throughout mudflat[13]	all year; spawn in spring	feeding, growth and reproduction	_____
harpacticoid copepods	mud and tidal flats, intertidal and shallow subtidal[9]	all year; many carry eggs in winter and release young in summer[10]	feeding on diatoms and organic matter at mud surface	more dense in summer
polychaete worms and other small invertebrates	mud and tidal flats, intertidal and shallow subtidal	all year	feed on organic matter in and at sediment surface	may be particularly dense in this area because of organic inputs from saltmarsh plants and animals
algae	macroalgae floating and attached; benthic diatoms growing on sediment surface and other substrates	macroalgae seasonal or all year; benthic diatoms bloom in summer	growth and reproduction	benthic diatoms provide food for harpacticoid copepods[9]

Sub-Area D: Duck Flats and Old Valdez

Receptor Characterization (continued)

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
		STREAM MOUTH HABITAT		
gulls	stream mouths and all over the Duck Flats[7]	all year	feed on fishes and invertebrates	numbers increase during salmon and stickleback spawning, and fry outmigration[6]
Bald eagle	Siwash Creek[8]	summer concentrations	nesting; feed on spawning salmon	1 pair; 0.5 nests/km of shoreline Port-wide[8]
		ROCKY SHORELINE and SHALLOW SUBTIDAL		
sea otters	outer islands	all year	feeding; resting	_____
terns	outer islands (spruce, cranberry and iris)[11]	summer	nesting; feed on fishes and invertebrates	30 breeding pairs: peak in late July and gone by Aug. 1
mussels and barnacles	along rocky shores or islands,	barnacle spat in summer[14]	attached to rocks or other substrates; feeding, growth and reproduction	_____
Fucus and other algae	along rocky shores or islands	all year; some seasonal	attached to rocks, other algae, or floating; growth and reproduction	_____
subtidal plants and invertebrates	shallow rocky area around Seal Rocks	all year	feeding, growth and reproduction	rich subtidal community with numerous invertebrates[13]


Area E. Robe and Lowe Rivers
SCALE
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1 kilometer
N
Old Valdez
(Site)
BM 2.6
GLACIER
VALDE
Gravel
Pit
HIGHWAY
LOWE
RIVER
Mud
Mud
Mud
Mud
Robe
TERMINAL
HIGHWAY
VALDEZ
MARINE
TERMINAL
Sugar
Abercrombie
Gulch

Sub-Area E: Robe and Lowe River

Stressor Characterization

Stressor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
		ANTHROPOGENIC STRESSORS		
hydrocarbons	normal boat operations and spills	water; deposition to sediment and shoreline (especially mudflat area)	sporadic; increase in summer	_____
	air pollution	surface water and shoreline sediments	all year	increase during inversions
	contaminated road and industrial runoff (Petro Star)	water, near-shore sediments	increase with summer snowmelt and runoff	spills reported on land[5]: crude, diesel, lube oil, kerosene and naphtha: 1155 L, 13 spills
other	contaminated road and industrial runoff (Petro Star)	water, near-shore sediments	increase with summer snowmelt and runoff	spills reported on land[5:] antifreeze: 946 L, 1 spill corrosion inhibitor: 7.6 L, 1 spill
organic matter	septic tanks from Robe Lake, Robe River and Alpine Woods subdivisions	groundwater contamination and area surrounding groundwater runoff	increase with summer snowmelt and runoff	_____
straying salmon	hatchery pink salmon	wild salmon spawning habitat and gene pool; shoreline water and sediments	spawning season	number of straying hatchery salmon unknown
		NATURAL STRESSORS		
sediment	glacial runoff from Lowe River	water column and deposition to sediments	increase with summer snowmelt and runoff	sediment deposition of: $2x10^6$kg/day in June $1x10^7$kg/day in July $6x10^6$kg/day in Aug. $1x10^7$kg/day in Sept. $1x10^4$kg/day in Oct.[4]
	glacial runoff from Valdez Glacier Stream	water column and deposition to sediments	increase with summer snowmelt and runoff	sediment deposition of: $6x10^6$kg/day in July $4x10^4$kg/day in Oct.[4]

Sub-Area E: Robe and Lowe Rivers

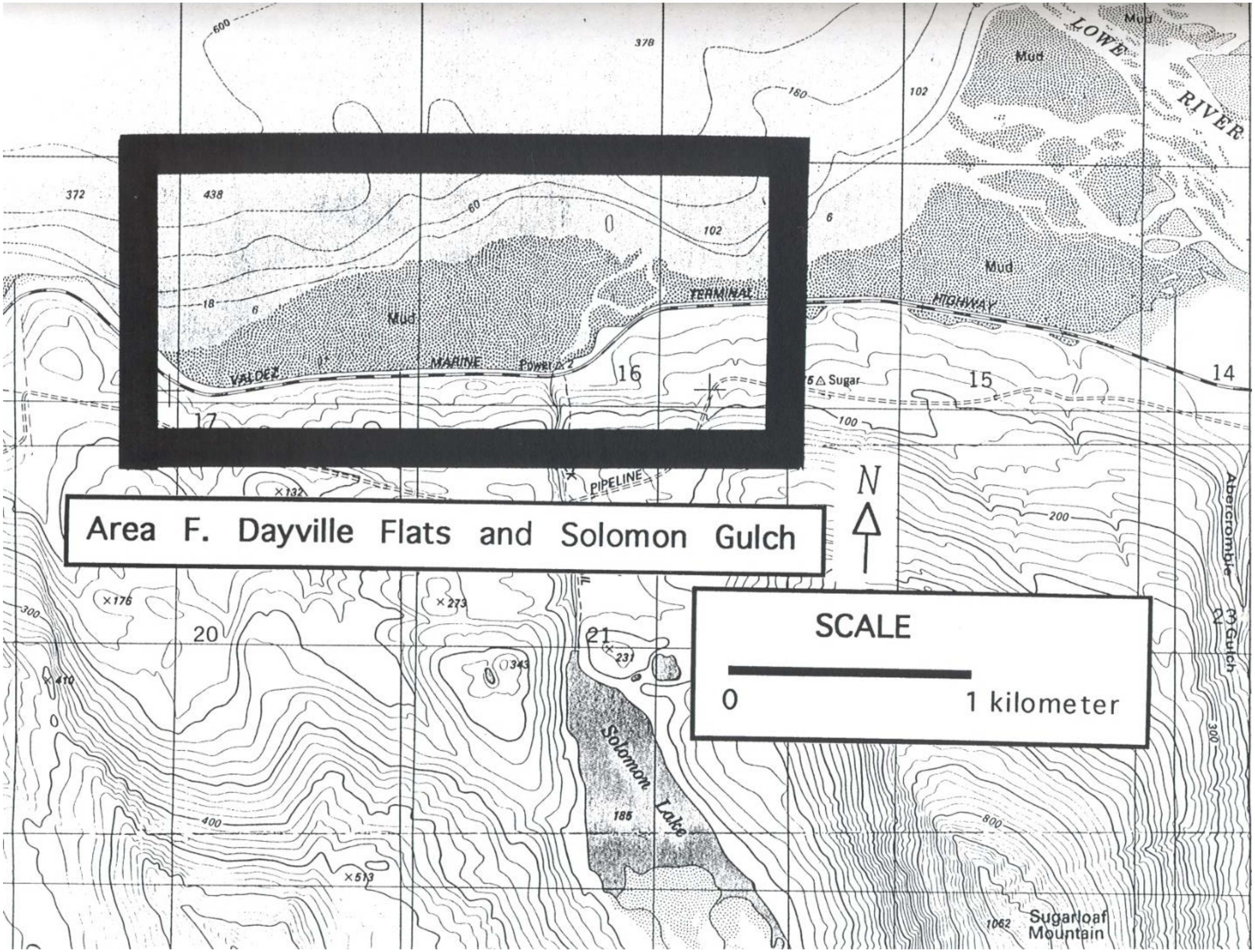
Receptor Characterization

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
STREAM MOUTH HABITAT				
pink salmon	Robe (ADF&G #11380) and Lowe (ADF&G #11370) River and ADF&G #11368[4]	adults return and spawn in late June to mid-Oct.; fry hatch early to mid-winter and migrate out in late winter or spring[5]	spawn in intertidal or upstream; adults die within 2 weeks of spawning; fry feed for several weeks during outmigration; fry return in 2 yrs	_____
chum salmon	Robe (ADF&G #11380) and Lowe (ADF&G #11370) River and ADF&G #11368[4]	adults return July to Oct.; fry migrate out in spring	spawn in intertidal or upstream; fry migrate out in spring and may spend several weeks in intertidal stream mouth[24]; return to the Port in 3-6 yrs	_____
silver salmon	Robe (ADF&G #11380) and Lowe (ADF&G #11370) River[4]	adults return Aug. to Nov.	spawn upstream in clear water tributaries or lakes; fry rear in freshwater and migrate out of the Port as juveniles	_____
red salmon	Robe (ADF&G #11380) and Lowe (ADF&G #11370) River[4]	adults return July to Aug.	spawn upstream in clear water usually near lakes; young may rear in lakes for several years	number of red salmon have decreased in the Port due to changes in Robe Lake
Dolly Varden	Robe (ADF&G #11380) and Lowe (ADF&G #11370) River[4]	_____	swim upstream to spawn in freshwater	_____
Bald eagles	Lowe River, 2 active by Dayville Road, 3 inactive by Dayville Road, 1 inactive by Corbin Creek/Glacier[8]	all year; concentrations in summer when salmon are present	active and inactive nests; eagles feed on salmon during spawning	breeding pair; 6 nests - 2 active and 4 inactive; hundreds of eagles feed in the Lowe River Valley

Sub-Area E: Robe and Lowe Rivers

Receptor Characterization (continued)

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
MUDFLAT and SHALLOW SUBTIDAL HABITAT				
Canadian geese	along the shoreline of Dayville flats[8]	spring and fall migrations	staging	———
clams (*Macoma*)	mostly upper to mid-intertidal sediments	young settle in late May	suspension/surface deposit feeder; food and space competition evident[11,15]	maximum abundance in late July, declines late Aug. to early Sept.[11,15]
harpacticoid copepods	intertidal and shallow subtidal sediments, upper 30 mm[9]	all year; many carry eggs in winter and release young in summer[10]	feed on diatoms and organic matter at mud surface; many carry eggs in winter and release young in summer[10]	more dense in summer
polychaete worms and other small invertebrates	in sediments	present all year	feed on organic matter in and on sediments	may not be as dense in this area as in the Duck Flats because of the compact sediments


Area F. Dayville Flats and Solomon Gulch
SCALE
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1 kilometer
N
LOWE RIVER
Mud
TERMINAL
HIGHWAY
VALDEZ
MARINE
PIPELINE
Solomon Lake
Sugarloaf Mountain
Abercrombie Gulch

Sub-Area F: Solomon Gulch and Dayville Flats

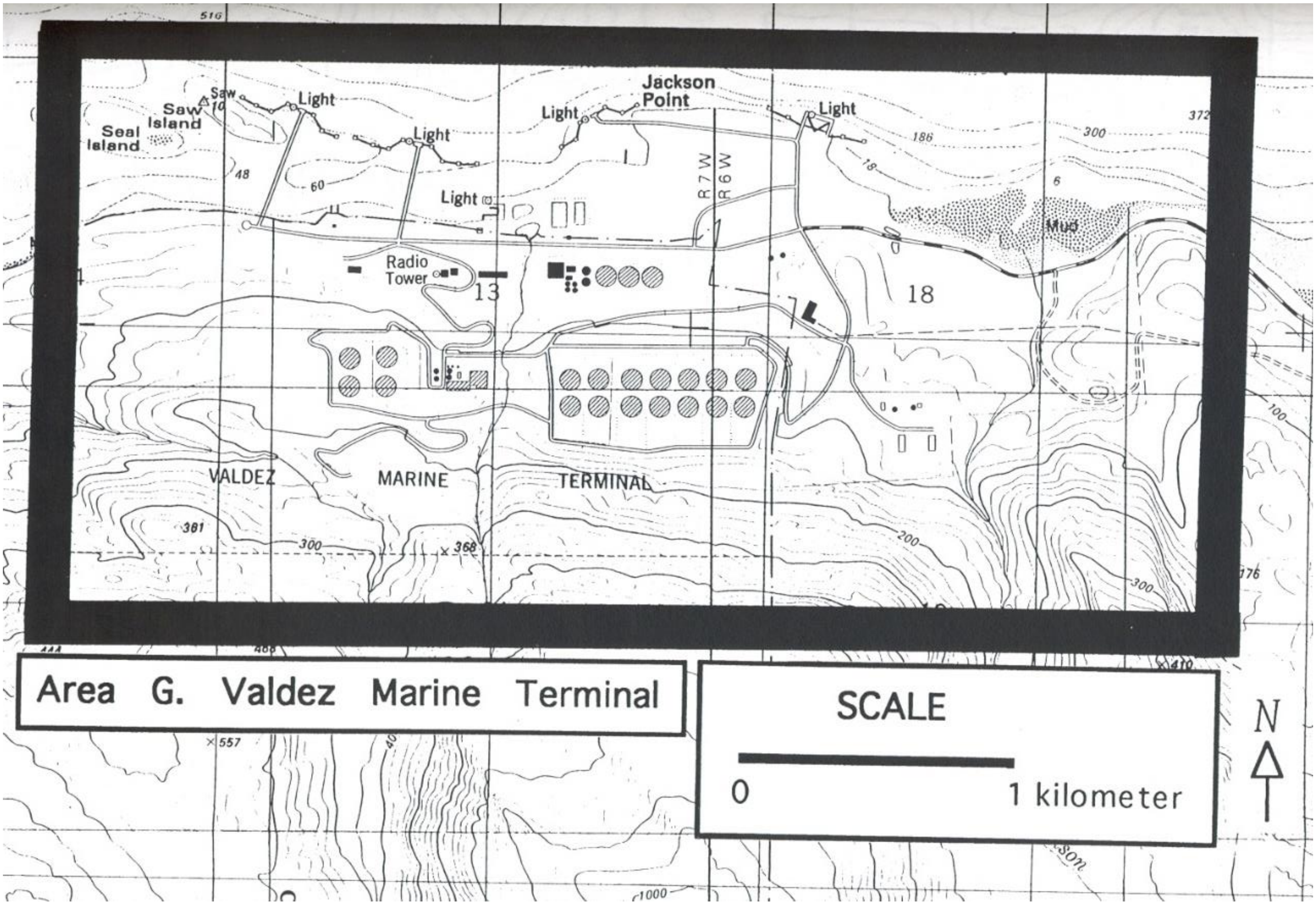
Stressor Characterization

Stressor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
		ANTHROPOGENIC STRESSORS		
hydrocarbons	normal boat operation and spills	water; deposition to sediments and shoreline	sporadic; increase in summer	commercial fishing allowed near the hatchery in some years
	possible ballast water effluent transported from Sub-Area G	water and sediment	continuous or sporadic depending on currents	_____
	air pollution	surface water and shoreline sediments	all year to sporadic	increase during inversions
other chemicals	antibiotics used in culturing at the hatchery	near-shore waters and organisms	sporadic	little use of antibiotics needed at the hatchery
organic matter	hatchery wastewater, excess food and fecal matter in netpens,	near-shore waters and sediment	continuous during netpen use in the summer; process waters sporadic	_____
hatchery fish	returning salmon and fish fry releases	water and sediment surrounding fish hatchery	episodic; summer	loss of benthic organisms and increased organic matter
		NATURAL STRESSORS		
sediment	from Sub-Area E	water column and deposition to sediments	increase with summer snowmelt and runoff	_____

Sub-Area F: Solomon Gulch and Dayville Flats

Receptor Characterization

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
		STREAM MOUTH HABITAT		
sea otters	around the hatchery[1]	all year	feeding and resting	_____
harbor seals	in front of Solomon Gulch Creek	all year	feed on returning hatchery salmon	_____
pink salmon	5 spawning streams (ADF&G #11353, 11356, 11364, 11366, and 11300)[4]	adults return and spawn in late June to mid-Oct.; fry hatch early to mid-winter and migrate out in late winter or spring[5]	adults die within 2 weeks of spawning; fry feed for several weeks during outmigration; fry return in 2 yrs	_____
chum salmon	2 spawning streams (ADF&G #11356 and 11353)[4]	adults return July to Oct.; fry migrate out in spring	spawn in intertidal or upstream; fry migrate out in spring and may spend several weeks in intertidal stream mouth[24]; return to the Port in 3-6 yrs	_____
silver salmon	2 spawning streams (ADF&G #11366 and 11300)[4]	adults return July to Aug.	spawn upstream in clear water usually near lakes; young may rear in lakes for several years	_____
		MUDFLAT HABITAT and SHALLOW SUBTIDAL HABITAT		
benthic fishes	intertidal areas during high tide and subtidal	all year	feed on invertebrates	low density in the Port
gulls and terns	around hatchery	especially during spawning	feeding on fishes and invertebrates	_____
harpacticoid copepods, cumaceans, clams, and other sediment infauna	in sediments and at sediment surface	all year	feed on organic matter in sediments, at sediment surface, and in water	along approx. 3 km of coast
algae	macroalgae floating and attached; benthic diatoms growing on sediment surface and other substrates	macroalgae seasonal or all year; benthic diatoms bloom in summer	growth and reproduction	benthic diatoms provide food for harpacticoid copepods[9]


Jackson Point
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Saw Island
Seal Island
Saw 10
Radio Tower
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Mud
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R 6 W
VALDEZ
MARINE
TERMINAL
Area G. Valdez Marine Terminal
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1 kilometer
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Sub-Area G: Valdez Marine Terminal

Stressor Characterization

Stressor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
ANTHROPOGENIC STRESSORS				
hydrocarbons	oil spills associated with tankers or loading	shoreline and nearshore waters; deposition to sediment	sporadic; all year	crude: 32 spills, 1,295 L[5]
	normal boat operation and spills (berths, small boat harbor, and tug dock)	shoreline and near-shore waters; deposition to sediment	sporadic; all year	crude: 2 small spills diesel/gas: 8 L, 20 spills oils: 30 L, 38 spills[5]
	spills on land; contaminated runoff	shoreline and near-shore waters; deposition to sediment (spills routinely cleaned up; most runoff collected by oily water sewer system)	sporadic (may be continuous for undetected leaks); increase with summer snowmelt and runoff	crude: 4,900 L, 51 spills diesel/fuels: 50,000 L, 60 spills oils: 640 L, 116 spills[5]
	BWTP discharge at 60 m depth	mixing zone and sediments near discharge; plume typically rises[12]; possible transport to other areas	continuous	volatiles released, but regulated; semi-volatiles not frequently detected
	air pollution; crude oil loading; BWTP air emissions	air, deposition to surface water and shoreline sediments	all year	plan to build recovery system for vapors released during loading; increase during inversions
metals	BWTP discharge at 60 m depth	mixing zone and sediments near discharge; plume typically rises[12]; possibly transported to other areas	continuous; some increase in winter	zinc measured in effluent
organotins	large tankers and ships	water and sediments near berths and docks	leaching from bottom paint and paint chips in sediment	number of tankers using TBT unknown; more likely on ships that spend time in warm waters where fouling is a problem

Sub-Area G: Valdez Marine Terminal

Stressor Characterization (continued)

Stressor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
		ANTHROPOGENIC STRESSORS		
other chemicals	spills on water	water and sediments near berths, docks, and small boat harbor	all year	antifreeze: 1 small spill creosote: 1 small spill corrosion inhibitor: 1 small spill other: 7 spills[5]
	spills on land; contaminated runoff	shoreline and near-shore waters; deposition to sediment (spills routinely cleaned up; most runoff collected by oily water sewer system)	sporadic; increase with summer snowmelt and runoff	antifreeze: 220 L, 27 spills acid/solvent: 38 L, 3 spills caustic: 27,000 L, 2 spills condensate: 4,600 L, 1 spill corrosion inhibitor: 38 L, 4 spills[5]
	BWTP discharge at 60 m depth	mixing zone and sediments near discharge; plume typically rises[12]; possible transport to other areas	continuous - chemical inputs may be sporadic depending on what is in each ballast water tank	surfactants, corrosion inhibitor, and industrial site wastes are known to be in the BWTP influent (no chlorinated compounds)[14]
nutrients and organic matter	BWTP discharge at 60 m depth	mixing zone and sediments near discharge; plume typically rises[12]; possible transport to other areas	continuous	nutrients added in the treatment process to promote growth of the bacteria; bacteria discharged in the effluent are also a nutrient source
	Sewage Treatment Plant discharge at 0.3 m depth	mixing zone: 10 m radius, 12 m high	maximum discharge of 10,000 gpd	_____
debris	sandblasting docks	water and sediments surrounding the docks	occurs at approx. 5 year intervals	approx. 5 cm of deposits on sediments
disturbance	tankers; noise and movement; propeller movement	water and sediments near berths	frequent	bottom disturbed by tanker propellers and wash from propellers

Sub-Area G: Valdez Marine Terminal

Stressor Characterization (continued)

Stressor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
		ANTHROPOGENIC STRESSORS		
straying salmon	hatchery pink salmon	wild salmon spawning habitat and gene pool; shoreline water and sediments	spawning season	number of straying hatchery salmon unknown
hatchery fry	large numbers of pink salmon fry released from hatchery	water column	spring	feed on zooplankton - may reduce numbers; known to concentrate in this area[15]
non-native species	release of ballast from segregated or cleaned tanks; especially from foreign tankers from cold water ports	water and sediments	all year	potential for establishment of species small; if established, the population may expand to other areas
	species carried into the Port attached to tanker hulls	water and sediments	all year; rare	species must be able to tolerate high salinities in the ocean and lower salinities in the Port
	BWTP discharge at 60 m depth	water and sediments	all year; rare	species must survive transport in oily water and treatment process
		NATURAL STRESSORS		
predation	increasing sea otter population	intertidal and subtidal invertebrates; rocky shores and pilings	all year	no sea otter population prior to 1973[2]

Sub-Area G: Valdez Marine Terminal

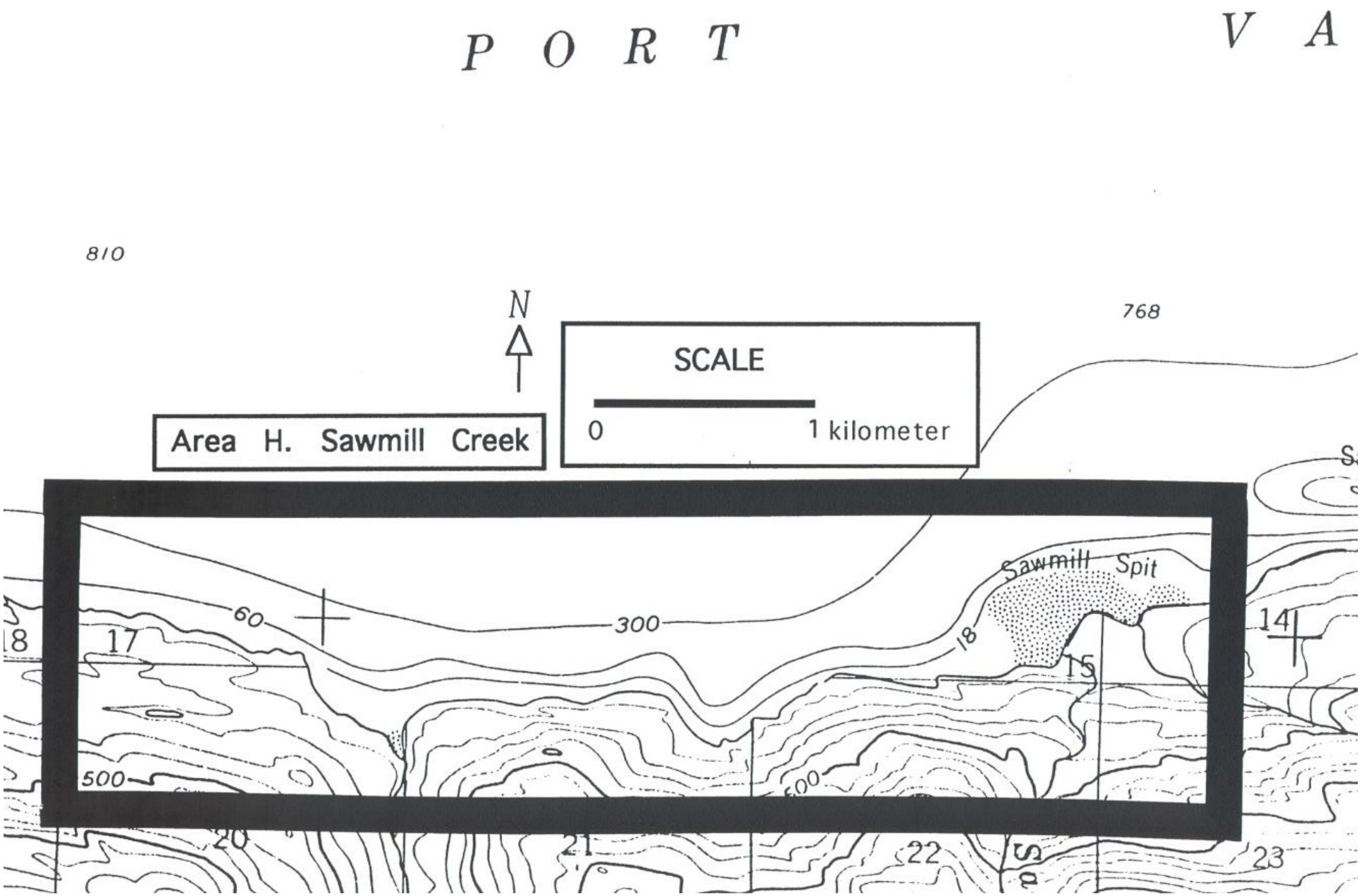
Receptor Characterization

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
ROCKY SHORELINE and SHALLOW SUBTIDAL HABITAT				
sea otters	around the terminal[1]	all year	feeding and resting	monthly average of 5 for August to September
harbor seals	around the terminal	all year	feeding; haul out on Saw Island	small in comparison to areas outside port[2]; approx. 100 sighted port wide during a day survey[3]
mussels	rocky shoreline; Saw Island; pilings	all year	feeding, growth and reproduction; spawn in spring	dense mussel beds on Saw Island
rocky intertidal invertebrates	most of shoreline; rocky outcroppings at Allison point, Jackson Point and Saw Island; narrow subtidal region	all year	feeding, growth and reproduction	_____
algae	attached to rocks, other algae, or floating	all year, some seasonals	growth and reproduction	_____
MUDFLAT and SHALLOW SUBTIDAL HABITAT				
harpacticoid copepods	mudflat and subtidal sediments	all year	feeding, growth and reproduction	most common invertebrate found in artificial substrate sampler; peaked spring and winter[17]
sediment infauna	subtidal sediments and mudflat between Jackson and Allison Points	all year	feeding, growth and reproduction	narrow subtidal region; mudflat small
algae	macroalgae floating; benthic diatoms growing on sediment surface and other substrates	macroalgae seasonal or all year; benthic diatoms bloom in summer	growth and reproduction	benthic diatoms provide food for harpacticoid copepods[9]

Sub-Area G: Valdez Marine Terminal

Receptor Characterization (continued)

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
STREAM MOUTH HABITAT				
pink salmon	Allison Creek (ADF&G #11350)[4]	adults return and spawn in late June to mid-Oct.; fry hatch early to mid-winter and migrate out in late winter or spring[5]	adults die within 2 weeks of spawning; fry feed for several weeks during outmigration; fry return in 2 yrs	_____
chum salmon	Allison Creek (ADF&G #11350)[4]	adults return July to Oct.; fry migrate out in spring	spawn in intertidal or upstream; fry migrate out in spring and may spend several weeks in intertidal stream mouth[24]; return to the Port in 3-6 yrs	_____
salmon fry	berth area and small boat harbor	during fry migration out of the Port	feed on zooplankton and some benthic invertebrates	several thousand wild pink and chum seen occasionally[18]
waterfowl	in front of the Terminal[8]	winter concentrations	feeding on invertebrates	_____


P O R T
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1 kilometer
Area H. Sawmill Creek
768
Sawmill Spit
60
300
18
17
18
15
14
500
600
20
21
22
23

Sub-Area H: Sawmill to Seven-Mile Creek

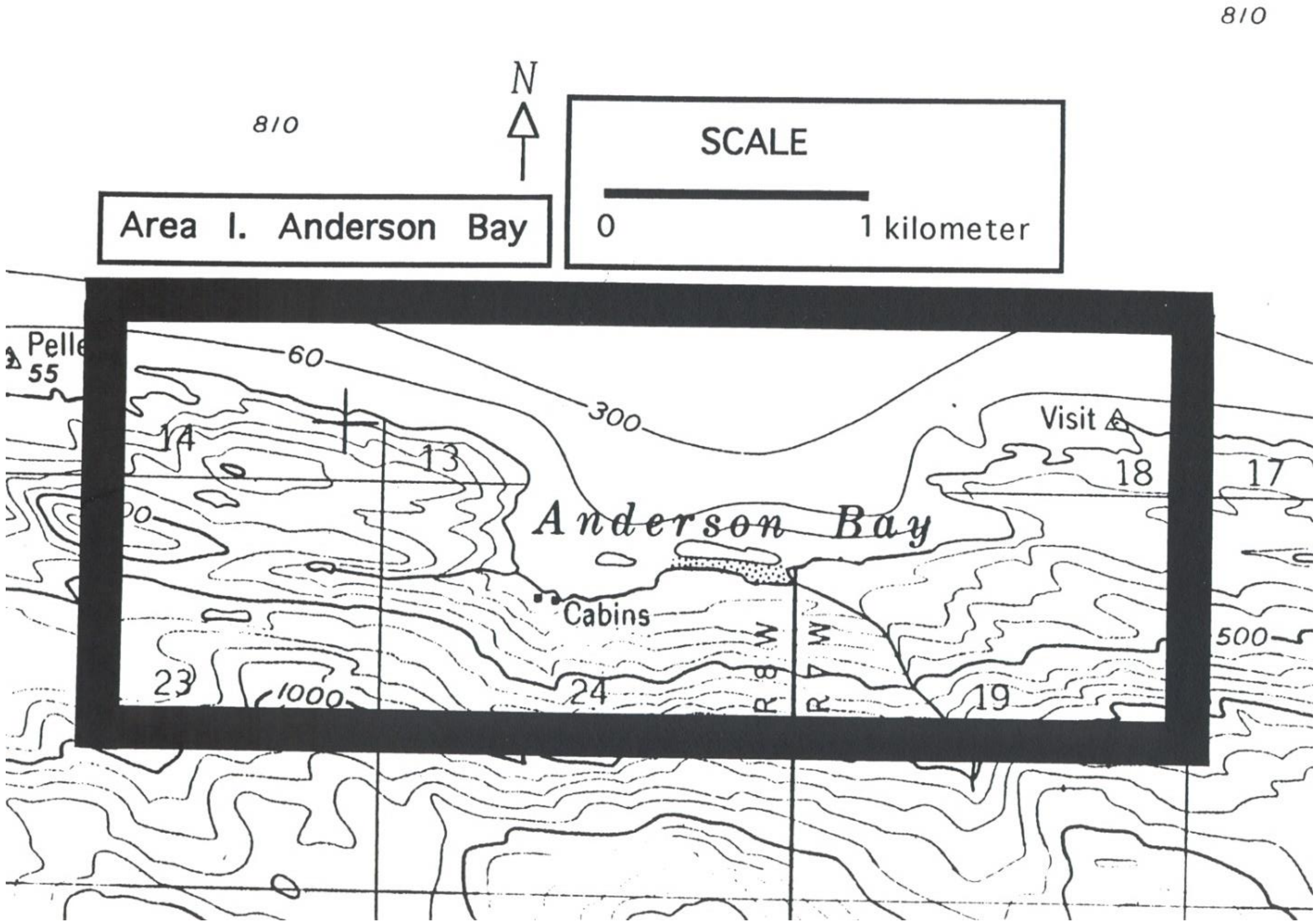
Stressor Characterization

Stressor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
		ANTHROPOGENIC STRESSORS		
hydrocarbons	normal boat operation; vessel traffic associated with Valdez Marine Terminal	shoreline and near-shore waters; deposition to sediment	sporadic; all year but higher in summer	_____
	spills from boats	shoreline and near-shore waters; deposition to sediment	sporadic; all year but higher in summer	hydraulic fluid: 1 small spill[5]
	air pollution	surface water and shoreline sediments	all year	increase during inversions
disturbance	recreational boating, nearby vessel traffic associated with Valdez Marine Terminal	shoreline, near and off-shore waters	sporadic; increase in summer	_____
straying salmon	hatchery pink salmon	spawning habitat and salmon gene pool; shoreline water and sediments	spawning season	number of straying hatchery salmon unknown
hatchery fry	large numbers of pink salmon fry released from hatchery	water column	spring	feed on zooplankton - may reduce numbers; known to concentrate in this area[15]
		NATURAL STRESSORS		
predation	increasing sea otter population	mussel beds on Sawmill Spit	all year	no sea otter population prior to 1973[2]
organic matter	decomposition of adult salmon carcasses	spawning season		

Sub-Area H: Sawmill to Seven-Mile Creek

Receptor Characterization

Receptor	Distribution	Season	Activity	Density or Area
STREAM MOUTH HABITAT				
sea otters	in the intertidal areas[1]	all year	feeding and resting; extensive feeding on mussel beds near Sawmill Spit	_____
harbor seals	subtidal areas and around stream mouths	all year	feed on fishes	small in comparison to areas outside port[2]; approx. 100 sighted port wide during a day survey[3]
chum salmon	(ADF&G #11310), Salmon Creek (ADF&G #11320) and Sawmill Creek (ADF&G #11330)[4]	adults return July to Oct.; fry migrate out in spring	spawn in intertidal or upstream; fry migrate out in spring and may spend several weeks in intertidal stream mouth[24]; return to the Port in 3-6 yrs	adults counted in 11310/ 11330: 1992 - 275/ 800 1993 - 1,685/ 2,775 1994 - 140/ 875[4]
ROCKY SHORELINE, SPITS AND LOW-PROFILE BEACH and SHALLOW SUBTIDAL HABITATS				
mussel beds	along beach near Sawmill Creek	all year; spawn in spring	feeding, growth and reproduction	used to be large mussel bed; much otter damage
clams	subtidal sediments[19]	all year	feeding, growth and reproduction	_____
sea stars and other echinoderms	intertidal and subtidal areas west of Sawmill Creek	all year	feeding, growth and reproduction	more dense in this area than eastern Port due to higher year round salinity[14]
other rocky intertidal invertebrates	shoreline areas west of Sawmill Creek	present all year; sea stars and sea urchins in spring and summer	feeding, growth and reproduction	higher year round salinity increases richness and diversity of area[14]
red algae	shoreline	all year	growth and reproduction	more dense in this area than eastern Port due to higher year round salinity[14]
other algae	attached to rocks, other algae or loose	all year, some seasonals	growth and reproduction; provide habitat for invertebrates	_____


810
810
N
Area I. Anderson Bay
SCALE
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1 kilometer
Pelle
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300
Visit
14
13
18
17
Anderson Bay
Cabins
R 8 W
R 7 W
500
23
1000
24
19

Sub-Area I: Anderson Bay

Stressor Characterization

Stressor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
ANTHROPOGENIC STRESSORS				
hydrocarbons	normal boat operation and spills	water; deposition to sediment and shoreline	all year; increase in summer	near the Valdez Narrows where vessels enter or leave the Port; high risk area for accidents
	air pollution	throughout area: water, sediment exposed to air, rocky shoreline and subtidal areas	all year to sporadic; may depend on wind direction	increase during inversions
disturbance	vessel traffic and recreational boating; noise and movement	surface water	frequent; increase in summer	near the Valdez Narrows where vessels enter or leave the Port
straying salmon	hatchery pink salmon	spawning habitat and salmon gene pool; shoreline water and sediments	spawning season	number of straying hatchery salmon unknown
hatchery fry	large numbers of pink salmon fry released from hatchery	water column	spring	feed on zooplankton - may reduce numbers; known to concentrate in this area[15]
NATURAL STRESSORS				
predation	increasing sea otter population	intertidal and subtidal invertebrates; rocky shores	all year	no sea otter population prior to 1973[2]

Sub-Area I: Anderson Bay

Receptor Characterization

Receptor	Distribution	Season	Activity	Density or Area
ROCKY SHORELINE and SHALLOW SUBTIDAL HABITAT				
sea otters[1]	in the intertidal	all year	feeding and resting	_____
sea stars and other echinoderms	intertidal and subtidal areas	all year	feeding, growth and reproduction	more dense in this area than eastern Port due to higher year round salinity[14]
other rocky intertidal invertebrates	shoreline, rocky island, and point within the Bay	present all year; sea stars and sea urchins in spring and summer	feeding, growth and reproduction	higher year round salinity increases richness and diversity of area[14]
red algae	shoreline	all year	growth and reproduction	more dense in this area than eastern Port due to higher year round salinity[14]
other algae	attached to rocks, other algae or loose	all year, some seasonals	growth and reproduction; provide habitat for invertebrates	_____
STREAM MOUTH HABITAT				
harbor seals	subtidal areas and around stream mouths	all year	feeding	small in comparison to areas outside port[2]; approx. 100 sighted port wide during a day survey[3]
pink salmon[4]	1 spawning stream(ADF&G #11300)	adults return and spawn in late June to mid-Oct.; fry hatch early to mid-winter and migrate out in late winter or spring[5]	adults die within 2 weeks of spawning; fry feed for several weeks during outmigration; fry return in 2 yrs	_____
gulls and terns	shoreline	all year; summer concentrations	feed on fishes and spawning salmon	_____

Sub-Area J: Western Port

Stressor Characterization

Stressor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
		ANTHROPOGENIC STRESSORS		
hydrocarbons	large spills from tankers and fuel barges	air, surface water	projected	traffic lane for tankers and fuel barges entering or leaving the Port; more than 300 tankers transporting crude oil per year
	small spills from boats	surface water	increase in summer	diesel: 1 small spill engine lube: 1 small spill reported[5]
	air pollution	surface water	all year to sporadic; may depend on wind direction	increase during inversions
organotins	leaching or paint chips from vessels larger than 25m	water; possible deposition to sediments	large vessels frequent	traffic lane for vessels entering or leaving the Port
disturbance	vessel traffic; noise and movement; propeller disturbance	surface water; subsurface area affected by propeller wash	large vessels frequent	traffic lane for vessels entering or leaving the Port
		NATURAL STRESSORS		
sediment	runoff from glacial rivers	water, sediments	increase in summer with snowmelt and runoff	less than in eastern Port

Sub-Area J: Western Port

Receptor Characterization

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
OPEN WATER HABITAT				
harbor seals	subsurface and surface waters	all year	feed on fishes; surface for air	small in comparison to areas outside port[2]; approx. 100 sighted port wide during a day survey[3]
sea otters	water surface	all year	traveling[1]	_____
herring	water column[20]	summer	feeding; spawn in spring	low density in the Port
other pelagic fishes	water column	all year	feed on zooplankton, invertebrates, or larval or small fishes	_____
migrating adult salmon	water column	spawning season	little to no feeding; travel through Port toward spawning streams	_____
shrimp	water column	all year	feed in the water column, especially at night	_____
zooplankton	surface and subsurface water column	low numbers in winter; increase in summer	feed on phytoplankton and other zooplankton; growth and reproduction	species composition varies year to year; zooplankton move in from outer PWS
phytoplankton	upper layer of water column	algal blooms occur in spring and sometime fall; depleted nutrients in surface waters until mixing in winter	primary production; growth and reproduction	high primary productivity in the Port

Sub-Area J: Western Port

Receptor Characterization (continued)

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
DEEP BENTHIC HABITAT				
bottom fishes[21,22]	near sediments; possibly some movement into water column	all year	feeding on invertebrates, may be nursery area for some species (many juvenile pollock)[21]	flounder, skate, cod, sculpins pollock on soft bottom; also perch and yelloweye rockfish have been seen which normally live on rocky bottoms[20]
crabs and shrimp[21,22]	above sediments	all year	feeding, growth and reproduction	low density of crabs compared to other areas of PWS
benthic invertebrates	deep bottom sediments and steep basin walls	all year	invertebrates are mostly deposit feeding polychaete worms; higher proportion of suspension feeding invertebrates than in east[19]	sediment deposition of the bottom during summer runoff less than in the eastern Port; density dependent on deposition of organic matter from the water column

Sub-Area K: Eastern Port

Stressor Characterization

Stressor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
		ANTHROPOGENIC STRESSORS		
hydrocarbons	large spills from tankers and fuel barges	air, surface water	projected	traffic lane for tankers and fuel barges; more than 300 tankers transporting crude oil per year
	air pollution	surface water	all year to sporadic; may depend on wind direction	increase during inversions
	small spills from commercial and recreational boating	surface water	sporadic	_____
	BWTP discharge near Sub-Area G	surface waters; subsurface waters; deposition to sediments	continuous	_____
	WWTP discharge from Sub-Area D	surface waters; subsurface waters; deposition to sediments	continuous	_____
	Valdez Marine Terminal sewage treatment plant from Sub-Area G	surface waters; subsurface waters; deposition to sediments	continuous	_____
metals	BWTP discharge near Sub-Area G	surface waters; subsurface waters; deposition to sediments	continuous	_____
	WWTP discharge from Sub-Area D	surface waters; subsurface waters; deposition to sediments	continuous	_____
	Valdez Marine Terminal sewage treatment plant from Sub-Area G	surface waters; subsurface waters; deposition to sediments	continuous	_____

Sub-Area K: Eastern Port

Stressor Characterization (continued)

Stressor	*Source*	*Fate and Distribution*	*Frequency*	*Additional Information*
		ANTHROPOGENIC STRESSORS		
nutrients and organic matter	BWTP discharge near Sub-Area G	surface waters; subsurface waters; deposition to sediments	continuous	_____
	WWTP discharge from Sub-Area D	surface waters; subsurface waters; deposition to sediments	continuous	_____
	Valdez Marine Terminal sewage treatment plant from Sub-Area G	surface waters; subsurface waters; deposition to sediments	continuous	_____
organotins	leaching or paint chips from vessels larger than 25m	water; possible deposition to sediments	large vessels frequent	traffic lane for vessels entering or leaving the Port
disturbance	vessel traffic; noise and movement; propeller disturbance	surface water; subsurface area affected by propeller wash	large vessels frequent	traffic lane for vessels; recreational boating
		NATURAL STRESSORS		
sediment	runoff from glacial rivers; sediment slumping	surface waters up to 15 m depth; deposition to sediments	increase in summer with snowmelt and runoff	higher suspended sediment loads and deposition than the Western Port

Sub-Area K: Eastern Port

Receptor Characterization

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
		OPEN WATER HABITAT		
harbor seals	subsurface and surface waters	all year	feed on fishes; surface for air	small in comparison to areas outside port[2]; approx. 100 sighted port wide during a day survey[3]
sea otters	water surface	all year	traveling[1]	_____
herring	water column[20]	summer	feeding; spawn in spring near shore	low density in the Port
other pelagic fishes	water column	all year	feed on zooplankton, invertebrates, or larval or small fishes	_____
migrating adult salmon	water column	spawning season	little to no feeding; travel through Port toward spawning streams	_____
shrimp	water column	all year	feed in the water column, especially at night	_____
zooplankton	surface and subsurface water column	low numbers in winter; increase in summer	feed on phytoplankton and other zooplankton; growth and reproduction	species composition varies year to year; zooplankton move in from outer PWS
phytoplankton	upper layer of water column	algal blooms occur in spring and sometime fall; depleted nutrients in surface waters until mixing in winter	primary production; growth and reproduction	high primary productivity in the Port

Sub-Area K: Eastern Port

Receptor Characterization (continued)

Receptor	*Distribution*	*Season*	*Activity*	*Density or Area*
DEEP BENTHIC HABITAT				
bottom fishes[21,22]	near sediments; possibly some movement into water column	all year	feeding on invertebrates, may be nursery area for some species (many juvenile pollock)[21]	flounder, skate, cod, sculpins pollock on soft bottom; also perch and yelloweye rockfish have been seen which normally live on rocky bottoms[20]
crabs and shrimp[21,22]	above sediments	all year	feeding, growth and reproduction	low density of crabs compared to other areas of PWS
benthic invertebrates	deep bottom sediments and steep basin walls	all year	invertebrates are mostly deposit feeding polychaete worms[19]	organisms stressed by high sediment deposition in summer; density dependent on deposition of organic matter from the water column

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Receptor References:

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Appendix D: Relative Risk Model

Appendix D is a hardcopy of the model designed to estimate relative risk. Two *MacIntosh®* files are included with this document for anyone interested in running the model with their own input. One is a *Microsoft Excel 5.0®* file which can be run as a software program by following the instructions once the file is opened. The second is a *Microsoft Excel 4.0®* file which can be run by inserting input directly into the model as described in the following table. Directions for altering the input are listed under Section 1. With each new set of input, the results will automatically recalculate. The end results can be viewed as described under Sections 5 and 6.

Appendix D Sections	**Pages**
Section 1: Input	
Input to the model includes ranks (step 1 and 2) and filters (step 3). New or modified input can be placed in the yellow squares (shaded gray in this hardcopy) of the *Excel 5.0®* file "Relative Risk Model".	**D3**
Step 1: Compare sub-areas for each **source** based on **ranking criteria** (Table 2-5 of the document). Use sub-area delineations (Figure 2-1) and information about sources (Section 5.2 of the document) for guidance. Type new ranks into the yellow squares.	**D3**
Step 2: Compare sub-areas for each **habitat** based on **ranking criteria** (Table 2-6 of the document). Use sub-area delineations (Figure 2-1) and information about sources (Section 5.3 of the document) for guidance. Type new ranks into the yellow squares.	**D4–D7**
Step 3: Choose an **exposure** or **effects filter** supplied on pages D4 to D6, or modify a filter to fit your specifications (see Example 1 of the document). Copy the filter into the yellow squares.	
Section 2: Unfiltered Output	
This is an intermediary calculation of the model consisting of raw scores from combined source and habitat ranks.	**D8–D11**

Section 3: Filtered Output (Exposure)

Choosing the exposure filter in step 3 above results in exposure output. The initial output are scores for each source and habitat combination in each sub-area. **D12–D15**

Appendix D Sections	**Pages**
Section 4: Filtered Output (Effects) Choosing one of the six effects filters in step 3 above results in effects output. The initial output are scores for each source and habitat combination in each sub-area. The scores apply to a specific impact (assessment endpoint), depending on which effects filter was chosen.	**D16–D43**
Section 5: Final Output (Exposure) Choosing the exposure filter in step 3 results in exposure output. The final output lists three types of results for each sub-area: 1) exposure scores for each habitat type with all possible sources, 2) exposure scores for each source type in all possible habitats, and 3) the total relative risk of exposure in each sub-area.	**D44–D45**
Section 6: Final Output (Effects) Choosing one of the six effects filters in step 3 results in effects output. The final output lists three types of results for each sub-area: 1) effects scores for each habitat type with all possible sources, 2) effects scores for each source type in all possible habitats, and 3) the total relative risk of the chosen impact in each sub-area.	**D46–D59**

Use of the model by people knowledgeable about the Port, as well as further risk analyses will provide feedback about its accuracy and specificity. The numbers used as input in this Appendix are based on the information provided and considerations discussed in the document. These risk calculations can be used as a starting point for anyone who wants to conduct further analysis using the model based on new data and considerations. Persons familiar with the region can then examine the modified results in context witht their own understanding of risk characteristics within the Port.

INPUT-Ranks

STEP 1: *Rank the sources between the sub-areas (see criteria in Table 2-5).*

Source Ranked Across Sub-Area = (Sij)

Source Type	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
treated discharges	0	0	0	4	0	0	6	0	0	0	6
contaminated runoff	2	2	6	4	4	2	4	0	0	0	0
accidental spills	2	2	6	4	2	4	6	2	2	4	4
seafood and fish wastes	0	0	6	0	0	4	0	0	0	2	2
vessel traffic	2	2	6	4	2	4	6	2	2	6	4
construction/development	0	2	4	4	4	2	4	0	6	0	0
hatchery fish	0	0	0	0	2	6	4	4	4	0	0
shoreline activity	2	4	6	6	2	4	6	0	2	0	0

STEP 2: *Rank the habitats between the sub-areas (see criteria in Table 2-6).*

Habitat Ranked Across Sub-Area = (Hik)

Habitat Type	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
mudflats	2	4	0	6	6	4	2	2	2	0	0
saltmarsh	0	0	0	6	0	0	0	0	0	0	0
spits and beaches	6	2	4	0	0	2	2	6	2	0	0
rocky shoreline	6	4	2	4	0	0	4	2	6	0	0
shallow subtidal	4	6	4	6	2	2	2	2	2	0	0
deep benthic	4	0	0	0	0	0	0	0	0	6	6
open water	4	0	0	0	0	0	0	0	0	6	6
stream mouth	2	6	0	6	6	4	2	2	2	0	0

INPUT-Exposure and Effects Filters

STEP 3: *Choose an exposure or effects filter from the following pages. Copy the filter into to the yellow area.*

Example: Effects Filter: Wildlife Food Availability

Weighting Factors (Wkj) Determined by the Filter

Effects Filter: Wildlife Food Availability

Habitat	Sources							
	treated discharges	Contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	1	1	0	0	1	0	1
saltmarsh	0	1	1	0	0	1	0	1
spits & beaches	0	1	1	0	0	1	0	1
rocky shoreline	0	0	1	0	0	0	0	1
shallow subtidal	1	1	1	1	1	0	0	0
deep benthic	1	0	0	1	1	1	0	0
open water	1	1	1	0	1	0	1	0
stream mouth	0	1	1	0	0	1	1	0

Exposure and Effects Filters Values

Copy and paste filter or effect values into the input box on the previous page.

Exposure Filter

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	1	1	0	0	1	0	1
saltmarsh	0	1	1	0	0	1	0	1
spits & beaches	0	1	1	0	0	1	0	1
rocky shoreline	0	0	1	0	0	0	0	1
shallow subtidal	1	1	1	1	1	0	0	0
deep benthic	1	0	0	1	1	1	0	0
open water	1	1	1	0	1	0	1	0
stream mouth	0	1	1	0	0	1	1	0

Effects Filter: Water Quality

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	1	1	0	0	1	0	0
saltmarsh	0	1	1	0	0	1	0	0
spits & beaches	0	1	1	0	0	1	0	0
rocky shoreline	0	0	1	0	0	0	0	0
shallow subtidal	1	1	1	1	1	0	0	0
deep benthic	1	0	0	1	1	1	0	0
open water	1	1	1	0	1	0	0	0
stream mouth	0	1	1	0	0	1	1	0

Effects Filter: Sediment Quality

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	1	1	0	0	1	0	1
saltmarsh	0	1	1	0	0	1	0	1
spits & beaches	0	1	1	0	0	1	0	1
rocky shoreline	0	0	1	0	0	0	0	1
shallow subtidal	1	1	1	1	1	0	0	0
deep benthic	1	0	0	1	1	1	0	0
open water	1	1	1	0	1	0	1	0
stream mouth	0	1	1	0	0	1	1	0

Exposure and Effects Filters Values

Effects Filter: Hatchery Salmon Culturing and Migration

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	1	1	0	0	1	0	0
saltmarsh	0	1	1	0	0	1	0	0
spits & beaches	0	1	1	0	0	1	0	0
rocky shoreline	0	0	1	0	0	0	0	0
shallow subtidal	1	1	1	1	1	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	1	1	1	0	1	0	1	0
stream mouth	0	1	1	0	0	1	1	0

Effects Filter: Benthic Fishes and Shellfishes

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	1	0	0	0	0	0
shallow subtidal	1	1	1	1	1	0	0	0
deep benthic	1	0	0	1	1	1	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Effects Filter: Wild Anadromous Fishes

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	1	1	0	0	1	0	0
spits & beaches	0	1	1	0	0	1	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	1	1	1	1	1	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	1	1	1	0	1	0	1	0
stream mouth	0	1	1	0	0	1	1	0

Exposure and Effects Filters Values

Effects Filter: Bird Reproduction

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	1	1	0	0	1	0	1
saltmarsh	0	1	1	0	0	1	0	1
spits & beaches	0	1	1	0	0	1	0	1
rocky shoreline	0	0	1	0	0	0	0	1
shallow subtidal	1	1	1	0	1	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	1	1	1	0	1	0	0	0
stream mouth	0	1	1	0	0	1	0	0

Effects Filter: Wildlife Food Availability

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	1	1	0	0	1	0	1
saltmarsh	0	1	1	0	0	1	0	1
spits & beaches	0	1	1	0	0	1	0	1
rocky shoreline	0	0	1	0	0	0	0	1
shallow subtidal	1	1	1	1	1	0	0	0
deep benthic	1	0	0	1	1	1	0	0
open water	1	1	1	0	1	0	1	0
stream mouth	0	1	1	0	0	1	1	0

UNFILTERED OUTPUT

STEP 4: *Calculate ranked risk (SHjk) in each sub-area (i = 1...11) with the formula*

SHjk = (Sj)(Hk).

Sub-Area A: i=1

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	4	4	0	4	0	0	4
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	12	12	0	12	0	0	12
rocky shoreline	0	12	12	0	12	0	0	12
shallow subtidal	0	8	8	0	8	0	0	8
deep benthic	0	8	8	0	8	0	0	8
open water	0	8	8	0	8	0	0	8
stream mouth	0	4	4	0	4	0	0	4

Sub-Area B: i=2

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	8	0	8	8	0	16
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	4	0	4	4	0	8
rocky shoreline	0	8	8	0	8	8	0	16
shallow subtidal	0	12	12	0	12	12	0	24
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	12	12	0	12	12	0	24

Sub-Area C: i=3

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	24	24	24	24	16	0	24
rocky shoreline	0	12	12	12	12	8	0	12
shallow subtidal	0	24	24	24	24	16	0	24
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

UNFILTERED OUTPUT

Sub-Area D: i=4

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	24	24	24	0	24	24	0	36
saltmarsh	24	24	24	0	24	24	0	36
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	16	16	16	0	16	16	0	24
shallow subtidal	24	24	24	0	24	24	0	36
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	24	24	24	0	24	24	0	36

Sub-Area E: i=5

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	24	12	0	12	24	12	12
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	8	4	0	4	8	4	4
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	12	0	12	24	12	12

Sub-Area F: i=6

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	16	16	16	8	24	16
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	8	8	8	4	12	8
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	4	8	8	8	4	12	8
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	16	16	16	8	24	16

UNFILTERED OUTPUT

Sub-Area G: i=7

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	12	8	12	0	12	8	8	12
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	12	8	12	0	12	8	8	12
rocky shoreline	24	16	24	0	24	16	16	24
shallow subtidal	12	8	12	0	12	8	8	12
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	12	8	12	0	12	8	8	12

Sub-Area H: i=8

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	4	0	4	0	8	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	12	0	12	0	24	0
rocky shoreline	0	0	4	0	4	0	8	0
shallow subtidal	0	0	4	0	4	0	8	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	4	0	8	0

Sub-Area I: i=9

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	4	0	4	12	8	4
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	4	0	4	12	8	4
rocky shoreline	0	0	12	0	12	36	24	12
shallow subtidal	0	0	4	0	4	12	8	4
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	4	12	8	4

UNFILTERED OUTPUT

Sub-Area J: i=10

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	0	0	24	12	36	0	0	0
open water	0	0	24	12	36	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area K: i=11

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	36	0	24	12	24	0	0	0
open water	36	0	24	12	24	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Exposure

STEP 5: *Calculate filtered risk (SHWjk) in each sub-area (i = 1..11) with the formula*
SHWjk = (Sj)(Hk)(Wjk).

Sub-Area A: i=1

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	4	4	0	0	0	0	4
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	12	12	0	0	0	0	12
rocky shoreline	0	0	12	0	0	0	0	12
shallow subtidal	0	8	8	0	8	0	0	0
deep benthic	0	0	0	0	8	0	0	0
open water	0	8	8	0	8	0	0	0
stream mouth	0	4	4	0	0	0	0	0

Sub-Area B: I=2

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	8	0	0	8	0	16
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	4	0	0	4	0	8
rocky shoreline	0	0	8	0	0	0	0	16
shallow subtidal	0	12	12	0	12	12	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	12	12	0	0	12	0	0

Sub-Area C: i=3

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	24	24	0	0	16	0	24
rocky shoreline	0	0	12	0	0	0	0	12
shallow subtidal	0	24	24	24	24	16	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Exposure

Sub-Area D: i=4

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	24	24	0	0	24	0	36
saltmarsh	0	24	24	0	0	24	0	36
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	16	0	0	0	0	24
shallow subtidal	24	24	24	0	24	24	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	24	0	0	24	0	0

Sub-Area E: i=5

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	24	12	0	0	24	0	12
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	8	4	0	4	8	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	12	0	0	24	12	0

Sub-Area F: i=6

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	16	0	0	8	0	16
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	8	0	0	4	0	8
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	4	8	8	8	4	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	16	0	0	8	24	0

FILTERED OUTPUT

Exposure

Sub-Area G: i=7

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	12	0	0	8	0	12
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	8	12	0	0	8	0	12
rocky shoreline	0	0	24	0	0	0	0	24
shallow subtidal	12	8	12	0	12	8	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	12	0	0	8	8	0

Sub-Area H: i=8

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	4	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	12	0	0	0	0	0
rocky shoreline	0	0	4	0	0	0	0	0
shallow subtidal	0	0	4	0	4	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	0	0	8	0

Sub-Area I: i=9

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	4	0	0	12	0	4
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	4	0	0	12	0	4
rocky shoreline	0	0	12	0	0	0	0	12
shallow subtidal	0	0	4	0	4	12	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	0	12	8	0

FILTERED OUTPUT

Exposure

Sub-Area J: i=10

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	0	0	0	12	36	0	0	0
open water	0	0	24	0	36	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area K: i=11

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	36	0	0	12	24	0	0	0
open water	36	0	24	0	24	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Water Quality

STEP 5*: Calculate filtered risk (SHWjk) in each sub-area (i = 1..11) with the formula*

SHWjk = (Sj)(Hk)(Wjk).

Sub-Area A: i=1

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	4	4	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	12	12	0	0	0	0	0
rocky shoreline	0	0	12	0	0	0	0	0
shallow subtidal	0	8	8	0	8	0	0	0
deep benthic	0	0	0	0	8	0	0	0
open water	0	8	8	0	8	0	0	0
stream mouth	0	4	4	0	0	0	0	0

Sub-Area B: I=2

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	8	0	0	8	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	4	0	0	4	0	0
rocky shoreline	0	0	8	0	0	0	0	0
shallow subtidal	0	12	12	0	12	12	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	12	12	0	0	12	0	0

Sub-Area C: i=3

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	24	24	0	0	16	0	0
rocky shoreline	0	0	12	0	0	0	0	0
shallow subtidal	0	24	24	24	24	16	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Water Quality

Sub-Area D: i=4

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	24	24	0	0	24	0	0
saltmarsh	0	24	24	0	0	24	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	16	0	0	0	0	0
shallow subtidal	24	24	24	0	24	24	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	24	0	0	24	0	0

Sub-Area E: i=5

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	24	12	0	0	24	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	8	4	0	4	8	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	12	0	0	24	12	0

Sub-Area F: i=6

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	16	0	0	8	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	8	0	0	4	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	4	8	8	8	4	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	16	0	0	8	24	0

FILTERED OUTPUT

Effects: Water Quality

Sub-Area G: i=7

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	12	0	0	8	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	8	12	0	0	8	0	0
rocky shoreline	0	0	24	0	0	0	0	0
shallow subtidal	12	8	12	0	12	8	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	12	0	0	8	8	0

Sub-Area H: i=8

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	4	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	12	0	0	0	0	0
rocky shoreline	0	0	4	0	0	0	0	0
shallow subtidal	0	0	4	0	4	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	0	0	8	0

Sub-Area I: i=9

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	4	0	0	12	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	4	0	0	12	0	0
rocky shoreline	0	0	12	0	0	0	0	0
shallow subtidal	0	0	4	0	4	12	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	0	12	8	0

FILTERED OUTPUT

Effects: Water Quality

Sub-Area J: i=10

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	0	0	0	12	36	0	0	0
open water	0	0	24	0	36	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area K: i=11

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	36	0	0	12	24	0	0	0
open water	36	0	24	0	24	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Sediment Quality

STEP 5*: Calculate filtered risk (SHWjk) in each sub-area (i = 1..11) with the formula*

SHWjk = (Sj)(Hk)(Wjk).

Sub-Area A: i=1

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	4	4	0	0	0	0	4
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	12	12	0	0	0	0	12
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	8	8	0	8	0	0	0
deep benthic	0	0	0	0	8	0	0	0
open water	0	8	8	0	8	0	0	0
stream mouth	0	4	4	0	0	0	0	0

Sub-Area B: I=2

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	8	0	0	8	0	16
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	4	0	0	4	0	8
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	12	12	0	12	12	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	12	12	0	0	12	0	0

Sub-Area C: i=3

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	24	24	0	0	16	0	24
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	24	24	24	24	16	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Sediment Quality

Sub-Area D: i=4

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	24	24	0	0	24	0	36
saltmarsh	0	24	24	0	0	24	0	36
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	16	0	0	0	0	0
shallow subtidal	24	24	24	0	24	24	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	24	0	0	24	0	0

Sub-Area E: i=5

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	24	12	0	0	24	0	12
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	8	4	0	4	8	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	12	0	0	24	12	0

Sub-Area F: i=6

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	16	0	0	8	0	16
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	8	0	0	4	0	8
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	4	8	8	8	4	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	16	0	0	8	24	0

FILTERED OUTPUT

Effects: Sediment Quality

Sub-Area G: i=7

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	12	0	0	8	0	12
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	8	12	0	0	8	0	12
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	12	8	12	0	12	8	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	12	0	0	8	8	0

Sub-Area H: i=8

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	4	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	12	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	4	0	4	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	0	0	8	0

Sub-Area I: i=9

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	4	0	0	12	0	4
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	4	0	0	12	0	4
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	4	0	4	12	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	0	12	8	0

FILTERED OUTPUT

Effects: Sediment Quality

Sub-Area J: i=10

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	0	0	0	12	36	0	0	0
open water	0	0	24	0	36	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area K: i=11

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	36	0	0	12	24	0	0	0
open water	36	0	24	0	24	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Hatchery Salmon Culturing and Migration

STEP 5*: Calculate filtered risk (SHWjk) in each sub-area (i = 1..11) with the formula*

SHWjk = (Sj)(Hk)(Wjk).

Sub-Area A: i=1

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	4	4	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	12	12	0	0	0	0	0
rocky shoreline	0	0	12	0	0	0	0	0
shallow subtidal	0	8	8	0	8	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	8	8	0	8	0	0	0
stream mouth	0	4	4	0	0	0	0	0

Sub-Area B: I=2

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	8	0	0	8	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	4	0	0	4	0	0
rocky shoreline	0	0	8	0	0	0	0	0
shallow subtidal	0	12	12	0	12	12	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	12	12	0	0	12	0	0

Sub-Area C: i=3

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	24	24	0	0	16	0	0
rocky shoreline	0	0	12	0	0	0	0	0
shallow subtidal	0	24	24	24	24	16	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Hatchery Salmon Culturing and Migration

Sub-Area D: i=4

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	24	24	0	0	24	0	0
saltmarsh	0	24	24	0	0	24	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	16	0	0	0	0	0
shallow subtidal	24	24	24	0	24	24	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	24	0	0	24	0	0

Sub-Area E: i=5

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	24	12	0	0	24	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	8	4	0	4	8	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	12	0	0	24	12	0

Sub-Area F: i=6

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	16	0	0	8	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	8	0	0	4	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	4	8	8	8	4	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	16	0	0	8	24	0

FILTERED OUTPUT

Effects: Hatchery Salmon Culturing and Migration

Sub-Area G: i=7

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	12	0	0	8	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	8	12	0	0	8	0	0
rocky shoreline	0	0	24	0	0	0	0	0
shallow subtidal	12	8	12	0	12	8	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	12	0	0	8	8	0

Sub-Area H: i=8

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	4	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	12	0	0	0	0	0
rocky shoreline	0	0	4	0	0	0	0	0
shallow subtidal	0	0	4	0	4	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	0	0	8	0

Sub-Area I: i=9

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	4	0	0	12	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	4	0	0	12	0	0
rocky shoreline	0	0	12	0	0	0	0	0
shallow subtidal	0	0	4	0	4	12	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	0	12	8	0

FILTERED OUTPUT

Effects: Hatchery Salmon Culturing and Migration

Sub-Area J: i=10

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	24	0	36	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area K: i=11

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	36	0	24	0	24	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Benthic Fishes and Shellfishes

STEP 5: ***Calculate filtered risk (SHWjk) in each sub-area (i = 1..11) with the formula***

SHWjk = (Sj)(Hk)(Wjk).

Sub-Area A: i=1

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	12	0	0	0	0	0
shallow subtidal	0	8	8	0	8	0	0	0
deep benthic	0	0	0	0	8	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area B: I=2

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	8	0	0	0	0	0
shallow subtidal	0	12	12	0	12	12	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area C: i=3

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	12	0	0	0	0	0
shallow subtidal	0	24	24	24	24	16	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Benthic Fishes and Shellfishes

Sub-Area D: i=4

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	16	0	0	0	0	0
shallow subtidal	24	24	24	0	24	24	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area E: i=5

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	8	4	0	4	8	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area F: i=6

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	4	8	8	8	4	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Benthic Fishes and Shellfishes

Sub-Area G: i=7

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	24	0	0	0	0	0
shallow subtidal	12	8	12	0	12	8	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area H: i=8

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	4	0	0	0	0	0
shallow subtidal	0	0	4	0	4	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area I: i=9

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	12	0	0	0	0	0
shallow subtidal	0	0	4	0	4	12	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Benthic Fishes and Shellfishes

Sub-Area J: i=10

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	0	0	0	12	36	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area K: i=11

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	36	0	0	12	24	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Wild Anadromous Fishes

STEP 5: *Calculate filtered risk (SHWjk) in each sub-area (i = 1..11) with the formula SHWjk = (Sj)(Hk)(Wjk).*

Sub-Area A: i=1

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	12	12	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	8	8	0	8	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	8	8	0	8	0	0	0
stream mouth	0	4	4	0	0	0	0	0

Sub-Area B: I=2

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	4	0	0	4	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	12	12	0	12	12	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	12	12	0	0	12	0	0

Sub-Area C: i=3

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	24	24	0	0	16	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	24	24	24	24	16	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Wild Anadromous Fishes

Sub-Area D: i=4

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	24	24	0	0	24	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	24	24	24	0	24	24	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	24	0	0	24	0	0

Sub-Area E: i=5

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	8	4	0	4	8	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	12	0	0	24	12	0

Sub-Area F: i=6

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	8	0	0	4	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	4	8	8	8	4	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	16	0	0	8	24	0

FILTERED OUTPUT

Effects: Wild Anadromous Fishes

Sub-Area G: i=7

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	8	12	0	0	8	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	12	8	12	0	12	8	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	12	0	0	8	8	0

Sub-Area H: i=8

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	12	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	4	0	4	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	0	0	8	0

Sub-Area I: i=9

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	4	0	0	12	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	4	0	4	12	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	0	12	8	0

FILTERED OUTPUT

Effects: Wild Anadromous Fishes

Sub-Area J: i=10

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	24	0	36	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area K: i=11

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	36	0	24	0	24	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Bird Reproduction

STEP 5: ***Calculate filtered risk (SHWjk) in each sub-area (i = 1..11) with the formula***

SHWjk = (Sj)(Hk)(Wjk).

Sub-Area A: i=1

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	4	4	0	0	0	0	4
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	12	12	0	0	0	0	12
rocky shoreline	0	0	12	0	0	0	0	12
shallow subtidal	0	8	8	0	8	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	8	8	0	8	0	0	0
stream mouth	0	4	4	0	0	0	0	0

Sub-Area B: I=2

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	8	0	0	8	0	16
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	4	0	0	4	0	8
rocky shoreline	0	0	8	0	0	0	0	16
shallow subtidal	0	12	12	0	12	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	12	12	0	0	12	0	0

Sub-Area C: i=3

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	24	24	0	0	16	0	24
rocky shoreline	0	0	12	0	0	0	0	12
shallow subtidal	0	24	24	0	24	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Bird Reproduction

Sub-Area D: i=4

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	24	24	0	0	24	0	36
saltmarsh	0	24	24	0	0	24	0	36
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	16	0	0	0	0	24
shallow subtidal	24	24	24	0	24	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	24	0	0	24	0	0

Sub-Area E: i=5

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	24	12	0	0	24	0	12
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	8	4	0	4	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	12	0	0	24	0	0

Sub-Area F: i=6

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	16	0	0	8	0	16
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	8	0	0	4	0	8
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	4	8	0	8	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	16	0	0	8	0	0

FILTERED OUTPUT

Effects: Bird Reproduction

Sub-Area G: i=7

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	12	0	0	8	0	12
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	8	12	0	0	8	0	12
rocky shoreline	0	0	24	0	0	0	0	24
shallow subtidal	12	8	12	0	12	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	12	0	0	8	0	0

Sub-Area H: i=8

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	4	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	12	0	0	0	0	0
rocky shoreline	0	0	4	0	0	0	0	0
shallow subtidal	0	0	4	0	4	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	0	0	0	0

Sub-Area I: i=9

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	4	0	0	12	0	4
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	4	0	0	12	0	4
rocky shoreline	0	0	12	0	0	0	0	12
shallow subtidal	0	0	4	0	4	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	0	12	0	0

FILTERED OUTPUT

Effects: Bird Reproduction

Sub-Area J: i=10

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	24	0	36	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area K: i=11

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	36	0	24	0	24	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Wildlife Food Availability and Quality

STEP 5: ***Calculate filtered risk (SHWjk) in each sub-area (i = 1..11) with the formula***

SHWjk = (Sj)(Hk)(Wjk).

Sub-Area A: i=1

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	4	4	0	0	0	0	4
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	12	12	0	0	0	0	12
rocky shoreline	0	0	12	0	0	0	0	12
shallow subtidal	0	8	8	0	8	0	0	0
deep benthic	0	0	0	0	8	0	0	0
open water	0	8	8	0	8	0	0	0
stream mouth	0	4	4	0	0	0	0	0

Sub-Area B: I=2

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	8	0	0	8	0	16
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	4	0	0	4	0	8
rocky shoreline	0	0	8	0	0	0	0	16
shallow subtidal	0	12	12	0	12	12	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	12	12	0	0	12	0	0

Sub-Area C: i=3

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	24	24	0	0	16	0	24
rocky shoreline	0	0	12	0	0	0	0	12
shallow subtidal	0	24	24	24	24	16	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FILTERED OUTPUT

Effects: Wildlife Food Availability and Quality

Sub-Area D: i=4

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	24	24	0	0	24	0	36
saltmarsh	0	24	24	0	0	24	0	36
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	16	0	0	0	0	24
shallow subtidal	24	24	24	0	24	24	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	24	0	0	24	0	0

Sub-Area E: i=5

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	24	12	0	0	24	0	12
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	8	4	0	4	8	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	24	12	0	0	24	12	0

Sub-Area F: i=6

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	16	0	0	8	0	16
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	4	8	0	0	4	0	8
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	4	8	8	8	4	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	16	0	0	8	24	0

FILTERED OUTPUT

Effects: Wildlife Food Availability and Quality

Sub-Area G: i=7

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	8	12	0	0	8	0	12
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	8	12	0	0	8	0	12
rocky shoreline	0	0	24	0	0	0	0	24
shallow subtidal	12	8	12	0	12	8	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	8	12	0	0	8	8	0

Sub-Area H: i=8

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	4	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	12	0	0	0	0	0
rocky shoreline	0	0	4	0	0	0	0	0
shallow subtidal	0	0	4	0	4	0	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	0	0	8	0

Sub-Area I: i=9

Habitat	Sources							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	4	0	0	12	0	4
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	4	0	0	12	0	4
rocky shoreline	0	0	12	0	0	0	0	12
shallow subtidal	0	0	4	0	4	12	0	0
deep benthic	0	0	0	0	0	0	0	0
open water	0	0	0	0	0	0	0	0
stream mouth	0	0	4	0	0	12	8	0

FILTERED OUTPUT

Effects: Wildlife Food Availability and Quality

Sub-Area J: i=10

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	0	0	0	12	36	0	0	0
open water	0	0	24	0	36	0	0	0
stream mouth	0	0	0	0	0	0	0	0

Sub-Area K: i=11

Habitat	**Sources**							
	treated discharges	contam. runoff	accid. spills	fish wastes	vessel traffic	constr. develop.	hatchery fish	shoreline activity
mudflats	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0
spits & beaches	0	0	0	0	0	0	0	0
rocky shoreline	0	0	0	0	0	0	0	0
shallow subtidal	0	0	0	0	0	0	0	0
deep benthic	36	0	0	12	24	0	0	0
open water	36	0	24	0	24	0	0	0
stream mouth	0	0	0	0	0	0	0	0

FINAL OUTPUT-Sources and Habitats

Exposure

STEP 6: *Calculate the risk from each source (Sij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for k=1 to 8.*

Risk from a Source (summation of all habitats)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
treated discharges	0	0	0	24	0	0	12	0	0	0	72
contaminated runoff	36	36	48	96	56	28	32	0	0	0	0
spills/accidental spills	48	44	60	112	28	56	72	28	28	24	24
seafood and fish wastes	0	0	24	0	0	8	0	0	0	12	12
vessel traffic	24	12	24	24	4	16	12	4	4	72	48
construction/development	0	36	32	96	56	24	32	0	48	0	0
hatchery	0	0	0	0	12	36	8	8	8	0	0
shoreline activity	28	40	36	96	12	24	48	0	20	0	0
Median	12	24	28	60	12	24	22	0	6	0	6
Maximum Value	48	44	60	112	56	48	72	28	48	72	72

STEP 7: *Calculate the risk to each habitat (Hij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8.*

Risk to a Habitat (summation of all sources)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
mudflats	12	40	0	108	72	48	40	4	20	0	0
saltmarsh	0	0	0	108	0	0	0	0	0	0	0
spits/beaches	36	20	88	0	0	24	40	12	20	0	0
rocky intertidal	24	24	24	40	0	0	48	4	24	0	0
shallow subtidal	24	48	112	120	24	32	52	8	20	0	0
deep benthic	8	0	0	0	0	0	0	0	0	48	72
open water	24	0	0	0	0	0	0	0	0	60	84
stream mouth	8	36	0	72	72	56	36	12	24	0	0
Median	18	22	0	56	0	12	38	4	20	0	0
Maximum Value	36	48	112	120	72	56	52	12	24	60	84

FINAL OUTPUT-Relative Risk to Sub-Areas

Exposure

STEP 8: *Calculate the total relative risk to each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8, k=1 to 8.*

Total Relative Risk Summed for Each Sub-Area

Sub-Area	Relative Risk Score
A. Shoup Bay	136
B. Mineral and Gold Creeks	168
C. City of Valdez	224
D. Duck Flats and Old Valdez	448
E. Robe and Lowe Rivers	168
F. Dayville Flats and Solomon Gulch	160
G. Valdez Marine Terminal	216
H. Sawmill to Seven-Mile Creeks	40
I. Anderson Bay	108
J. Western Port	108
K. Eastern Port	156

Maximum Relative Risk when all sources and habitat ranks are 6 and all filters are 1 = **2304**

FINAL OUTPUT-Sources and Habitats

Water Quality

STEP 6: *Calculate the risk from each source (Sij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for k=1 to 8.*

Risk from a Source (summation of all habitats)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
treated discharges	0	0	0	24	0	0	12	0	0	0	72
contaminated runoff	36	36	48	96	56	24	32	0	0	0	0
spills/accidental spills	48	44	60	112	28	48	72	28	28	24	24
seafood and fish wastes	0	0	24	0	0	8	0	0	0	12	12
vessel traffic	24	12	24	24	4	8	12	4	4	72	48
construction/development	0	36	32	96	56	24	32	0	48	0	0
hatchery	0	0	0	0	12	24	8	8	8	0	0
shoreline activity	0	0	0	0	0	0	0	0	0	0	0
Median	0	6	24	24	8	16	12	0	2	0	6
Maximum Value	48	44	60	112	56	48	72	28	48	72	72

STEP 7: *Calculate the risk to each habitat (Hij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8.*

Risk to a Habitat (summation of all sources)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
mudflats	8	24	0	72	60	32	28	4	16	0	0
saltmarsh	0	0	0	72	0	0	0	0	0	0	0
spits/beaches	24	12	64	0	0	16	28	12	16	0	0
rocky intertidal	12	8	12	16	0	0	24	4	12	0	0
shallow subtidal	24	48	112	120	24	32	52	8	20	0	0
deep benthic	8	0	0	0	0	0	0	0	0	48	72
open water	24	0	0	0	0	0	0	0	0	60	84
stream mouth	8	36	0	72	72	56	36	12	24	0	0
Median	10	10	0	44	0	8	26	4	14	0	0
Maximum Value	24	48	112	120	72	56	52	12	24	60	84

FINAL OUTPUT-Relative Risk to Sub-Areas

Water Quality

STEP 8: *Calculate the total relative risk to each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8, k=1 to 8.*

Total Relative Risk Summed for Each Sub-Area

Sub-Area	Relative Risk Score
A. Shoup Bay	108
B. Mineral and Gold Creeks	128
C. City of Valdez	188
D. Duck Flats and Old Valdez	352
E. Robe and Lowe Rivers	156
F. Dayville Flats and Solomon Gulch	136
G. Valdez Marine Terminal	168
H. Sawmill to Seven-Mile Creeks	40
I. Anderson Bay	88
J. Western Port	108
K. Eastern Port	156

Maximum Relative Risk when all sources and habitat ranks are 6 and all filters are 1 = **1008**

FINAL OUTPUT-Sources and Habitats

Sediment Quality

STEP 6: *Calculate the risk from each source (Sij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for k=1 to 8.*

Risk from a Source (summation of all habitats)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
treated discharges	0	0	0	24	0	0	12	0	0	0	72
contaminated runoff	36	36	48	96	56	24	32	0	0	0	0
spills/accidental spills	36	36	48	96	28	48	48	24	16	24	24
seafood and fish wastes	0	0	24	0	0	8	0	0	0	12	12
vessel traffic	24	12	24	24	4	8	12	4	4	72	48
construction/development	0	36	32	96	56	24	32	0	48	0	0
hatchery	0	0	0	0	12	24	8	8	8	0	0
shoreline activity	16	24	24	72	12	24	24	0	8	0	0
Median	8	18	24	48	12	24	18	0	6	0	6
Maximum Value	36	36	48	96	56	48	48	24	48	72	72

STEP 7: *Calculate the risk to each habitat (Hij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8.*

Risk to a Habitat (summation of all sources)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
mudflats	12	40	0	108	72	48	40	4	20	0	0
saltmarsh	0	0	0	108	0	0	0	0	0	0	0
spits/beaches	36	20	88	0	0	24	40	12	20	0	0
rocky intertidal	0	0	0	0	0	0	0	0	0	0	0
shallow subtidal	24	48	112	120	24	32	52	8	20	0	0
deep benthic	8	0	0	0	0	0	0	0	0	48	72
open water	24	0	0	0	0	0	0	0	0	60	84
stream mouth	8	36	0	72	72	56	36	12	24	0	0
Median	10	10	0	36	0	12	18	2	10	0	0
Maximum Value	36	48	112	120	72	56	52	12	24	60	84

FINAL OUTPUT-Relative Risk to Sub-Areas

Sediment Quality

STEP 8: *Calculate the total relative risk to each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8, k=1 to 8.*

Total Relative Risk Summed for Each Sub-Area

Sub-Area	Relative Risk Score
A. Shoup Bay	112
B. Mineral and Gold Creeks	144
C. City of Valdez	200
D. Duck Flats and Old Valdez	408
E. Robe and Lowe Rivers	168
F. Dayville Flats and Solomon Gulch	160
G. Valdez Marine Terminal	168
H. Sawmill to Seven-Mile Creeks	36
I. Anderson Bay	84
J. Western Port	108
K. Eastern Port	156

Maximum Relative Risk when all sources and habitat ranks are 6 and all filters are 1 = **1116**

FINAL OUTPUT-Sources and Habitats

Hatchery Salmon Culturing and Migration

STEP 6: *Calculate the risk from each source (Sij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for k=1 to 8.*

Risk from a Source (summation of all habitats)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
treated discharges	0	0	0	24	0	0	12	0	0	0	36
contaminated runoff	36	36	48	96	56	24	32	0	0	0	0
spills/accidental spills	48	44	60	112	28	48	72	28	28	24	24
seafood and fish wastes	0	0	24	0	0	8	0	0	0	0	0
vessel traffic	16	12	24	24	4	8	12	4	4	36	24
construction/development	0	36	32	96	56	24	32	0	48	0	0
hatchery	0	0	0	0	12	24	8	8	8	0	0
shoreline activity	0	0	0	0	0	0	0	0	0	0	0
Median	0	6	24	24	8	16	12	0	2	0	0
Maximum Value	48	44	60	112	56	48	72	28	48	36	36

STEP 7: *Calculate the risk to each habitat (Hij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8.*

Risk to a Habitat (summation of all sources)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
mudflats	8	24	0	72	60	32	28	4	16	0	0
saltmarsh	0	0	0	72	0	0	0	0	0	0	0
spits/beaches	24	12	64	0	0	16	28	12	16	0	0
rocky intertidal	12	8	12	16	0	0	24	4	12	0	0
shallow subtidal	24	48	112	120	24	32	52	8	20	0	0
deep benthic	0	0	0	0	0	0	0	0	0	0	0
open water	24	0	0	0	0	0	0	0	0	60	84
stream mouth	8	36	0	72	72	56	36	12	24	0	0
Median	10	10	0	44	0	8	26	4	14	0	0
Maximum Value	24	48	112	120	72	56	52	12	24	60	84

FINAL OUTPUT-Relative Risk to Sub-Areas

Hatchery Salmon Culturing and Migration

STEP 8: *Calculate the total relative risk to each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8, k=1 to 8.*

Total Relative Risk Summed for Each Sub-Area

Sub-Area	Relative Risk Score
A. Shoup Bay	100
B. Mineral and Gold Creeks	128
C. City of Valdez	188
D. Duck Flats and Old Valdez	352
E. Robe and Lowe Rivers	156
F. Dayville Flats and Solomon Gulch	136
G. Valdez Marine Terminal	168
H. Sawmill to Seven-Mile Creeks	40
I. Anderson Bay	88
J. Western Port	60
K. Eastern Port	84

Maximum Relative Risk when all sources and habitat ranks are 6 and all filters are 1: **900**

FINAL OUTPUT-Sources and Habitats

Benthic Fishes and Shellfishes

STEP 6: *Calculate the risk from each source (Sij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for k=1 to 8.*

Risk from a Source (summation of all habitats)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
treated discharges	0	0	0	24	0	0	12	0	0	0	36
contaminated runoff	8	12	24	24	8	4	8	0	0	0	0
spills/accidental spills	20	20	36	40	4	8	36	8	16	0	0
seafood and fish wastes	0	0	24	0	0	8	0	0	0	12	12
vessel traffic	16	12	24	24	4	8	12	4	4	36	24
construction/development	0	12	16	24	8	4	8	0	12	0	0
hatchery	0	0	0	0	0	0	0	0	0	0	0
shoreline activity	0	0	0	0	0	0	0	0	0	0	0
Median	0	6	20	24	2	4	8	0	0	0	0
Maximum Value	20	20	36	40	8	8	36	8	16	36	36

STEP 7: *Calculate the risk to each habitat (Hij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8.*

Risk to a Habitat (summation of all sources)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
mudflats	0	0	0	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	0	0	0	0	0	0	0	0
spits/beaches	0	0	0	0	0	0	0	0	0	0	0
rocky intertidal	12	8	12	16	0	0	24	4	12	0	0
shallow subtidal	24	48	112	120	24	32	52	8	20	0	0
deep benthic	8	0	0	0	0	0	0	0	0	48	72
open water	0	0	0	0	0	0	0	0	0	0	0
stream mouth	0	0	0	0	0	0	0	0	0	0	0
Median	0	0	0	0	0	0	0	0	0	0	0
Maximum Value	24	48	112	120	24	32	52	8	20	48	72

FINAL OUTPUT-Relative Risk to Sub-Areas

Benthic Fishes and Shellfishes

STEP 8: *Calculate the total relative risk to each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8, k=1 to 8.*

Total Relative Risk Summed for Each Sub-Area

Sub-Area	Relative Risk Score
A. Shoup Bay	44
B. Mineral and Gold Creeks	56
C. City of Valdez	124
D. Duck Flats and Old Valdez	136
E. Robe and Lowe Rivers	24
F. Dayville Flats and Solomon Gulch	32
G. Valdez Marine Terminal	76
H. Sawmill to Seven-Mile Creeks	12
I. Anderson Bay	32
J. Western Port	48
K. Eastern Port	72

Maximum Relative Risk when all sources and habitat ranks are 6 and all filters are 1: **396**

FINAL OUTPUT-Sources and Habitats

Wild Anadromous Fishes

STEP 6: *Calculate the risk from each source (Sij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for k=1 to 8.*

Risk from a Source (summation of all habitats)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
treated discharges	0	0	0	24	0	0	12	0	0	0	36
contaminated runoff	32	28	48	72	32	16	24	0	0	0	0
spills/accidental spills	32	28	48	72	16	32	36	20	12	24	24
seafood and fish wastes	0	0	24	0	0	8	0	0	0	0	0
vessel traffic	16	12	24	24	4	8	12	4	4	36	24
construction/development	0	28	32	72	32	16	24	0	36	0	0
hatchery	0	0	0	0	12	24	8	8	8	0	0
shoreline activity	0	0	0	0	0	0	0	0	0	0	0
Median	0	6	24	24	8	12	12	0	2	0	0
Maximum Value	32	28	48	72	32	32	36	20	36	36	36

STEP 7: *Calculate the risk to each habitat (Hij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8.*

Risk to a Habitat (summation of all sources)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
mudflats	0	0	0	0	0	0	0	0	0	0	0
saltmarsh	0	0	0	72	0	0	0	0	0	0	0
spits/beaches	24	12	64	0	0	16	28	12	16	0	0
rocky intertidal	0	0	0	0	0	0	0	0	0	0	0
shallow subtidal	24	48	112	120	24	32	52	8	20	0	0
deep benthic	0	0	0	0	0	0	0	0	0	0	0
open water	24	0	0	0	0	0	0	0	0	60	84
stream mouth	8	36	0	72	72	56	36	12	24	0	0
Median	4	0	0	0	0	0	0	0	0	0	0
Maximum Value	24	48	112	120	72	56	52	12	24	60	84

FINAL OUTPUT-Relative Risk to Sub-Areas

Wild Anadromous Fishes

STEP 8: *Calculate the total relative risk to each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8, k=1 to 8.*

Total Relative Risk Summed for Each Sub-Area

Sub-Area	Relative Risk Score
A. Shoup Bay	80
B. Mineral and Gold Creeks	96
C. City of Valdez	176
D. Duck Flats and Old Valdez	264
E. Robe and Lowe Rivers	96
F. Dayville Flats and Solomon Gulch	104
G. Valdez Marine Terminal	116
H. Sawmill to Seven-Mile Creeks	32
I. Anderson Bay	60
J. Western Port	60
K. Eastern Port	84

Maximum Relative Risk when all sources and habitat ranks are 6 and all filters are 1: **756**

FINAL OUTPUT-Sources and Habitats

Bird Reproduction

STEP 6: *Calculate the risk from each source (Sij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for k=1 to 8.*

Risk from a Source (summation of all habitats)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
treated discharges	0	0	0	24	0	0	12	0	0	0	36
contaminated runoff	36	36	48	96	56	24	32	0	0	0	0
spills/accidental spills	48	44	60	112	28	48	72	28	28	24	24
seafood and fish wastes	0	0	0	0	0	0	0	0	0	0	0
vessel traffic	16	12	24	24	4	8	12	4	4	36	24
construction/development	0	24	16	72	48	20	24	0	36	0	0
hatchery	0	0	0	0	0	0	0	0	0	0	0
shoreline activity	28	40	36	96	12	24	48	0	20	0	0
Median	8	18	20	48	8	14	18	0	2	0	0
Maximum Value	48	44	60	112	56	48	72	28	36	36	36

STEP 7: *Calculate the risk to each habitat (Hij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8.*

Risk to a Habitat (summation of all sources)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
mudflats	12	40	0	108	72	48	40	4	20	0	0
saltmarsh	0	0	0	108	0	0	0	0	0	0	0
spits/beaches	36	20	88	0	0	24	40	12	20	0	0
rocky intertidal	24	24	24	40	0	0	48	4	24	0	0
shallow subtidal	24	36	72	96	16	20	44	8	8	0	0
deep benthic	0	0	0	0	0	0	0	0	0	0	0
open water	24	0	0	0	0	0	0	0	0	60	84
stream mouth	8	36	0	72	60	32	28	4	16	0	0
Median	18	22	0	56	0	10	34	4	12	0	0
Maximum Value	36	40	88	108	72	48	48	12	24	60	84

FINAL OUTPUT-Relative Risk to Sub-Areas

Bird Reproduction

STEP 8: *Calculate the total relative risk to each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8, k=1 to 8.*

Total Relative Risk Summed for Each Sub-Area

Sub-Area	Relative Risk Score
A. Shoup Bay	128
B. Mineral and Gold Creeks	156
C. City of Valdez	184
D. Duck Flats and Old Valdez	424
E. Robe and Lowe Rivers	148
F. Dayville Flats and Solomon Gulch	124
G. Valdez Marine Terminal	200
H. Sawmill to Seven-Mile Creeks	32
I. Anderson Bay	88
J. Western Port	60
K. Eastern Port	84

Maximum Relative Risk when all sources and habitat ranks are 6 and all filters are 1: **900**

FINAL OUTPUT-Sources and Habitats

Wildlife Food Availability and Quality

STEP 6: *Calculate the risk from each source (Sij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for k=1 to 8.*

Risk from a Source (summation of all habitats)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
treated discharges	0	0	0	24	0	0	12	0	0	0	72
contaminated runoff	36	36	48	96	56	24	32	0	0	0	0
spills/accidental spills	48	44	60	112	28	48	72	28	28	24	24
seafood and fish wastes	0	0	24	0	0	8	0	0	0	12	12
vessel traffic	24	12	24	24	4	8	12	4	4	72	48
construction/development	0	36	32	96	56	24	32	0	48	0	0
hatchery	0	0	0	0	12	24	8	8	8	0	0
shoreline activity	28	40	36	96	12	24	48	0	20	0	0
Median	12	24	28	60	12	24	22	0	6	0	6
Maximum Value	48	44	60	112	56	48	72	28	48	72	72

STEP 7: *Calculate the risk to each habitat (Hij) for each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8.*

Risk to a Habitat (summation of all sources)

Sources	Sub-Area										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.
mudflats	12	40	0	108	72	48	40	4	20	0	0
saltmarsh	0	0	0	108	0	0	0	0	0	0	0
spits/beaches	36	20	88	0	0	24	40	12	20	0	0
rocky intertidal	24	24	24	40	0	0	48	4	24	0	0
shallow subtidal	24	48	112	120	24	32	52	8	20	0	0
deep benthic	8	0	0	0	0	0	0	0	0	48	72
open water	24	0	0	0	0	0	0	0	0	60	84
stream mouth	8	36	0	72	72	56	36	12	24	0	0
Median	18	22	0	56	0	12	38	4	20	0	0
Maximum Value	36	48	112	120	72	56	52	12	24	60	84

FINAL OUTPUT-Relative Risk to Sub-Areas

Wildlife Food Availability and Quality

STEP 8: *Calculate the total relative risk to each sub-area (i = 1...8) with the formula [Sum (Sij x Hik x Wjk)] for j=1 to 8, k=1 to 8.*

Total Relative Risk Summed for Each Sub-Area

Sub-Area	Relative Risk Score
A. Shoup Bay	136
B. Mineral and Gold Creeks	168
C. City of Valdez	224
D. Duck Flats and Old Valdez	448
E. Robe and Lowe Rivers	168
F. Dayville Flats and Solomon Gulch	160
G. Valdez Marine Terminal	216
H. Sawmill to Seven-Mile Creeks	40
I. Anderson Bay	108
J. Western Port	108
K. Eastern Port	156

Maximum Relative Risk when all sources and habitat ranks are 6 and all filters are 1: **1188**

Appendix E: ∑ PAH Model

Appendix E lists PAH data from Port Valdez sediments and the results of the Swartz (1995) sediment toxicity model applied to this data. Although the model was developed for use with 13 PAHs, we have used only ten.

The data used in the model is found on pages E3–E9. The sediment concentrations for the ten PAHs are listed separately for all field replicates from the sample stations. Any sample that was not detected during chemical analysis was set at the detection limit reported by the analyst. These limits were similar with the exception of the U.S. ACE data, where detection limits for each PAH were higher than in the other analyses. Total Organic Carbon measurements in the sediment samples are given in the column labeled ***TOC***. This information is used in the model and determines the amount of hydrocarbon that is likely to bind to the sediments (*i.e*., the greater the TOC, the greater the binding capacity of the sediments).

Steps 1, 2, and 3 of the model are listed in pages E10–E23. The model results are listed on pages E24–E30. The results list the ***Total Toxic Units*** (a measure of the toxicity associated with the chemical concentrations of all ten PAHs). Also listed are the ***Probability of Toxicity, Probability of Uncertain Toxicity***, and ***Probability of No Toxicity*** of the sediment samples to laboratory tested marine amphipods. The model defines toxicity as amphipod mortality greater than 24% in laboratory tests. Uncertain toxicity is defined as mortality between 13 and 24%, and no toxicity as mortality less than 13%.

The sources for PAH concentrations in the Port Valdez sediments are listed in the column labeled ***Data*** and include:

- *UAF-M:* yearly monitoring data from 1992 to 1995 collected throughout the Port as part of the Alyeska Environmental Monitoring Program and analyzed by Dr. David Shaw, University of Alaska Fairbanks.
- *UAF-D*: data collected in 1992 in association with construction of the SERVS dock and analyzed by Dr. David Shaw, University of Alaska, Fairbanks. Alaska.
- *UAF-S:* data collected in 1995 from two sites near the Solomon Gulch Hatchery and analyzed by Dr. David Shaw, University of Alaska, Fairbanks, Alaska.

- *LTEMP:* yearly monitoring data from 1993 to 1995 collected from two stations in the Port as part of the RCAC's Long Term Monitoring Program and analyzed by Kinnetics Laboratory, Anchorage, Alaska.
- *U.S. ACE:* samples taken in 1995 from inside the small boat harbor by the U.S. Army Corps of Engineers.

The column labeled *Area* divides the data and results into the sub-areas delineated in the ecological risk assessment. Because of the quantity of data in some of the sub-areas, further divisions have been included here. The sub-areas are:

- *B* - Mineral and Gold Creeks
- *C* - City of Valdez
- *F* - Dayville Flats and Solomon Gulch
- *G* - Valdez Marine Terminal
- G/*K d* - sampling station nearest the Ballast Water Treatment Plant diffuser on the border between the Valdez Marine Terminal and Eastern Deep Port sub-areas
- *I* - Anderson Bay
- *J* - Western Deep Port
- *K* - Eastern Deep Port
- *K mz* - Ballast Water Treatment Plant mixing zone in sub-area K

SAMPLE INFORMATION (levels below detection set at detection limit)						CONCENTRATION OF PAH (µg/kg dry sediment) IN PORT VALDEZ SEDIMENTS										
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)pyrene	TOC
92	B	UAF	37	1	48-58	3.60	0.00	8.30	48.70	0.00	17.80	25.50	3.10	5.60	0.00	0.54
92	B	UAF	37	2	48-58	1.00	0.30	2.10	6.50	0.30	5.50	12.20	1.00	0.30	0.30	0.49
92	B	UAF	37	3	48-58	1.20	0.50	2.50	3.20	0.50	4.80	5.50	0.30	1.30	0.50	0.59
93	B	UAF	37	1	49-50	1.50	0.00	3.30	7.40	0.00	5.80	3.90	1.00	0.00	0.00	0.53
93	B	UAF	37	2	49-50	0.00	0.50	1.40	4.90	0.50	3.80	0.50	0.00	0.50	0.50	0.50
93	B	UAF	37	3	49-50	1.00	1.00	1.20	5.80	1.00	4.50	2.20	1.00	1.00	1.00	0.55
94	B	UAF	37	1	27	0.00	0.00	1.50	3.30	0.00	2.90	1.90	0.00	0.00	0.00	0.48
94	B	UAF	37	2	27	1.00	0.50	1.40	6.80	0.50	4.70	7.00	0.50	0.50	0.50	0.50
94	B	UAF	37	3	27	1.20	1.00	2.00	8.10	1.00	5.80	6.70	1.00	1.00	1.00	0.48
95	B	UAF	37	1	51	0.50	0.00	1.50	5.40	0.00	4.00	5.60	0.00	0.00	0.00	0.50
95	B	UAF	37	2	51	1.90	0.50	1.40	7.60	0.50	5.70	4.60	0.50	0.50	0.50	0.46
95	B	UAF	37	3	51	2.00	1.00	1.60	7.50	1.00	5.50	6.10	1.00	1.00	1.00	0.54
93	B	LTEMP	GOC-s(1)	1	34	1.80	0.30	0.80	3.10	0.40	3.10	2.50	0.90	1.60	0.70	0.70
93	B	LTEMP	GOC-s(1)	2	28	1.70	0.30	0.60	3.00	0.70	2.70	1.70	0.70	1.50	0.40	0.60
93	B	LTEMP	GOC-s(1)	3	28	1.60	0.40	1.10	4.20	1.40	3.40	2.30	1.00	2.20	0.80	0.80
93	B	LTEMP	GOC-s(2)	1	28	1.50	0.30	0.70	5.20	0.80	4.20	3.80	1.10	2.00	1.10	0.80
93	B	LTEMP	GOC-s(2)	2	27	0.80	0.20	0.40	1.80	0.30	2.30	2.00	0.80	0.90	0.60	0.50
93	B	LTEMP	GOC-s(2)	3	33	0.80	0.10	0.40	1.70	0.20	1.60	1.10	0.50	0.60	0.30	0.60
94	B	LTEMP	GOC-s(3)	1	30	1.70	0.40	0.80	4.40	0.40	2.50	1.80	0.70	1.30	0.50	0.53
94	B	LTEMP	GOC-s(3)	2	31	1.70	0.40	0.80	2.10	0.30	2.20	1.50	0.60	1.50	0.50	0.58
94	B	LTEMP	GOC-s(3)	3	31	1.90	0.50	1.20	7.40	1.40	10.40	12.00	4.30	4.40	4.10	0.52
94	B	LTEMP	GOC-s(4)	1	27	1.50	0.30	0.80	3.10	0.60	1.80	1.30	0.50	1.80	0.40	0.47
94	B	LTEMP	GOC-s(4)	2	25	1.80	0.10	0.40	0.90	0.20	1.10	0.90	0.20	0.70	0.30	0.56
94	B	LTEMP	GOC-s(4)	3	21	1.70	0.60	1.10	6.60	1.00	5.90	5.40	1.50	2.50	1.80	0.63
95	B	LTEMP	GOC-s(5)	1	30	1.60	0.30	0.70	2.50	0.90	5.20	4.30	3.30	3.40	2.10	0.57
95	B	LTEMP	GOC-s(5)	2	32	1.70	0.30	0.50	2.30	0.30	1.80	1.30	0.80	1.60	0.70	0.54
95	B	LTEMP	GOC-s(5)	3	33	1.50	0.50	0.50	1.90	1.30	1.60	1.10	1.00	1.70	0.70	0.54
95	B	LTEMP	GOC-s(6)	1	28	1.50	0.90	1.10	4.40	0.90	4.30	3.40	1.00	2.80	1.00	0.67
95	B	LTEMP	GOC-s(6)	2	30	1.70	0.70	1.30	3.90	0.90	3.40	2.60	1.20	3.60	0.90	0.66
95	B	LTEMP	GOC-s(6)	3	26	1.70	1.20	0.70	0.70	0.50	2.40	2.20	0.70	0.20	0.60	0.61
95	C	US ACE	1	1	7*	565.00	565.00	565.00	565.00	565.00	565.00	565.00	565.00	565.00	565.00	0.69
95	C	US ACE	1	2	7*	533.00	533.00	533.00	533.00	533.00	533.00	533.00	533.00	533.00	533.00	0.63
95	C	US ACE	2	1	8*	623.00	623.00	623.00	2830.00	623.00	2830.00	1890.00	623.00	736.00	623.00	1.09
95	C	US ACE	3	1	7*	579.00	579.00	579.00	2980.00	930.00	5610.00	3860.00	754.00	2630.00	579.00	1.04
95	C	US ACE	4	1	7*	633.00	633.00	633.00	633.00	633.00	833.00	633.00	633.00	633.00	633.00	1.07
95	C	US ACE	5	1	9	576.00	576.00	576.00	576.00	576.00	576.00	576.00	576.00	576.00	576.00	0.87
95	C	US ACE	6	1	7	552.00	552.00	552.00	552.00	552.00	552.00	552.00	552.00	552.00	552.00	0.89
94	C	UAF	E1D	1	5	*data not available*										
94	C	UAF	E1D	2	5	*data not available*										
94	C	UAF	E1D	3	5	*data not available*										

SAMPLE INFORMATION (levels below detection set at detection limit)						CONCENTRATION OF PAH (µg/kg dry sediment) IN PORT VALDEZ SEDIMENTS										
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)pyrene	TOC
94	C	UAF	E2D	1	10	3.00	0.00	0.50	13.40	1.00	18.00	14.80	0.00	0.00	0.00	0.46
94	C	UAF	E2D	2	10	2.20	0.50	2.10	6.50	0.00	8.30	10.40	1.50	1.00	0.50	0.46
94	C	UAF	E2D	3	10	1.10	1.00	1.20	7.20	1.00	9.10	9.30	1.00	1.60	1.00	0.46
94	C	UAF	E3D	1	20	2.00	0.00	0.50	0.50	0.00	12.10	9.90	0.00	0.00	0.00	0.48
94	C	UAF	E3D	2	20	1.20	0.50	2.50	7.20	0.50	8.10	8.70	1.50	1.40	0.50	0.43
94	C	UAF	E3D	3	20	1.10	1.00	1.30	6.70	1.00	8.70	6.10	1.00	1.00	1.00	0.48
93	C	UAF	E4S	1	20	1.70	0.00	0.50	3.90	0.00	5.80	4.60	0.00	0.00	0.00	0.48
93	C	UAF	E4S	2	20	2.10	1.00	1.30	5.30	0.50	6.00	6.60	0.50	0.50	0.50	0.48
93	C	UAF	E4S	3	20	8.50	1.10	5.30	18.80	1.00	0.50	1.30	1.00	1.00	1.00	0.52
94	C	UAF	W1D	1	5	0.00	0.00	0.00	2.30	0.00	9.10	6.70	0.00	0.00	0.00	0.50
94	C	UAF	W1D	2	5	2.10	0.50	2.20	7.50	0.50	0.00	11.30	1.10	1.50	0.50	0.59
94	C	UAF	W1D	3	5	1.00	1.00	1.00	5.60	1.00	1.00	4.40	1.00	1.00	1.00	0.51
94	C	UAF	W2D	1	30	3.90	0.00	2.50	5.90	0.00	16.80	23.90	0.50	1.20	0.00	0.84
94	C	UAF	W2D	2	30	2.40	0.50	0.50	9.20	0.50	21.40	48.60	1.10	0.50	0.50	0.70
94	C	UAF	W2D	3	30	3.40	1.00	1.90	10.70	1.00	0.50	13.00	2.10	3.20	1.00	0.76
95	F	UAF	SGH-1	1		1.40	0.50	0.50	3.00	0.00	9.90	0.50	0.00	0.00	0.00	0.50
95	F	UAF	SGH-1	2		0.50	1.20	1.40	7.40	1.00	0.50	2.50	0.50	0.50	0.50	0.44
95	F	UAF	SGH-1	3		2.50	3.10	4.20	40.40	2.60	1.20	1.90	1.00	1.00	1.00	0.52
95	F	UAF	SGH-2	1		0.00	0.00	0.00	3.50	0.00	2.90	4.30	0.00	0.00	0.00	0.44
95	F	UAF	SGH-2	2		0.50	0.50	0.50	3.00	0.50	2.60	3.40	0.50	0.50	0.50	0.45
95	F	UAF	SGH-2	3		1.00	1.00	1.00	3.40	1.00	2.60	4.20	1.00	1.00	1.00	0.49
92	G	UAF	82	1	43-66	3.60	10.40	8.50	60.60	16.60	48.20	62.30	19.80	32.10	21.00	0.66
92	G	UAF	82	2	43-66	2.30	0.30	2.10	10.60	16.90	10.20	12.30	2.50	0.30	25.00	0.56
92	G	UAF	82	3	43-66	1.40	2.20	4.40	21.60	4.30	21.60	17.20	7.90	14.90	6.10	0.80
92	G/K d	UAF	D33	1	53-71	6.90	4.40	6.80	68.10	0.30	64.10	57.20	0.30	0.00	14.10	0.65
92	G/K d	UAF	D33	2	53-71	7.60	11.50	13.00	102.60	19.70	105.50	112.10	42.20	88.70	52.40	0.86
92	G/K d	UAF	D33	3	53-71	2.80	5.10	7.70	45.00	3.00	57.20	50.20	14.30	0.50	11.70	0.78
94	G/K d	UAF	D33	1	49-55	0.50	2.70	3.60	22.30	3.40	20.00	15.80	9.90	21.80	19.80	0.63
94	G/K d	UAF	D33	2	49-55	1.90	8.10	9.80	56.00	8.60	54.50	63.80	20.10	20.90	13.20	0.82
94	G/K d	UAF	D33	3	49-55	3.80	5.40	8.50	73.90	5.50	69.30	77.30	18.60	44.60	23.50	0.68
95	G/K d	UAF	D33	1	55	1.10	0.50	18.20	13.70	1.40	123.10	27.70	6.60	21.40	43.30	0.60
95	G/K d	UAF	D33	2	55	4.70	21.40	16.00	98.30	19.50	104.60	70.90	34.40	59.30	41.40	0.76
95	G/K d	UAF	D33	3	55	4.30	16.20	15.80	128.70	24.70	121.90	123.30	36.10	53.80	30.80	0.77
92	I	UAF	90	1	45-54	0.30	0.00	0.30	21.90	0.00	6.50	24.50	0.30	9.50	0.00	0.64
92	I	UAF	90	2	45-54	1.70	0.80	2.90	8.80	0.30	5.40	5.90	1.00	2.10	0.30	0.81
92	I	UAF	90	3	45-54	1.60	0.50	2.70	7.90	0.50	6.10	0.30	0.80	2.30	0.50	0.97
93	I	UAF	91	1	44-50	0.00	0.00	0.00	6.30	0.00	2.10	4.60	0.00	0.00	0.00	0.67
93	I	UAF	91	2	44-50	0.50	0.50	1.00	2.00	0.50	1.20	1.10	0.50	1.00	0.50	0.66
93	I	UAF	91	3	44-50	1.00	1.00	1.40	7.80	1.00	5.60	1.50	1.00	1.80	1.00	0.73
94	I	UAF	91	1	40	0.50	0.00	1.00	4.70	0.00	3.00	1.90	0.00	1.00	0.00	1.01
94	I	UAF	91	2	40	1.80	0.50	1.30	6.20	0.50	3.70	5.50	0.50	0.00	0.50	0.78

SAMPLE INFORMATION (levels below detection set at detection limit)						CONCENTRATION OF PAH (µg/kg dry sediment) IN PORT VALDEZ SEDIMENTS										
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)pyrene	TOC
94	I	UAF	91	3	40	1.70	1.00	1.10	6.30	1.00	4.20	5.70	1.00	1.00	1.00	0.74
94	I	UAF	91	1	40	0.50	0.00	1.00	4.70	0.00	3.00	1.90	0.00	1.00	0.00	1.01
94	I	UAF	91	2	40	1.80	0.50	1.30	6.20	0.50	3.70	5.50	0.50	0.00	0.50	0.78
94	I	UAF	91	3	40	1.70	1.00	1.10	6.30	1.00	4.20	5.70	1.00	1.00	1.00	0.74
95	I	UAF	91	1	45	0.00	0.00	1.20	6.50	0.00	3.00	3.60	0.00	0.00	0.00	0.65
95	I	UAF	91	2	45	1.30	0.50	2.10	7.90	0.50	5.60	5.80	0.50	1.00	0.50	0.76
95	I	UAF	91	3	45	1.00	1.00	2.00	7.40	1.00	4.60	4.90	1.00	1.00	1.00	0.67
92	J	UAF	40	1	238-241	3.40	0.00	3.20	13.10	0.00	8.70	16.90	0.00	0.00	18.10	0.58
92	J	UAF	40	2	238-241	1.80	0.30	2.40	8.70	0.30	5.40	7.30	1.00	0.50	0.00	0.56
92	J	UAF	40	3	238-241	0.30	0.50	2.10	5.00	0.50	3.10	5.70	0.50	0.80	0.50	0.52
93	J	UAF	40	1	235-237	2.10	0.00	2.30	9.30	0.00	5.20	6.20	0.00	0.00	0.00	0.54
93	J	UAF	40	2	235-237	1.00	0.50	1.10	3.30	0.50	2.20	1.70	0.50	0.50	0.50	0.49
93	J	UAF	40	3	235-237	0.50	1.00	0.50	5.00	1.00	3.60	2.40	1.00	1.00	1.00	0.53
94	J	UAF	40	1	253	2.10	1.60	1.80	3.60	0.00	2.20	1.20	0.00	1.10	0.00	0.51
94	J	UAF	40	2	253	0.50	0.00	1.40	5.80	0.50	3.70	5.00	0.50	0.00	0.50	0.57
94	J	UAF	40	3	253	1.20	1.00	0.50	5.70	1.00	3.40	4.00	1.00	1.00	1.00	0.56
95	J	UAF	40	1	239	2.00	0.00	1.50	4.80	0.00	2.50	2.50	0.00	0.00	0.00	0.47
95	J	UAF	40	2	239	1.90	1.30	1.60	3.70	0.50	2.10	0.50	0.50	0.50	0.50	0.48
95	J	UAF	40	3	239	1.50	1.00	2.00	7.40	1.00	4.90	6.70	1.00	1.00	1.00	0.52
92	J	UAF	45	1	244-245	2.10	0.00	10.20	21.80	0.00	7.10	9.80	0.00	0.00	0.00	0.58
92	J	UAF	45	2	244-245	2.60	0.30	2.50	13.10	0.30	5.80	4.80	0.30	0.30	5.90	0.55
92	J	UAF	45	3	244-245	0.80	0.50	1.50	5.20	0.50	3.50	5.30	0.50	0.50	0.50	0.50
93	J	UAF	45	1	245-246	5.40	2.90	4.50	9.50	1.60	5.30	5.70	2.10	2.30	1.30	0.56
93	J	UAF	45	2	245-246	1.10	0.00	1.70	4.50	0.50	2.40	1.70	0.00	0.00	0.00	0.52
93	J	UAF	45	3	245-246	2.60	1.00	2.00	3.60	2.70	2.70	1.90	1.00	1.00	1.00	0.52
94	J	UAF	45	1	253	0.50	2.70	2.60	5.60	0.00	3.90	2.40	0.00	1.80	0.00	0.56
94	J	UAF	45	2	253	1.40	0.00	1.40	5.10	0.50	2.80	3.50	0.50	0.00	0.50	0.52
94	J	UAF	45	3	253	1.30	1.00	0.50	6.10	1.00	3.30	3.60	1.00	1.00	1.00	0.78
95	J	UAF	45	1	241	1.60	0.00	1.80	6.00	0.00	3.70	2.80	1.00	0.00	0.00	0.55
95	J	UAF	45	2	241	1.90	0.50	1.70	4.40	0.50	2.10	3.20	0.00	0.50	0.50	0.47
95	J	UAF	45	3	241	2.20	1.00	1.70	6.20	1.00	4.80	6.70	1.00	1.00	1.00	0.54
92	J	UAF	50	1	243-247	0.80	0.00	4.40	84.00	0.00	6.20	16.40	0.00	4.00	5.90	0.65
92	J	UAF	50	2	243-247	2.90	0.30	3.20	14.40	0.30	8.60	8.20	0.30	2.00	0.00	0.63
92	J	UAF	50	3	243-247	1.70	0.50	2.60	7.80	0.50	3.20	4.20	0.50	0.80	0.50	0.66
93	J	UAF	50	1	242-245	3.80	1.90	4.00	11.70	2.50	6.60	7.80	2.50	3.30	2.50	0.65
93	J	UAF	50	2	242-245	1.90	0.00	1.50	5.50	0.00	3.10	1.80	0.00	0.00	0.00	0.63
93	J	UAF	50	3	242-245	2.30	1.00	1.60	7.30	1.00	3.40	2.70	1.00	1.00	1.00	0.64
94	J	UAF	50	1	250	2.60	0.00	1.10	3.60	0.00	2.10	1.40	0.00	0.00	0.00	0.55
94	J	UAF	50	2	250	1.10	0.50	1.50	9.20	0.50	8.70	9.60	0.50	0.50	0.50	0.64
94	J	UAF	50	3	250	1.50	1.00	1.40	6.40	1.00	3.60	4.70	1.00	1.00	1.00	0.63
95	J	UAF	50	1	241	0.50	0.00	2.40	8.10	0.00	4.40	5.60	0.00	0.00	0.00	0.63

SAMPLE INFORMATION (levels below detection set at detection limit)						CONCENTRATION OF PAH (µg/kg dry sediment) IN PORT VALDEZ SEDIMENTS										
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)pyrene	TOC
95	J	UAF	50	2	241	1.40	0.50	2.20	7.20	0.50	3.60	4.10	0.50	0.50	0.50	0.64
95	J	UAF	50	3	241	1.50	1.00	2.00	5.90	1.00	2.80	3.60	1.00	1.00	1.00	0.51
92	K	UAF	11	1	201-205	0.00	0.00	1.90	5.10	3.40	1.60	3.20	2.30	0.00	0.00	0.38
92	K	UAF	11	2	201-205	2.00	0.30	2.00	1.70	0.00	1.20	1.60	2.30	0.50	0.30	0.37
92	K	UAF	11	3	201-205	0.50	0.50	0.80	1.10	0.50	0.30	4.70	0.30	0.80	0.50	0.04
93	K	UAF	11	1	206	0.00	0.00	1.40	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.34
93	K	UAF	11	2	206	1.00	0.50	0.50	1.20	0.50	0.50	0.50	1.00	0.50	0.50	0.35
93	K	UAF	11	3	206	1.30	1.00	1.20	1.90	1.00	1.00	1.00	1.20	1.00	1.00	0.36
94	K	UAF	11	1	206-207	0.50	0.00	0.00	0.50	0.00	0.00	0.50	0.00	0.00	0.00	0.37
94	K	UAF	11	2	206-207	1.70	0.50	1.10	2.00	0.50	0.50	1.90	0.50	0.50	0.50	0.36
94	K	UAF	11	3	206-207	1.00	1.00	1.00	2.00	1.00	1.00	1.70	1.00	1.00	1.00	0.35
95	K	UAF	11	1	198	0.00	0.00	1.20	2.30	0.00	1.60	2.50	0.00	0.00	0.00	0.40
95	K	UAF	11	2	198	1.10	0.50	0.50	3.40	0.50	1.90	2.40	0.50	0.50	0.50	0.39
95	K	UAF	11	3	198	1.00	1.00	1.10	3.30	1.00	2.00	3.80	1.00	1.00	1.00	0.38
92	K	UAF	16	1	232-233	0.00	0.00	1.30	2.30	0.00	1.60	1.20	0.00	0.00	0.00	0.37
92	K	UAF	16	2	232-233	0.50	0.50	0.00	1.70	0.50	1.10	0.00	0.50	0.50	0.50	0.39
92	K	UAF	16	3	232-233	1.00	1.00	1.00	2.10	1.00	1.00	1.00	1.00	1.00	1.00	0.40
93	K	UAF	16	1	233	0.00	0.00	0.00	2.40	0.00	4.80	2.30	0.00	1.20	0.00	0.39
93	K	UAF	16	2	233	1.00	0.50	1.00	2.70	0.50	1.30	3.00	0.50	0.00	0.50	0.39
93	K	UAF	16	3	233	1.10	1.00	1.40	3.30	1.00	1.70	3.00	1.00	1.00	1.00	0.37
94	K	UAF	16	1	238-240	1.40	0.00	1.70	10.70	0.00	4.00	6.20	0.00	0.00	0.00	0.42
94	K	UAF	16	2	238-240	1.00	0.30	1.30	3.20	0.30	1.90	4.80	1.20	0.30	0.30	0.40
94	K	UAF	16	3	238-240	0.30	0.50	1.70	0.80	0.50	1.60	4.50	0.50	0.50	0.50	0.44
95	K	UAF	16	1	239	0.50	0.00	1.20	3.20	0.00	2.60	4.20	0.00	0.00	0.00	0.41
95	K	UAF	16	2	239	2.20	0.50	1.00	3.10	0.50	1.90	1.90	0.50	0.50	0.50	0.40
95	K	UAF	16	3	239	1.00	1.00	0.50	2.70	1.00	2.30	4.40	1.00	1.00	1.00	0.39
92	K	UAF	32	1	237-241	1.30	0.00	1.60	6.70	0.00	8.70	9.20	0.00	0.30	4.00	0.47
92	K	UAF	32	2	237-241	1.20	0.30	1.50	6.00	0.30	3.90	6.30	0.30	1.20	0.00	0.47
92	K	UAF	32	3	237-241	0.30	0.50	0.80	2.20	0.50	1.10	4.90	0.50	1.00	0.50	0.48
93	K	UAF	32	1	239-240	3.00	1.80	3.80	5.70	1.00	3.60	4.30	1.90	0.00	1.20	0.41
93	K	UAF	32	2	239-240	0.50	0.00	1.20	2.10	0.00	0.50	0.00	0.00	0.50	0.00	0.41
93	K	UAF	32	3	239-240	1.40	1.00	1.00	3.60	1.00	2.50	1.00	1.00	1.00	1.00	0.43
94	K	UAF	32	1	241	0.00	0.00	1.20	0.50	0.00	1.30	0.50	0.00	0.00	0.00	0.41
94	K	UAF	32	2	241	1.00	0.50	0.50	3.10	0.50	1.90	2.90	0.50	0.50	0.50	0.39
94	K	UAF	32	3	241	1.30	1.00	1.10	2.70	1.00	1.60	2.50	1.00	1.00	1.00	0.41
95	K	UAF	32	1	23	0.50	0.00	1.50	4.10	0.00	3.20	4.10	1.00	0.00	0.00	0.44
95	K	UAF	32	2	235	1.40	1.30	0.50	3.40	0.50	0.50	0.50	0.00	0.50	0.50	0.43
95	K	UAF	32	3	235	1.50	1.00	1.70	2.90	1.00	2.10	4.50	1.00	1.00	1.00	0.43
92	K	UAF	80	1	87-92	3.90	0.00	4.80	15.70	0.00	14.90	14.40	5.40	11.00	0.00	0.58
92	K	UAF	80	2	87-92	0.30	0.50	2.00	18.20	0.50	12.70	23.10	0.30	21.90	0.50	0.59
92	K	UAF	80	3	87-92	1.50	1.50	3.50	10.30	0.80	9.40	2.40	1.60	8.30	1.00	0.61

SAMPLE INFORMATION (levels below detection set at detection limit)						CONCENTRATION OF PAH (µg/kg dry sediment) IN PORT VALDEZ SEDIMENTS										
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)pyrene	TOC
93	K	UAF	80	1	76-79	2.80	3.00	4.90	11.70	2.40	11.30	12.50	6.30	2.50	0.00	0.58
93	K	UAF	80	2	76-79	0.50	0.50	1.00	4.50	0.50	4.90	3.50	1.10	4.90	1.00	0.56
93	K	UAF	80	3	76-79	2.40	1.10	3.50	1.40	1.40	11.10	6.80	4.00	2.40	3.30	0.59
94	K	UAF	80	1	85-88	1.50	0.00	1.60	3.90	0.00	3.90	2.20	1.10	6.00	2.30	0.56
94	K	UAF	80	2	85-88	0.50	0.50	1.20	5.10	0.50	5.50	8.90	0.00	2.30	0.00	0.60
94	K	UAF	80	3	85-88	1.80	1.00	1.40	4.80	1.00	5.20	8.60	1.00	1.70	1.00	0.56
95	K	UAF	80	1	79	0.00	0.00	2.00	8.00	1.40	8.80	12.20	1.50	4.60	0.00	0.64
95	K	UAF	80	2	79	1.00	3.50	0.50	10.90	1.40	10.90	39.10	0.50	0.50	1.00	0.60
95	K	UAF	80	3	79	1.00	1.00	1.30	10.10	0.50	13.60	20.00	1.10	2.00	1.00	0.55
93	K	UAF	82	1	89-93	0.50	0.00	2.40	5.60	0.50	8.50	4.80	2.30	2.60	0.50	0.53
93	K	UAF	82	2	89-93	1.30	1.30	2.60	11.60	2.40	10.20	9.70	3.00	1.00	1.20	0.56
93	K	UAF	82	3	89-93	1.40	1.00	2.40	11.60	1.40	17.40	24.60	10.00	13.50	8.00	0.84
94	K	UAF	82	1	107	0.50	4.90	4.50	31.20	5.30	26.90	26.00	6.60	13.10	7.00	0.65
94	K	UAF	82	2	107	2.90	4.00	4.70	20.60	3.00	38.00	17.70	5.20	8.60	1.80	0.61
94	K	UAF	82	3	107	1.20	0.50	1.00	6.30	0.50	7.10	8.40	1.00	0.50	0.50	0.55
95	K	UAF	82	1	79	0.00	1.50	1.60	7.40	1.80	13.80	8.40	7.50	9.40	3.90	0.53
95	K	UAF	82	2	79	1.00	0.50	1.70	5.20	0.50	6.30	6.40	1.90	0.50	1.60	0.51
95	K	UAF	82	3	79	0.50	6.30	7.20	33.80	6.90	4.90	4.20	16.20	5.50	1.20	0.68
93	K	UAF	E5S	1	100	1.10	0.00	0.00	2.50	0.00	1.10	1.50	0.00	0.00	0.00	0.38
93	K	UAF	E5S	2	100	0.00	0.50	0.50	2.50	0.50	1.60	1.90	0.50	0.50	0.50	0.40
93	K	UAF	E5S	3	100	1.00	1.00	1.00	2.30	1.00	0.50	0.50	1.00	1.00	1.00	0.39
94	K	UAF	W3D	1	60	3.10	0.00	6.80	29.40	5.10	58.00	61.60	9.60	14.60	1.90	0.78
94	K	UAF	W3D	2	60	2.10	0.50	5.10	31.00	3.00	90.70	103.10	7.90	9.30	3.00	0.97
94	K	UAF	W3D	3	60	1.00	1.00	2.30	16.30	1.50	74.40	46.70	2.00	3.30	0.50	0.72
93	K	UAF	W4S	1	60	1.10	0.00	2.60	15.90	0.00	19.90	14.70	1.40	3.30	0.00	0.54
93	K	UAF	W4S	2	60	0.50	0.50	3.30	15.80	1.90	24.50	16.30	1.10	3.00	0.50	0.57
93	K	UAF	W4S	3	60	1.10	1.00	2.60	10.00	1.00	24.40	16.60	1.10	2.20	1.00	0.85
93	K	UAF	W5S	1	100	*data not available*										
93	K	UAF	W5S	2	100	*data not available*										
93	K	UAF	W5S	3	100	*data not available*										
93	K mz	LTEMP	AMT-S(1)	1	79	2.80	0.80	1.40	7.10	0.90	6.60	5.40	3.10	6.00	3.00	0.70
93	K mz	LTEMP	AMT-S(1)	1	79	4.40	0.90	2.10	10.90	1.30	6.50	6.30	3.00	11.40	2.70	0.80
93	K mz	LTEMP	AMT-S(1)	1	79	2.60	0.50	1.40	7.60	0.90	5.50	4.90	1.90	5.40	1.70	0.80
93	K mz	LTEMP	AMT-S(2)	2	63	1.80	0.40	0.70	4.50	1.00	4.00	4.00	3.10	4.60	2.40	0.70
93	K mz	LTEMP	AMT-S(2)	2	71	3.20	0.40	1.00	5.40	1.40	4.40	4.20	1.70	6.10	2.40	0.60
93	K mz	LTEMP	AMT-S(2)	2	76	3.20	3.70	6.60	85.50	3.90	55.10	41.90	3.70	11.80	3.30	0.70
94	K mz	LTEMP	AMT-S(3)	3	67	1.80	1.10	1.50	8.70	1.20	10.80	9.80	5.50	9.10	4.10	0.54
94	K mz	LTEMP	AMT-S(3)	3	67	2.40	0.40	1.40	5.80	1.00	4.70	4.40	2.90	5.30	2.10	0.63
94	K mz	LTEMP	AMT-S(3)	3	65	3.10	1.10	1.70	9.80	1.70	13.40	11.70	6.50	8.00	4.40	0.56
94	K mz	LTEMP	AMT-S(4)	4	78	2.30	0.50	0.80	3.80	1.50	3.20	3.10	1.00	4.70	2.40	0.67
94	K mz	LTEMP	AMT-S(4)	4	73	2.00	1.20	1.60	11.00	1.70	15.20	12.20	4.20	7.40	3.90	0.62

SAMPLE INFORMATION (levels below detection set at detection limit)						CONCENTRATION OF PAH (µg/kg dry sediment) IN PORT VALDEZ SEDIMENTS										
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)pyrene	TOC
94	K mz	LTEMP	AMT-S(4)	4	68	2.60	0.90	1.50	11.70	2.50	22.00	19.00	8.60	20.50	8.70	0.67
95	K mz	LTEMP	AMT-S(5)	1	67	31.90	1.60	2.00	9.30	1.70	5.30	2.80	2.30	11.60	2.20	0.65
95	K mz	LTEMP	AMT-S(5)	2	78	30.00	0.80	1.40	11.40	3.20	5.90	3.80	6.20	9.40	2.20	0.60
95	K mz	LTEMP	AMT-S(5)	3	68	21.30	1.60	3.00	13.70	1.50	11.10	2.10	2.30	9.80	0.80	0.64
95	K mz	LTEMP	AMT-S(6)	1	70	4.00	10.70	12.20	110.40	21.80	125.40	110.70	78.00	93.40	50.60	0.74
95	K mz	LTEMP	AMT-S(6)	2	67	2.60	1.70	1.80	8.90	1.40	8.20	10.40	3.30	8.90	3.50	0.76
95	K mz	LTEMP	AMT-S(6)	3	77	2.90	1.10	1.50	6.10	0.80	5.10	6.00	3.00	14.80	3.60	0.80
92	K mz	UAF	D25	1	160-167	0.30	1.70	0.30	9.20	0.00	0.30	8.80	2.50	3.40	0.00	0.47
92	K mz	UAF	D25	2	160-167	0.50	0.00	1.60	4.70	0.30	4.10	5.70	1.30	0.30	5.70	0.51
92	K mz	UAF	D25	3	160-167	1.00	0.50	1.10	3.20	0.50	1.60	4.80	0.30	3.40	0.50	0.53
93	K mz	UAF	D25	1	96-98	0.00	0.00	0.50	5.00	0.00	6.20	5.90	1.80	2.10	0.50	0.59
93	K mz	UAF	D25	2	96-98	1.00	0.50	1.90	4.90	0.50	7.20	4.70	1.90	2.00	2.30	0.58
93	K mz	UAF	D25	3	96-98	2.50	1.00	3.20	7.70	1.00	7.80	6.20	2.40	1.90	1.00	0.56
94	K mz	UAF	D25	1	79	0.00	0.00	1.90	4.80	0.00	7.50	4.80	3.60	8.50	8.50	0.63
94	K mz	UAF	D25	2	79	0.50	1.00	1.10	6.10	1.00	8.40	11.20	2.30	2.90	1.30	0.59
94	K mz	UAF	D25	3	79	1.00	1.20	1.90	10.80	1.00	11.20	12.00	2.00	7.90	0.50	0.60
95	K mz	UAF	D25	1	73	0.00	9.70	6.10	10.90	1.20	8.20	8.70	0.50	31.80	0.50	0.74
95	K mz	UAF	D25	2	73	0.50	20.90	14.80	28.40	1.70	87.30	40.50	7.60	138.40	4.30	0.85
95	K mz	UAF	D25	3	73	1.00	11.90	0.50	15.60	0.50	19.40	26.20	5.40	12.40	4.20	0.72
93	K mz	UAF	D33	1	84-87	1.40	1.40	4.10	13.40	1.50	17.00	13.90	5.40	4.30	2.10	0.82
93	K mz	UAF	D33	2	84-87	0.00	0.00	2.90	12.00	1.00	14.10	11.30	5.00	12.20	1.60	0.57
93	K mz	UAF	D33	3	84-87	1.00	1.00	3.10	17.90	2.00	23.00	11.00	6.90	4.50	3.10	0.87
92	K mz	UAF	D51	1	105-110	3.10	0.00	6.20	12.00	0.00	13.80	16.80	0.00	15.10	2.90	0.57
92	K mz	UAF	D51	2	105-110	1.90	0.50	1.80	10.10	0.50	9.00	7.60	0.50	14.70	0.00	0.60
92	K mz	UAF	D51	3	105-110	3.90	2.60	6.40	7.30	2.40	10.40	9.70	3.50	0.30	0.50	0.60
93	K mz	UAF	D51	1	88-122	1.00	0.00	2.20	5.60	0.00	7.10	4.60	1.50	2.30	0.00	0.56
93	K mz	UAF	D51	2	88-122	0.50	0.50	1.90	6.40	0.50	7.00	5.30	2.10	2.50	0.50	0.60
93	K mz	UAF	D51	3	88-122	2.60	1.00	1.90	7.70	1.00	8.00	2.10	2.70	2.90	1.00	0.60
94	K mz	UAF	D51	1	98-100	0.00	0.00	1.60	2.90	1.50	2.70	1.40	1.70	5.00	4.70	0.55
94	K mz	UAF	D51	2	98-100	0.50	0.50	0.00	4.70	0.00	5.30	10.10	0.00	2.60	0.00	0.53
94	K mz	UAF	D51	3	98-100	1.00	1.00	1.00	4.90	1.00	6.00	8.00	1.00	2.00	1.00	0.57
95	K mz	UAF	D51	1	79	0.00	0.50	1.40	8.80	0.00	12.40	13.10	2.60	4.90	0.00	0.55
95	K mz	UAF	D51	2	79	1.50	2.30	2.40	10.00	0.50	12.50	13.60	1.40	7.70	0.50	0.60
95	K mz	UAF	D51	3	79	1.00	2.40	3.80	12.00	1.00	17.20	15.50	4.70	7.80	1.00	0.64
92	K mz	UAF	D69	1	99-128	2.10	0.00	2.50	12.30	0.00	13.20	19.50	0.00	2.40	79.00	0.61
92	K mz	UAF	D69	2	99-128	1.60	0.50	2.90	8.00	7.40	8.30	9.40	0.50	10.90	0.00	0.57
92	K mz	UAF	D69	3	99-128	3.20	2.60	6.40	7.90	0.50	9.60	0.30	0.80	10.40	0.50	0.56
93	K mz	UAF	D69	1	101-105	1.10	1.00	3.10	7.50	0.00	6.70	8.80	0.50	11.40	0.00	0.60
93	K mz	UAF	D69	2	101-105	1.10	0.00	3.20	8.10	0.50	9.00	8.40	3.50	2.50	1.00	0.65
93	K mz	UAF	D69	3	101-105	0.50	1.00	1.20	5.80	1.00	7.40	2.70	2.50	2.80	1.40	0.60
94	K mz	UAF	D69	1	73	1.60	0.50	1.80	6.80	0.50	11.50	6.40	3.00	5.80	6.10	0.66

SAMPLE INFORMATION (levels below detection set at detection limit)						CONCENTRATION OF PAH (µg/kg dry sediment) IN PORT VALDEZ SEDIMENTS										
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)pyrene	TOC
94	K mz	UAF	D69	2	73	0.50	1.10	1.40	11.30	1.20	16.00	17.20	4.50	4.70	2.50	0.60
94	K mz	UAF	D69	3	73	2.00	1.80	2.30	16.40	2.60	19.30	17.20	5.60	11.40	2.00	0.60
95	K mz	UAF	D69	1	68	0.00	0.00	1.20	5.70	0.00	4.70	5.20	1.00	0.00	0.00	0.49
95	K mz	UAF	D69	2	68	0.50	0.50	0.00	4.40	0.50	6.00	10.80	1.40	2.40	1.80	0.55
95	K mz	UAF	D69	3	68	1.00	1.00	1.00	2.70	1.00	2.10	4.50	0.50	1.00	1.00	0.46
92	K mz	UAF	D73	1	236-241	2.30	0.00	2.40	17.40	0.00	9.20	9.00	0.00	3.10	0.00	0.45
92	K mz	UAF	D73	2	236-241	2.10	0.80	2.30	4.50	0.30	3.80	6.50	1.50	0.00	0.30	0.48
92	K mz	UAF	D73	3	236-241	0.30	0.50	1.60	3.00	0.50	3.10	4.20	0.50	0.50	0.50	0.49
93	K mz	UAF	D73	1	232-234	1.00	0.00	1.50	3.60	0.00	3.20	2.10	3.50	0.00	0.00	0.47
93	K mz	UAF	D73	2	232-234	0.50	0.50	1.20	2.90	0.50	2.10	1.50	0.00	0.50	0.50	0.46
93	K mz	UAF	D73	3	232-234	2.50	1.00	1.60	3.30	1.00	1.80	2.30	1.00	1.00	1.00	0.49
94	K mz	UAF	D73	1	228	1.80	0.00	1.00	1.60	0.00	1.70	0.50	0.00	1.00	0.00	0.44
94	K mz	UAF	D73	2	228	0.00	0.50	0.50	3.90	0.50	3.30	4.90	0.50	0.00	0.50	0.50
94	K mz	UAF	D73	3	228	1.00	1.00	1.00	2.90	1.00	2.60	3.70	1.00	1.00	1.00	0.45
95	K mz	UAF	D73	1	231	1.40	0.00	1.10	3.30	0.00	3.10	3.80	0.00	0.00	0.00	0.48
95	K mz	UAF	D73	2	231	1.00	1.00	0.00	3.70	0.50	2.50	0.50	0.50	0.50	0.50	0.36
95	K mz	UAF	D73	3	231	0.50	1.00	1.00	2.70	1.00	1.70	2.20	1.00	1.00	1.00	0.43
92	K mz	UAF	D77	1	234-236	0.30	0.00	0.30	65.10	0.00	9.90	12.30	0.00	0.00	0.00	0.47
92	K mz	UAF	D77	2	234-236	2.30	0.30	2.00	6.90	0.30	5.40	6.60	0.50	0.50	0.30	0.47
92	K mz	UAF	D77	3	234-236	1.10	0.50	2.40	6.60	0.50	3.40	4.20	0.80	3.40	0.50	0.46
93	K mz	UAF	D77	1	236-238	2.80	1.80	2.90	5.80	1.30	3.20	3.70	1.20	1.20	0.00	0.41
93	K mz	UAF	D77	2	236-238	1.10	0.00	2.10	3.40	0.00	2.40	1.60	0.00	0.00	0.50	0.45
93	K mz	UAF	D77	3	236-238	0.50	1.00	1.10	3.00	1.00	1.40	0.50	1.00	1.00	1.00	0.41
94	K mz	UAF	D77	1	235-238	1.80	0.00	2.30	3.60	0.00	2.60	1.60	0.00	0.00	0.00	0.42
94	K mz	UAF	D77	2	235-238	1.00	0.50	0.00	3.50	0.50	2.70	5.50	0.50	0.50	0.50	0.42
94	K mz	UAF	D77	3	235-238	0.50	1.00	1.00	3.10	1.00	2.90	3.40	1.00	1.00	1.00	0.06
95	K mz	UAF	D77	1	231	0.00	0.00	0.00	3.80	0.00	2.80	1.80	0.00	0.00	0.00	0.42
95	K mz	UAF	D77	2	231	1.00	1.00	1.00	3.10	0.50	3.50	0.50	0.50	0.50	0.50	0.43
95	K mz	UAF	D77	3	231	1.60	1.00	1.30	3.50	1.00	2.40	4.00	1.00	1.00	1.00	0.41

SAMPLE INFORMATION (levels below detection set at detection limit)						MODEL CALCULATIONS (1) PAHiw = PAHb/(KocxTOC)									
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)-pyrene
92	B	UAF	37	1	48-58	3.27E-03	0.00E+00	1.19E-03	4.63E-03	0.00E+00	3.30E-04	2.78E-04	1.77E-05	3.20E-05	0.00E+00
92	B	UAF	37	2	48-58	1.00E-03	1.02E-04	3.33E-04	6.80E-04	3.07E-05	1.12E-04	1.47E-04	6.31E-06	1.89E-06	7.03E-07
92	B	UAF	37	3	48-58	9.96E-04	1.41E-04	3.29E-04	2.78E-04	4.25E-05	8.14E-05	5.49E-05	1.57E-06	6.81E-06	9.73E-07
93	B	UAF	37	1	49-50	1.39E-03	0.00E+00	4.83E-04	7.16E-04	0.00E+00	1.09E-04	4.33E-05	5.83E-06	0.00E+00	0.00E+00
93	B	UAF	37	2	49-50	0.00E+00	1.66E-04	2.17E-04	5.03E-04	5.01E-05	7.60E-05	5.89E-06	0.00E+00	3.09E-06	1.15E-06
93	B	UAF	37	3	49-50	8.91E-04	3.02E-04	1.69E-04	5.41E-04	9.11E-05	8.18E-05	2.36E-05	5.62E-06	5.62E-06	2.09E-06
94	B	UAF	37	1	27	0.00E+00	0.00E+00	2.43E-04	3.53E-04	0.00E+00	6.04E-05	2.33E-05	0.00E+00	0.00E+00	0.00E+00
94	B	UAF	37	2	27	9.80E-04	1.66E-04	2.17E-04	6.97E-04	5.01E-05	9.40E-05	8.24E-05	3.09E-06	3.09E-06	1.15E-06
94	B	UAF	37	3	27	1.22E-03	3.46E-04	3.23E-04	8.65E-04	1.04E-04	1.21E-04	8.22E-05	6.44E-06	6.44E-06	2.39E-06
95	B	UAF	37	1	51	4.90E-04	0.00E+00	2.33E-04	5.54E-04	0.00E+00	8.00E-05	6.60E-05	0.00E+00	0.00E+00	0.00E+00
95	B	UAF	37	2	51	2.02E-03	1.80E-04	2.36E-04	8.47E-04	5.45E-05	1.24E-04	5.89E-05	3.36E-06	3.36E-06	1.25E-06
95	B	UAF	37	3	51	1.81E-03	3.07E-04	2.30E-04	7.12E-04	9.28E-05	1.02E-04	6.65E-05	5.72E-06	5.72E-06	2.13E-06
93	B	LTEMP	GOC-s(1)	1	34	1.26E-03	7.11E-05	8.87E-05	2.27E-04	2.86E-05	4.43E-05	2.10E-05	3.97E-06	7.06E-06	1.15E-06
93	B	LTEMP	GOC-s(1)	2	28	1.39E-03	8.30E-05	7.76E-05	2.56E-04	5.85E-05	4.50E-05	1.67E-05	3.61E-06	7.73E-06	7.65E-07
93	B	LTEMP	GOC-s(1)	3	28	9.80E-04	8.30E-05	1.07E-04	2.69E-04	8.77E-05	4.25E-05	1.69E-05	3.86E-06	8.50E-06	1.15E-06
93	B	LTEMP	GOC-s(2)	1	28	9.18E-04	6.22E-05	6.79E-05	3.33E-04	5.01E-05	5.25E-05	2.80E-05	4.25E-06	7.73E-06	1.58E-06
93	B	LTEMP	GOC-s(2)	2	27	7.84E-04	6.64E-05	6.21E-05	1.85E-04	3.01E-05	4.60E-05	2.36E-05	4.94E-06	5.56E-06	1.38E-06
93	B	LTEMP	GOC-s(2)	3	33	6.53E-04	2.77E-05	5.17E-05	1.45E-04	1.67E-05	2.67E-05	1.08E-05	2.58E-06	3.09E-06	5.74E-07
94	B	LTEMP	GOC-s(3)	1	30	1.57E-03	1.25E-04	1.17E-04	4.26E-04	3.78E-05	4.72E-05	2.00E-05	4.08E-06	7.58E-06	1.08E-06
94	B	LTEMP	GOC-s(3)	2	31	1.44E-03	1.14E-04	1.07E-04	1.86E-04	2.59E-05	3.79E-05	1.52E-05	3.20E-06	7.99E-06	9.90E-07
94	B	LTEMP	GOC-s(3)	3	31	1.79E-03	1.60E-04	1.79E-04	7.30E-04	1.35E-04	2.00E-04	1.36E-04	2.56E-05	2.61E-05	9.05E-06
94	B	LTEMP	GOC-s(4)	1	27	1.56E-03	1.06E-04	1.32E-04	3.38E-04	6.40E-05	3.83E-05	1.63E-05	3.29E-06	1.18E-05	9.77E-07
94	B	LTEMP	GOC-s(4)	2	25	1.57E-03	2.96E-05	5.54E-05	8.24E-05	1.79E-05	1.96E-05	9.46E-06	1.10E-06	3.86E-06	6.15E-07
94	B	LTEMP	GOC-s(4)	3	21	1.32E-03	1.58E-04	1.36E-04	5.37E-04	7.96E-05	9.37E-05	5.05E-05	7.36E-06	1.23E-05	3.28E-06
95	B	LTEMP	GOC-s(5)	1	30	1.37E-03	8.73E-05	9.53E-05	2.25E-04	7.91E-05	9.12E-05	4.44E-05	1.79E-05	1.84E-05	4.23E-06
95	B	LTEMP	GOC-s(5)	2	32	1.54E-03	9.22E-05	7.19E-05	2.18E-04	2.78E-05	3.33E-05	1.42E-05	4.58E-06	9.16E-06	1.49E-06
95	B	LTEMP	GOC-s(5)	3	33	1.36E-03	1.54E-04	7.19E-05	1.80E-04	1.21E-04	2.96E-05	1.20E-05	5.72E-06	9.73E-06	1.49E-06
95	B	LTEMP	GOC-s(6)	1	28	1.10E-03	2.23E-04	1.27E-04	3.37E-04	6.73E-05	6.42E-05	2.99E-05	4.61E-06	1.29E-05	1.71E-06
95	B	LTEMP	GOC-s(6)	2	30	1.26E-03	1.76E-04	1.53E-04	3.03E-04	6.83E-05	5.15E-05	2.32E-05	5.62E-06	1.69E-05	1.57E-06
95	B	LTEMP	GOC-s(6)	3	26	1.36E-03	3.26E-04	8.91E-05	5.89E-05	4.11E-05	3.93E-05	2.12E-05	3.55E-06	1.01E-06	1.13E-06
95	C	US ACE	1	1	7*	4.04E-01	1.37E-01	6.40E-02	4.23E-02	4.13E-02	8.25E-03	4.86E-03	2.55E-03	2.55E-03	9.47E-04
95	C	US ACE	1	2	7*	4.14E-01	1.40E-01	6.57E-02	4.34E-02	4.24E-02	8.46E-03	4.98E-03	2.61E-03	2.61E-03	9.71E-04
95	C	US ACE	2	1	8*	2.80E-01	9.49E-02	4.44E-02	1.33E-01	2.86E-02	2.60E-02	1.02E-02	1.77E-03	2.09E-03	6.56E-04
95	C	US ACE	3	1	7*	2.73E-01	9.24E-02	4.32E-02	1.47E-01	4.48E-02	5.39E-02	2.19E-02	2.24E-03	7.81E-03	6.39E-04
95	C	US ACE	4	1	7*	2.90E-01	9.82E-02	4.59E-02	3.03E-02	2.96E-02	7.79E-03	3.48E-03	1.83E-03	1.83E-03	6.79E-04
95	C	US ACE	5	1	9	3.23E-01	1.09E-01	5.12E-02	3.38E-02	3.31E-02	6.60E-03	3.89E-03	2.04E-03	2.04E-03	7.58E-04
95	C	US ACE	6	1	7	3.05E-01	1.03E-01	4.84E-02	3.20E-02	3.12E-02	6.23E-03	3.67E-03	1.93E-03	1.93E-03	7.15E-04
94	C	UAF	E1D	1	5	*data not available*									
94	C	UAF	E1D	2	5	*data not available*									
94	C	UAF	E1D	3	5	*data not available*									

SAMPLE INFORMATION						MODEL CALCULATIONS									
(levels below detection set at detection limit)															
									(1)	PAHiw = PAHb/(KocxTOC)					
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)-pyrene
94	C	UAF	E2D	1	10	3.19E-03	0.00E+00	8.44E-05	1.49E-03	1.09E-04	3.91E-04	1.89E-04	0.00E+00	0.00E+00	0.00E+00
94	C	UAF	E2D	2	10	2.34E-03	1.80E-04	3.54E-04	7.25E-04	0.00E+00	1.80E-04	1.33E-04	1.01E-05	6.72E-06	1.25E-06
94	C	UAF	E2D	3	10	1.17E-03	3.61E-04	2.02E-04	8.03E-04	1.09E-04	1.98E-04	1.19E-04	6.72E-06	1.07E-05	2.50E-06
94	C	UAF	E3D	1	20	2.04E-03	0.00E+00	8.09E-05	5.34E-05	0.00E+00	2.52E-04	1.21E-04	0.00E+00	0.00E+00	0.00E+00
94	C	UAF	E3D	2	20	1.37E-03	1.93E-04	4.51E-04	8.59E-04	5.83E-05	1.88E-04	1.19E-04	1.08E-05	1.01E-05	1.34E-06
94	C	UAF	E3D	3	20	1.12E-03	3.46E-04	2.10E-04	7.16E-04	1.04E-04	1.81E-04	7.48E-05	6.44E-06	6.44E-06	2.39E-06
93	C	UAF	E4S	1	20	1.73E-03	0.00E+00	8.09E-05	4.17E-04	0.00E+00	1.21E-04	5.64E-05	0.00E+00	0.00E+00	0.00E+00
93	C	UAF	E4S	2	20	2.14E-03	3.46E-04	2.10E-04	5.66E-04	5.22E-05	1.25E-04	8.10E-05	3.22E-06	3.22E-06	1.20E-06
93	C	UAF	E4S	3	20	8.01E-03	3.51E-04	7.91E-04	1.85E-03	9.64E-05	9.62E-06	1.47E-05	5.94E-06	5.94E-06	2.21E-06
94	C	UAF	W1D	1	5	0.00E+00	0.00E+00	0.00E+00	2.36E-04	0.00E+00	1.82E-04	7.89E-05	0.00E+00	0.00E+00	0.00E+00
94	C	UAF	W1D	2	5	1.74E-03	1.41E-04	2.89E-04	6.52E-04	4.25E-05	0.00E+00	1.13E-04	5.76E-06	7.86E-06	9.73E-07
94	C	UAF	W1D	3	5	9.60E-04	3.25E-04	1.52E-04	5.63E-04	9.83E-05	1.96E-05	5.08E-05	6.06E-06	6.06E-06	2.25E-06
94	C	UAF	W2D	1	30	2.27E-03	0.00E+00	2.31E-04	3.60E-04	0.00E+00	2.00E-04	1.68E-04	1.84E-06	4.41E-06	0.00E+00
94	C	UAF	W2D	2	30	1.68E-03	1.19E-04	5.54E-05	6.74E-04	3.58E-05	3.06E-04	4.09E-04	4.86E-06	2.21E-06	8.20E-07
94	C	UAF	W2D	3	30	2.19E-03	2.18E-04	1.94E-04	7.22E-04	6.59E-05	6.58E-06	1.01E-04	8.54E-06	1.30E-05	1.51E-06
95	F	UAF	SGH-1	1		1.37E-03	1.66E-04	7.76E-05	3.08E-04	0.00E+00	1.98E-04	5.89E-06	0.00E+00	0.00E+00	0.00E+00
95	F	UAF	SGH-1	2		5.57E-04	4.53E-04	2.47E-04	8.63E-04	1.14E-04	1.14E-05	3.35E-05	3.51E-06	3.51E-06	1.30E-06
95	F	UAF	SGH-1	3		2.35E-03	9.89E-04	6.27E-04	3.98E-03	2.51E-04	2.31E-05	2.15E-05	5.94E-06	5.94E-06	2.21E-06
95	F	UAF	SGH-2	1		0.00E+00	0.00E+00	0.00E+00	4.08E-04	0.00E+00	6.59E-05	5.75E-05	0.00E+00	0.00E+00	0.00E+00
95	F	UAF	SGH-2	2		5.44E-04	1.84E-04	8.62E-05	3.42E-04	5.57E-05	5.78E-05	4.45E-05	3.43E-06	3.43E-06	1.28E-06
95	F	UAF	SGH-2	3		1.00E-03	3.39E-04	1.58E-04	3.56E-04	1.02E-04	5.31E-05	5.05E-05	6.31E-06	6.31E-06	2.34E-06
92	G	UAF	82	1	43-66	2.67E-03	2.62E-03	1.00E-03	4.71E-03	1.26E-03	7.30E-04	5.56E-04	9.27E-05	1.50E-04	3.65E-05
92	G	UAF	82	2	43-66	2.01E-03	8.89E-05	2.91E-04	9.71E-04	1.51E-03	1.82E-04	1.29E-04	1.38E-05	1.66E-06	5.13E-05
92	G	UAF	82	3	43-66	8.57E-04	4.56E-04	4.27E-04	1.38E-03	2.69E-04	2.70E-04	1.27E-04	3.05E-05	5.76E-05	8.75E-06
92	G/K d	UAF	D33	1	53-71	5.20E-03	1.12E-03	8.12E-04	5.37E-03	2.31E-05	9.86E-04	5.18E-04	1.43E-06	0.00E+00	2.49E-05
92	G/K d	UAF	D33	2	53-71	4.33E-03	2.22E-03	1.17E-03	6.12E-03	1.15E-03	1.23E-03	7.68E-04	1.52E-04	3.19E-04	7.00E-05
92	G/K d	UAF	D33	3	53-71	1.76E-03	1.09E-03	7.66E-04	2.96E-03	1.93E-04	7.33E-04	3.79E-04	5.67E-05	1.98E-06	1.72E-05
94	G/K d	UAF	D33	1	49-55	3.89E-04	7.11E-04	4.44E-04	1.82E-03	2.70E-04	3.17E-04	1.48E-04	4.86E-05	1.07E-04	3.61E-05
94	G/K d	UAF	D33	2	49-55	1.13E-03	1.64E-03	9.28E-04	3.50E-03	5.26E-04	6.65E-04	4.58E-04	7.57E-05	7.88E-05	1.85E-05
94	G/K d	UAF	D33	3	49-55	2.74E-03	1.32E-03	9.70E-04	5.57E-03	4.05E-04	1.02E-03	6.69E-04	8.45E-05	2.03E-04	3.97E-05
95	G/K d	UAF	D33	1	55	8.98E-04	1.38E-04	2.35E-03	1.17E-03	1.17E-04	2.05E-03	2.72E-04	3.40E-05	1.10E-04	8.29E-05
95	G/K d	UAF	D33	2	55	3.03E-03	4.67E-03	1.63E-03	6.63E-03	1.29E-03	1.38E-03	5.49E-04	1.40E-04	2.41E-04	6.25E-05
95	G/K d	UAF	D33	3	55	2.74E-03	3.49E-03	1.59E-03	8.57E-03	1.61E-03	1.58E-03	9.43E-04	1.45E-04	2.16E-04	4.59E-05
92	I	UAF	90	1	45-54	2.30E-04	0.00E+00	3.64E-05	1.75E-03	0.00E+00	1.02E-04	2.25E-04	1.45E-06	4.59E-05	0.00E+00
92	I	UAF	90	2	45-54	1.03E-03	1.64E-04	2.78E-04	5.57E-04	1.86E-05	6.67E-05	4.29E-05	3.82E-06	8.01E-06	4.25E-07
92	I	UAF	90	3	45-54	8.08E-04	8.55E-05	2.16E-04	4.18E-04	2.58E-05	6.29E-05	1.82E-06	2.55E-06	7.33E-06	5.92E-07
93	I	UAF	91	1	44-50	0.00E+00	0.00E+00	0.00E+00	4.82E-04	0.00E+00	3.13E-05	4.04E-05	0.00E+00	0.00E+00	0.00E+00
93	I	UAF	91	2	44-50	3.71E-04	1.26E-04	1.18E-04	1.55E-04	3.80E-05	1.82E-05	9.81E-06	2.34E-06	4.68E-06	8.70E-07
93	I	UAF	91	3	44-50	6.71E-04	2.27E-04	1.49E-04	5.48E-04	6.87E-05	7.67E-05	1.21E-05	4.23E-06	7.62E-06	1.57E-06

SAMPLE INFORMATION (levels below detection set at detection limit)						MODEL CALCULATIONS (1) PAHiw = PAHb/(KocxTOC)									
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)-pyrene
94	I	UAF	91	1	40	2.42E-04	0.00E+00	7.69E-05	2.39E-04	0.00E+00	2.97E-05	1.11E-05	0.00E+00	3.06E-06	0.00E+00
94	I	UAF	91	2	40	1.13E-03	1.06E-04	1.29E-04	4.08E-04	3.21E-05	4.74E-05	4.15E-05	1.98E-06	0.00E+00	7.36E-07
94	I	UAF	91	3	40	1.13E-03	2.24E-04	1.15E-04	4.37E-04	6.77E-05	5.68E-05	4.54E-05	4.18E-06	4.18E-06	1.55E-06
94	I	UAF	91	1	40	2.42E-04	0.00E+00	7.69E-05	2.39E-04	0.00E+00	2.97E-05	1.11E-05	0.00E+00	3.06E-06	0.00E+00
94	I	UAF	91	2	40	1.13E-03	1.06E-04	1.29E-04	4.08E-04	3.21E-05	4.74E-05	4.15E-05	1.98E-06	0.00E+00	7.36E-07
94	I	UAF	91	3	40	1.13E-03	2.24E-04	1.15E-04	4.37E-04	6.77E-05	5.68E-05	4.54E-05	4.18E-06	4.18E-06	1.55E-06
95	I	UAF	91	1	45	0.00E+00	0.00E+00	1.43E-04	5.13E-04	0.00E+00	4.62E-05	3.26E-05	0.00E+00	0.00E+00	0.00E+00
95	I	UAF	91	2	45	8.38E-04	1.09E-04	2.14E-04	5.33E-04	3.30E-05	7.37E-05	4.49E-05	2.03E-06	4.07E-06	7.55E-07
95	I	UAF	91	3	45	7.31E-04	2.48E-04	2.32E-04	5.66E-04	7.48E-05	6.87E-05	4.31E-05	4.61E-06	4.61E-06	1.71E-06
92	J	UAF	40	1	238-241	2.87E-03	0.00E+00	4.28E-04	1.16E-03	0.00E+00	1.50E-04	1.72E-04	0.00E+00	0.00E+00	3.58E-05
92	J	UAF	40	2	238-241	1.57E-03	8.89E-05	3.33E-04	7.97E-04	2.68E-05	9.64E-05	7.68E-05	5.52E-06	2.76E-06	0.00E+00
92	J	UAF	40	3	238-241	2.83E-04	1.60E-04	3.13E-04	4.93E-04	4.82E-05	5.96E-05	6.45E-05	2.97E-06	4.75E-06	1.10E-06
93	J	UAF	40	1	235-237	1.90E-03	0.00E+00	3.31E-04	8.83E-04	0.00E+00	9.63E-05	6.76E-05	0.00E+00	0.00E+00	0.00E+00
93	J	UAF	40	2	235-237	1.00E-03	1.69E-04	1.74E-04	3.45E-04	5.11E-05	4.49E-05	2.04E-05	3.15E-06	3.15E-06	1.17E-06
93	J	UAF	40	3	235-237	4.62E-04	3.13E-04	7.32E-05	4.84E-04	9.46E-05	6.79E-05	2.67E-05	5.83E-06	5.83E-06	2.17E-06
94	J	UAF	40	1	253	2.02E-03	5.21E-04	2.74E-04	3.62E-04	0.00E+00	4.31E-05	1.39E-05	0.00E+00	6.67E-06	0.00E+00
94	J	UAF	40	2	253	4.30E-04	0.00E+00	1.91E-04	5.22E-04	4.40E-05	6.49E-05	5.17E-05	2.71E-06	0.00E+00	1.01E-06
94	J	UAF	40	3	253	1.05E-03	2.96E-04	6.93E-05	5.22E-04	8.95E-05	6.07E-05	4.21E-05	5.52E-06	5.52E-06	2.05E-06
95	J	UAF	40	1	239	2.08E-03	0.00E+00	2.48E-04	5.24E-04	0.00E+00	5.32E-05	3.13E-05	0.00E+00	0.00E+00	0.00E+00
95	J	UAF	40	2	239	1.94E-03	4.49E-04	2.59E-04	3.95E-04	5.22E-05	4.38E-05	6.13E-06	3.22E-06	3.22E-06	1.20E-06
95	J	UAF	40	3	239	1.41E-03	3.19E-04	2.99E-04	7.30E-04	9.64E-05	9.42E-05	7.59E-05	5.94E-06	5.94E-06	2.21E-06
92	J	UAF	45	1	244-245	1.77E-03	0.00E+00	1.37E-03	1.93E-03	0.00E+00	1.22E-04	9.95E-05	0.00E+00	0.00E+00	0.00E+00
92	J	UAF	45	2	244-245	2.32E-03	9.05E-05	3.53E-04	1.22E-03	2.73E-05	1.05E-04	5.14E-05	1.69E-06	1.69E-06	1.23E-05
92	J	UAF	45	3	244-245	7.84E-04	1.66E-04	2.33E-04	5.33E-04	5.01E-05	7.00E-05	6.24E-05	3.09E-06	3.09E-06	1.15E-06
93	J	UAF	45	1	245-246	4.72E-03	8.59E-04	6.24E-04	8.70E-04	1.43E-04	9.46E-05	5.99E-05	1.16E-05	1.27E-05	2.67E-06
93	J	UAF	45	2	245-246	1.04E-03	0.00E+00	2.54E-04	4.44E-04	4.82E-05	4.62E-05	1.93E-05	0.00E+00	0.00E+00	0.00E+00
93	J	UAF	45	3	245-246	2.45E-03	3.19E-04	2.99E-04	3.55E-04	2.60E-04	5.19E-05	2.15E-05	5.94E-06	5.94E-06	2.21E-06
94	J	UAF	45	1	253	4.37E-04	8.00E-04	3.60E-04	5.13E-04	0.00E+00	6.96E-05	2.52E-05	0.00E+00	9.93E-06	0.00E+00
94	J	UAF	45	2	253	1.32E-03	0.00E+00	2.09E-04	5.03E-04	4.82E-05	5.38E-05	3.96E-05	2.97E-06	0.00E+00	1.10E-06
94	J	UAF	45	3	253	8.16E-04	2.13E-04	4.98E-05	4.01E-04	6.43E-05	4.23E-05	2.72E-05	3.96E-06	3.96E-06	1.47E-06
95	J	UAF	45	1	241	1.42E-03	0.00E+00	2.54E-04	5.59E-04	0.00E+00	6.73E-05	3.00E-05	5.62E-06	0.00E+00	0.00E+00
95	J	UAF	45	2	241	1.98E-03	1.77E-04	2.81E-04	4.80E-04	5.33E-05	4.47E-05	4.01E-05	0.00E+00	3.29E-06	1.22E-06
95	J	UAF	45	3	241	2.00E-03	3.07E-04	2.44E-04	5.89E-04	9.28E-05	8.89E-05	7.31E-05	5.72E-06	5.72E-06	2.13E-06
92	J	UAF	50	1	243-247	6.03E-04	0.00E+00	5.25E-04	6.63E-03	0.00E+00	9.54E-05	1.49E-04	0.00E+00	1.90E-05	1.04E-05
92	J	UAF	50	2	243-247	2.25E-03	7.90E-05	3.94E-04	1.17E-03	2.39E-05	1.37E-04	7.66E-05	1.47E-06	9.81E-06	0.00E+00
92	J	UAF	50	3	243-247	1.26E-03	1.26E-04	3.06E-04	6.06E-04	3.80E-05	4.85E-05	3.75E-05	2.34E-06	3.75E-06	8.70E-07
93	J	UAF	50	1	242-245	2.86E-03	4.85E-04	4.78E-04	9.23E-04	1.93E-04	1.02E-04	7.07E-05	1.19E-05	1.57E-05	4.42E-06
93	J	UAF	50	2	242-245	1.48E-03	0.00E+00	1.85E-04	4.48E-04	0.00E+00	4.92E-05	1.68E-05	0.00E+00	0.00E+00	0.00E+00
93	J	UAF	50	3	242-245	1.76E-03	2.59E-04	1.94E-04	5.85E-04	7.83E-05	5.31E-05	2.48E-05	4.83E-06	4.83E-06	1.79E-06

SAMPLE INFORMATION (levels below detection set at detection limit)						MODEL CALCULATIONS (1) PAHiw = PAHb/(KocxTOC)									
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)-pyrene
94	J	UAF	50	1	250	2.32E-03	0.00E+00	1.55E-04	3.36E-04	0.00E+00	3.82E-05	1.50E-05	0.00E+00	0.00E+00	0.00E+00
94	J	UAF	50	2	250	8.42E-04	1.30E-04	1.82E-04	7.37E-04	3.92E-05	1.36E-04	8.83E-05	2.41E-06	2.41E-06	8.97E-07
94	J	UAF	50	3	250	1.17E-03	2.63E-04	1.72E-04	5.21E-04	7.96E-05	5.71E-05	4.39E-05	4.91E-06	4.91E-06	1.82E-06
95	J	UAF	50	1	241	3.89E-04	0.00E+00	2.96E-04	6.59E-04	0.00E+00	6.98E-05	5.23E-05	0.00E+00	0.00E+00	0.00E+00
95	J	UAF	50	2	241	1.07E-03	1.30E-04	2.67E-04	5.77E-04	3.92E-05	5.63E-05	3.77E-05	2.41E-06	2.41E-06	8.97E-07
95	J	UAF	50	3	241	1.44E-03	3.25E-04	3.04E-04	5.93E-04	9.83E-05	5.49E-05	4.16E-05	6.06E-06	6.06E-06	2.25E-06
92	K	UAF	11	1	201-205	0.00E+00	0.00E+00	3.88E-04	6.88E-04	4.48E-04	4.21E-05	4.96E-05	1.87E-05	0.00E+00	0.00E+00
92	K	UAF	11	2	201-205	2.65E-03	1.35E-04	4.20E-04	2.36E-04	0.00E+00	3.24E-05	2.55E-05	1.92E-05	4.18E-06	9.31E-07
92	K	UAF	11	3	201-205	6.62E-03	2.24E-03	1.68E-03	1.52E-03	6.77E-04	8.11E-05	7.48E-04	2.51E-05	6.68E-05	1.55E-05
93	K	UAF	11	1	206	0.00E+00	0.00E+00	3.20E-04	2.26E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
93	K	UAF	11	2	206	1.40E-03	2.37E-04	1.11E-04	1.76E-04	7.16E-05	1.43E-05	8.41E-06	8.83E-06	4.41E-06	1.64E-06
93	K	UAF	11	3	206	1.77E-03	4.61E-04	2.59E-04	2.71E-04	1.39E-04	2.78E-05	1.64E-05	1.03E-05	8.58E-06	3.19E-06
94	K	UAF	11	1	206-207	6.62E-04	0.00E+00	0.00E+00	6.93E-05	0.00E+00	0.00E+00	7.96E-06	0.00E+00	0.00E+00	0.00E+00
94	K	UAF	11	2	206-207	2.31E-03	2.30E-04	2.37E-04	2.85E-04	6.96E-05	1.39E-05	3.11E-05	4.29E-06	4.29E-06	1.59E-06
94	K	UAF	11	3	206-207	1.40E-03	4.74E-04	2.22E-04	2.93E-04	1.43E-04	2.86E-05	2.86E-05	8.83E-06	8.83E-06	3.28E-06
95	K	UAF	11	1	198	0.00E+00	0.00E+00	2.33E-04	2.95E-04	0.00E+00	4.00E-05	3.68E-05	0.00E+00	0.00E+00	0.00E+00
95	K	UAF	11	2	198	1.38E-03	2.13E-04	9.95E-05	4.47E-04	6.43E-05	4.87E-05	3.62E-05	3.96E-06	3.96E-06	1.47E-06
95	K	UAF	11	3	198	1.29E-03	4.37E-04	2.25E-04	4.45E-04	1.32E-04	5.26E-05	5.89E-05	8.13E-06	8.13E-06	3.02E-06
92	K	UAF	16	1	232-233	0.00E+00	0.00E+00	2.73E-04	3.19E-04	0.00E+00	4.32E-05	1.91E-05	0.00E+00	0.00E+00	0.00E+00
92	K	UAF	16	2	232-233	6.28E-04	2.13E-04	0.00E+00	2.24E-04	6.43E-05	2.82E-05	0.00E+00	3.96E-06	3.96E-06	1.47E-06
92	K	UAF	16	3	232-233	1.22E-03	4.15E-04	1.94E-04	2.69E-04	1.25E-04	2.50E-05	1.47E-05	7.73E-06	7.73E-06	2.87E-06
93	K	UAF	16	1	233	0.00E+00	0.00E+00	0.00E+00	3.16E-04	0.00E+00	1.23E-04	3.47E-05	0.00E+00	9.51E-06	0.00E+00
93	K	UAF	16	2	233	1.26E-03	2.13E-04	1.99E-04	3.55E-04	6.43E-05	3.33E-05	4.53E-05	3.96E-06	0.00E+00	1.47E-06
93	K	UAF	16	3	233	1.46E-03	4.49E-04	2.94E-04	4.57E-04	1.35E-04	4.59E-05	4.77E-05	8.35E-06	8.35E-06	3.10E-06
94	K	UAF	16	1	238-240	1.63E-03	0.00E+00	3.14E-04	1.31E-03	0.00E+00	9.52E-05	8.69E-05	0.00E+00	0.00E+00	0.00E+00
94	K	UAF	16	2	238-240	1.22E-03	1.24E-04	2.52E-04	4.10E-04	3.76E-05	4.75E-05	7.07E-05	9.27E-06	2.32E-06	8.61E-07
94	K	UAF	16	3	238-240	3.34E-04	1.89E-04	3.00E-04	9.32E-05	5.70E-05	3.64E-05	6.02E-05	3.51E-06	3.51E-06	1.30E-06
95	K	UAF	16	1	239	5.97E-04	0.00E+00	2.27E-04	4.00E-04	0.00E+00	6.34E-05	6.03E-05	0.00E+00	0.00E+00	0.00E+00
95	K	UAF	16	2	239	2.69E-03	2.07E-04	1.94E-04	3.97E-04	6.26E-05	4.75E-05	2.80E-05	3.86E-06	3.86E-06	1.44E-06
95	K	UAF	16	3	239	1.26E-03	4.26E-04	9.95E-05	3.55E-04	1.29E-04	5.90E-05	6.64E-05	7.92E-06	7.92E-06	2.94E-06
92	K	UAF	32	1	237-241	1.35E-03	0.00E+00	2.64E-04	7.31E-04	0.00E+00	1.85E-04	1.15E-04	0.00E+00	1.97E-06	9.77E-06
92	K	UAF	32	2	237-241	1.25E-03	1.06E-04	2.48E-04	6.55E-04	3.20E-05	8.30E-05	7.89E-05	1.97E-06	7.89E-06	0.00E+00
92	K	UAF	32	3	237-241	3.06E-04	1.73E-04	1.29E-04	2.35E-04	5.22E-05	2.29E-05	6.01E-05	3.22E-06	6.44E-06	1.20E-06
93	K	UAF	32	1	239-240	3.58E-03	7.29E-04	7.19E-04	7.13E-04	1.22E-04	8.78E-05	6.18E-05	1.43E-05	0.00E+00	3.36E-06
93	K	UAF	32	2	239-240	5.97E-04	0.00E+00	2.27E-04	2.63E-04	0.00E+00	1.22E-05	0.00E+00	0.00E+00	3.77E-06	0.00E+00
93	K	UAF	32	3	239-240	1.59E-03	3.86E-04	1.81E-04	4.29E-04	1.17E-04	5.81E-05	1.37E-05	7.19E-06	7.19E-06	2.67E-06
94	K	UAF	32	1	241	0.00E+00	0.00E+00	2.27E-04	6.25E-05	0.00E+00	3.17E-05	7.18E-06	0.00E+00	0.00E+00	0.00E+00
94	K	UAF	32	2	241	1.26E-03	2.13E-04	9.95E-05	4.08E-04	6.43E-05	4.87E-05	4.38E-05	3.96E-06	3.96E-06	1.47E-06
94	K	UAF	32	3	241	1.55E-03	4.05E-04	2.08E-04	3.38E-04	1.22E-04	3.90E-05	3.59E-05	7.54E-06	7.54E-06	2.80E-06

SAMPLE INFORMATION (levels below detection set at detection limit)						MODEL CALCULATIONS									
									(1)	PAHiw = PAHb/(KocxTOC)					
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)-pyrene
95	K	UAF	32	1	23	5.57E-04	0.00E+00	2.65E-04	4.78E-04	0.00E+00	7.27E-05	5.49E-05	7.02E-06	0.00E+00	0.00E+00
95	K	UAF	32	2	235	1.59E-03	5.02E-04	9.03E-05	4.06E-04	5.83E-05	1.16E-05	6.85E-06	0.00E+00	3.59E-06	1.34E-06
95	K	UAF	32	3	235	1.71E-03	3.86E-04	3.07E-04	3.46E-04	1.17E-04	4.88E-05	6.16E-05	7.19E-06	7.19E-06	2.67E-06
92	K	UAF	80	1	87-92	3.29E-03	0.00E+00	6.42E-04	1.39E-03	0.00E+00	2.57E-04	1.46E-04	2.88E-05	5.86E-05	0.00E+00
92	K	UAF	80	2	87-92	2.49E-04	1.41E-04	2.63E-04	1.58E-03	4.25E-05	2.15E-04	2.31E-04	1.57E-06	1.15E-04	9.73E-07
92	K	UAF	80	3	87-92	1.20E-03	4.08E-04	4.45E-04	8.66E-04	6.57E-05	1.54E-04	2.32E-05	8.11E-06	4.20E-05	1.88E-06
93	K	UAF	80	1	76-79	2.36E-03	8.58E-04	6.56E-04	1.03E-03	2.07E-04	1.95E-04	1.27E-04	3.36E-05	1.33E-05	0.00E+00
93	K	UAF	80	2	76-79	4.37E-04	1.48E-04	1.39E-04	4.12E-04	4.47E-05	8.75E-05	3.68E-05	6.07E-06	2.70E-05	2.05E-06
93	K	UAF	80	3	76-79	1.99E-03	3.09E-04	4.60E-04	1.22E-04	1.19E-04	1.88E-04	6.79E-05	2.10E-05	1.26E-05	6.42E-06
94	K	UAF	80	1	85-88	1.31E-03	0.00E+00	2.22E-04	3.57E-04	0.00E+00	6.96E-05	2.31E-05	6.07E-06	3.31E-05	4.72E-06
94	K	UAF	80	2	85-88	4.08E-04	1.38E-04	1.55E-04	4.36E-04	4.18E-05	9.17E-05	8.73E-05	0.00E+00	1.18E-05	0.00E+00
94	K	UAF	80	3	85-88	1.57E-03	2.96E-04	1.94E-04	4.40E-04	8.95E-05	9.29E-05	9.04E-05	5.52E-06	9.38E-06	2.05E-06
95	K	UAF	80	1	79	0.00E+00	0.00E+00	2.43E-04	6.41E-04	1.10E-04	1.38E-04	1.12E-04	7.24E-06	2.22E-05	0.00E+00
95	K	UAF	80	2	79	8.16E-04	9.68E-04	6.47E-05	9.32E-04	1.17E-04	1.82E-04	3.84E-04	2.58E-06	2.58E-06	1.91E-06
95	K	UAF	80	3	79	8.91E-04	3.02E-04	1.83E-04	9.42E-04	4.56E-05	2.47E-04	2.14E-04	6.18E-06	1.12E-05	2.09E-06
93	K	UAF	82	1	89-93	4.62E-04	0.00E+00	3.52E-04	5.42E-04	4.73E-05	1.60E-04	5.33E-05	1.34E-05	1.52E-05	1.08E-06
93	K	UAF	82	2	89-93	1.14E-03	3.85E-04	3.60E-04	1.06E-03	2.15E-04	1.82E-04	1.02E-04	1.66E-05	5.52E-06	2.46E-06
93	K	UAF	82	3	89-93	8.16E-04	1.98E-04	2.22E-04	7.08E-04	8.35E-05	2.07E-04	1.72E-04	3.68E-05	4.97E-05	1.09E-05
94	K	UAF	82	1	107	3.77E-04	1.25E-03	5.37E-04	2.46E-03	4.09E-04	4.14E-04	2.36E-04	3.14E-05	6.23E-05	1.24E-05
94	K	UAF	82	2	107	2.33E-03	1.09E-03	5.98E-04	1.73E-03	2.46E-04	6.23E-04	1.71E-04	2.63E-05	4.36E-05	3.39E-06
94	K	UAF	82	3	107	1.07E-03	1.51E-04	1.41E-04	5.87E-04	4.56E-05	1.29E-04	8.99E-05	5.62E-06	2.81E-06	1.04E-06
95	K	UAF	82	1	79	0.00E+00	4.70E-04	2.34E-04	7.16E-04	1.70E-04	2.60E-04	9.33E-05	4.37E-05	5.48E-05	8.45E-06
95	K	UAF	82	2	79	9.60E-04	1.63E-04	2.59E-04	5.23E-04	4.91E-05	1.24E-04	7.39E-05	1.15E-05	3.03E-06	3.60E-06
95	K	UAF	82	3	79	3.60E-04	1.54E-03	8.22E-04	2.55E-03	5.09E-04	7.21E-05	3.64E-05	7.36E-05	2.50E-05	2.03E-06
93	K	UAF	E5S	1	100	1.42E-03	0.00E+00	0.00E+00	3.37E-04	0.00E+00	2.89E-05	2.32E-05	0.00E+00	0.00E+00	0.00E+00
93	K	UAF	E5S	2	100	0.00E+00	2.07E-04	9.70E-05	3.21E-04	6.26E-05	4.00E-05	2.80E-05	3.86E-06	3.86E-06	1.44E-06
93	K	UAF	E5S	3	100	1.26E-03	4.26E-04	1.99E-04	3.02E-04	1.29E-04	1.28E-05	7.55E-06	7.92E-06	7.92E-06	2.94E-06
94	K	UAF	W3D	1	60	1.95E-03	0.00E+00	6.77E-04	1.93E-03	3.28E-04	7.44E-04	4.65E-04	3.80E-05	5.78E-05	2.80E-06
94	K	UAF	W3D	2	60	1.06E-03	8.55E-05	4.08E-04	1.64E-03	1.55E-04	9.35E-04	6.26E-04	2.52E-05	2.96E-05	3.55E-06
94	K	UAF	W3D	3	60	6.80E-04	2.30E-04	2.48E-04	1.16E-03	1.04E-04	1.03E-03	3.82E-04	8.58E-06	1.42E-05	7.97E-07
93	K	UAF	W4S	1	60	9.98E-04	0.00E+00	3.74E-04	1.51E-03	0.00E+00	3.69E-04	1.60E-04	8.01E-06	1.89E-05	0.00E+00
93	K	UAF	W4S	2	60	4.30E-04	1.46E-04	4.49E-04	1.42E-03	1.67E-04	4.30E-04	1.68E-04	5.96E-06	1.63E-05	1.01E-06
93	K	UAF	W4S	3	60	6.34E-04	1.95E-04	2.37E-04	6.03E-04	5.90E-05	2.87E-04	1.15E-04	4.00E-06	8.00E-06	1.35E-06
93	K	UAF	W5S	1	100										
93	K	UAF	W5S	2	100										
93	K	UAF	W5S	3	100										
93	K mz	LTEMP	AMT-S(1)	1	79	1.96E-03	1.90E-04	1.55E-04	5.20E-04	6.44E-05	9.43E-05	4.54E-05	1.37E-05	2.65E-05	4.92E-06
93	K mz	LTEMP	AMT-S(1)	1	79	2.69E-03	1.87E-04	2.04E-04	6.99E-04	8.14E-05	8.13E-05	4.64E-05	1.16E-05	4.40E-05	3.88E-06
93	K mz	LTEMP	AMT-S(1)	1	79	1.59E-03	1.04E-04	1.36E-04	4.87E-04	5.64E-05	6.88E-05	3.61E-05	7.34E-06	2.09E-05	2.44E-06

SAMPLE INFORMATION (levels below detection set at detection limit)						MODEL CALCULATIONS (1) PAHiw = PAHb/(KocxTOC)									
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)-pyrene
93	K mz	LTEMP	AMT-S(2)	2	63	1.26E-03	9.48E-05	7.76E-05	3.30E-04	7.16E-05	5.71E-05	3.36E-05	1.37E-05	2.03E-05	3.94E-06
93	K mz	LTEMP	AMT-S(2)	2	71	2.61E-03	1.11E-04	1.29E-04	4.62E-04	1.17E-04	7.33E-05	4.12E-05	8.76E-06	3.14E-05	4.59E-06
93	K mz	LTEMP	AMT-S(2)	2	76	2.24E-03	8.77E-04	7.32E-04	6.26E-03	2.79E-04	7.87E-04	3.52E-04	1.63E-05	5.21E-05	5.41E-06
94	K mz	LTEMP	AMT-S(3)	3	67	1.63E-03	3.38E-04	2.16E-04	8.26E-04	1.11E-04	2.00E-04	1.07E-04	3.15E-05	5.21E-05	8.72E-06
94	K mz	LTEMP	AMT-S(3)	3	67	1.87E-03	1.05E-04	1.72E-04	4.72E-04	7.96E-05	7.46E-05	4.11E-05	1.42E-05	2.60E-05	3.83E-06
94	K mz	LTEMP	AMT-S(3)	3	65	2.71E-03	3.26E-04	2.36E-04	8.98E-04	1.52E-04	2.39E-04	1.23E-04	3.59E-05	4.41E-05	9.02E-06
94	K mz	LTEMP	AMT-S(4)	4	78	1.68E-03	1.24E-04	9.27E-05	2.91E-04	1.12E-04	4.78E-05	2.72E-05	4.61E-06	2.17E-05	4.11E-06
94	K mz	LTEMP	AMT-S(4)	4	73	1.58E-03	3.21E-04	2.00E-04	9.10E-04	1.37E-04	2.45E-04	1.16E-04	2.09E-05	3.69E-05	7.22E-06
94	K mz	LTEMP	AMT-S(4)	4	68	1.90E-03	2.23E-04	1.74E-04	8.96E-04	1.87E-04	3.28E-04	1.67E-04	3.97E-05	9.46E-05	1.49E-05
95	K mz	LTEMP	AMT-S(5)	1	67	2.40E-02	4.09E-04	2.39E-04	7.34E-04	1.31E-04	8.15E-05	2.54E-05	1.09E-05	5.51E-05	3.89E-06
95	K mz	LTEMP	AMT-S(5)	2	78	2.45E-02	2.21E-04	1.81E-04	9.74E-04	2.67E-04	9.83E-05	3.73E-05	3.19E-05	4.84E-05	4.21E-06
95	K mz	LTEMP	AMT-S(5)	3	68	1.63E-02	4.15E-04	3.64E-04	1.10E-03	1.17E-04	1.73E-04	1.93E-05	1.11E-05	4.73E-05	1.44E-06
95	K mz	LTEMP	AMT-S(6)	1	70	2.65E-03	2.40E-03	1.28E-03	7.65E-03	1.48E-03	1.69E-03	8.81E-04	3.26E-04	3.90E-04	7.85E-05
95	K mz	LTEMP	AMT-S(6)	2	67	1.68E-03	3.71E-04	1.84E-04	6.01E-04	9.23E-05	1.08E-04	8.06E-05	1.34E-05	3.62E-05	5.29E-06
95	K mz	LTEMP	AMT-S(6)	3	77	1.78E-03	2.28E-04	1.46E-04	3.91E-04	5.01E-05	6.38E-05	4.42E-05	1.16E-05	5.72E-05	5.17E-06
92	K mz	UAF	D25	1	160-167	3.13E-04	6.00E-04	4.95E-05	1.00E-03	0.00E+00	6.38E-06	1.10E-04	1.64E-05	2.24E-05	0.00E+00
92	K mz	UAF	D25	2	160-167	4.80E-04	0.00E+00	2.44E-04	4.73E-04	2.95E-05	8.04E-05	6.58E-05	7.88E-06	1.82E-06	1.28E-05
92	K mz	UAF	D25	3	160-167	9.24E-04	1.57E-04	1.61E-04	3.10E-04	4.73E-05	3.02E-05	5.33E-05	1.75E-06	1.98E-05	1.08E-06
93	K mz	UAF	D25	1	96-98	0.00E+00	0.00E+00	6.58E-05	4.35E-04	0.00E+00	1.05E-04	5.89E-05	9.43E-06	1.10E-05	9.73E-07
93	K mz	UAF	D25	2	96-98	8.44E-04	1.43E-04	2.54E-04	4.33E-04	4.32E-05	1.24E-04	4.77E-05	1.01E-05	1.07E-05	4.55E-06
93	K mz	UAF	D25	3	96-98	2.19E-03	2.96E-04	4.44E-04	7.05E-04	8.95E-05	1.39E-04	6.52E-05	1.32E-05	1.05E-05	2.05E-06
94	K mz	UAF	D25	1	79	0.00E+00	0.00E+00	2.34E-04	3.91E-04	0.00E+00	1.19E-04	4.49E-05	1.77E-05	4.17E-05	1.55E-05
94	K mz	UAF	D25	2	79	4.15E-04	2.81E-04	1.45E-04	5.30E-04	8.49E-05	1.42E-04	1.12E-04	1.20E-05	1.52E-05	2.53E-06
94	K mz	UAF	D25	3	79	8.16E-04	3.32E-04	2.46E-04	9.23E-04	8.35E-05	1.87E-04	1.18E-04	1.03E-05	4.07E-05	9.57E-07
95	K mz	UAF	D25	1	73	0.00E+00	2.18E-03	6.40E-04	7.55E-04	8.13E-05	1.11E-04	6.92E-05	2.09E-06	1.33E-04	7.76E-07
95	K mz	UAF	D25	2	73	2.88E-04	4.08E-03	1.35E-03	1.71E-03	1.00E-04	1.03E-03	2.81E-04	2.76E-05	5.03E-04	5.81E-06
95	K mz	UAF	D25	3	73	6.80E-04	2.74E-03	5.39E-05	1.11E-03	3.48E-05	2.69E-04	2.14E-04	2.32E-05	5.32E-05	6.70E-06
93	K mz	UAF	D33	1	84-87	8.36E-04	2.83E-04	3.88E-04	8.38E-04	9.17E-05	2.07E-04	9.98E-05	2.04E-05	1.62E-05	2.94E-06
93	K mz	UAF	D33	2	84-87	0.00E+00	0.00E+00	3.95E-04	1.08E-03	8.79E-05	2.47E-04	1.17E-04	2.71E-05	6.61E-05	3.22E-06
93	K mz	UAF	D33	3	84-87	5.63E-04	1.91E-04	2.77E-04	1.06E-03	1.15E-04	2.64E-04	7.45E-05	2.45E-05	1.60E-05	4.09E-06
92	K mz	UAF	D51	1	105-110	2.66E-03	0.00E+00	8.44E-04	1.08E-03	0.00E+00	2.42E-04	1.74E-04	0.00E+00	8.19E-05	5.84E-06
92	K mz	UAF	D51	2	105-110	1.55E-03	1.38E-04	2.33E-04	8.63E-04	4.18E-05	1.50E-04	7.46E-05	2.58E-06	7.57E-05	0.00E+00
92	K mz	UAF	D51	3	105-110	3.18E-03	7.19E-04	8.28E-04	6.24E-04	2.00E-04	1.73E-04	9.52E-05	1.80E-05	1.55E-06	9.57E-07
93	K mz	UAF	D51	1	88-122	8.75E-04	0.00E+00	3.05E-04	5.13E-04	0.00E+00	1.27E-04	4.84E-05	8.28E-06	1.27E-05	0.00E+00
93	K mz	UAF	D51	2	88-122	4.08E-04	1.38E-04	2.46E-04	5.47E-04	4.18E-05	1.17E-04	5.20E-05	1.08E-05	1.29E-05	9.57E-07
93	K mz	UAF	D51	3	88-122	2.12E-03	2.77E-04	2.46E-04	6.58E-04	8.35E-05	1.33E-04	2.06E-05	1.39E-05	1.49E-05	1.91E-06
94	K mz	UAF	D51	1	98-100	0.00E+00	0.00E+00	2.26E-04	2.70E-04	1.37E-04	4.91E-05	1.50E-05	9.55E-06	2.81E-05	9.81E-06
94	K mz	UAF	D51	2	98-100	4.62E-04	1.57E-04	0.00E+00	4.55E-04	0.00E+00	1.00E-04	1.12E-04	0.00E+00	1.52E-05	0.00E+00
94	K mz	UAF	D51	3	98-100	8.59E-04	2.91E-04	1.36E-04	4.41E-04	8.79E-05	1.05E-04	8.26E-05	5.42E-06	1.08E-05	2.01E-06

SAMPLE INFORMATION (levels below detection set at detection limit)						MODEL CALCULATIONS (1) PAHiw = PAHb/(KocxTOC)									
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)-pyrene
95	K mz	UAF	D51	1	79	0.00E+00	1.51E-04	1.98E-04	8.21E-04	0.00E+00	2.25E-04	1.40E-04	1.46E-05	2.75E-05	0.00E+00
95	K mz	UAF	D51	2	79	1.22E-03	6.36E-04	3.10E-04	8.55E-04	4.18E-05	2.08E-04	1.33E-04	7.21E-06	3.97E-05	9.57E-07
95	K mz	UAF	D51	3	79	7.65E-04	6.22E-04	4.61E-04	9.62E-04	7.83E-05	2.69E-04	1.43E-04	2.27E-05	3.77E-05	1.79E-06
92	K mz	UAF	D69	1	99-128	1.69E-03	0.00E+00	3.18E-04	1.03E-03	0.00E+00	2.16E-04	1.88E-04	0.00E+00	1.22E-05	1.49E-04
92	K mz	UAF	D69	2	99-128	1.37E-03	1.46E-04	3.95E-04	7.20E-04	6.51E-04	1.46E-04	9.71E-05	2.71E-06	5.91E-05	0.00E+00
92	K mz	UAF	D69	3	99-128	2.80E-03	7.71E-04	8.87E-04	7.24E-04	4.47E-05	1.71E-04	3.15E-06	4.41E-06	5.74E-05	1.03E-06
93	K mz	UAF	D69	1	101-105	8.98E-04	2.77E-04	4.01E-04	6.41E-04	0.00E+00	1.12E-04	8.64E-05	2.58E-06	5.87E-05	0.00E+00
93	K mz	UAF	D69	2	101-105	8.29E-04	0.00E+00	3.82E-04	6.39E-04	3.86E-05	1.38E-04	7.61E-05	1.66E-05	1.19E-05	1.77E-06
93	K mz	UAF	D69	3	101-105	4.08E-04	2.77E-04	1.55E-04	4.96E-04	8.35E-05	1.23E-04	2.65E-05	1.29E-05	1.44E-05	2.68E-06
94	K mz	UAF	D69	1	73	1.19E-03	1.26E-04	2.12E-04	5.28E-04	3.80E-05	1.74E-04	5.71E-05	1.40E-05	2.72E-05	1.06E-05
94	K mz	UAF	D69	2	73	4.08E-04	3.04E-04	1.81E-04	9.66E-04	1.00E-04	2.67E-04	1.69E-04	2.32E-05	2.42E-05	4.78E-06
94	K mz	UAF	D69	3	73	1.63E-03	4.98E-04	2.98E-04	1.40E-03	2.17E-04	3.22E-04	1.69E-04	2.88E-05	5.87E-05	3.83E-06
95	K mz	UAF	D69	1	68	0.00E+00	0.00E+00	1.90E-04	5.97E-04	0.00E+00	9.59E-05	6.25E-05	6.31E-06	0.00E+00	0.00E+00
95	K mz	UAF	D69	2	68	4.45E-04	1.51E-04	0.00E+00	4.10E-04	4.56E-05	1.09E-04	1.16E-04	7.87E-06	1.35E-05	3.76E-06
95	K mz	UAF	D69	3	68	1.06E-03	3.61E-04	1.69E-04	3.01E-04	1.09E-04	4.57E-05	5.76E-05	3.36E-06	6.72E-06	2.50E-06
92	K mz	UAF	D73	1	236-241	2.50E-03	0.00E+00	4.14E-04	1.98E-03	0.00E+00	2.04E-04	1.18E-04	0.00E+00	2.13E-05	0.00E+00
92	K mz	UAF	D73	2	236-241	2.14E-03	2.77E-04	3.72E-04	4.81E-04	3.13E-05	7.92E-05	7.97E-05	9.66E-06	0.00E+00	7.18E-07
92	K mz	UAF	D73	3	236-241	3.00E-04	1.69E-04	2.53E-04	3.14E-04	5.11E-05	6.33E-05	5.05E-05	3.15E-06	3.15E-06	1.17E-06
93	K mz	UAF	D73	1	232-234	1.04E-03	0.00E+00	2.48E-04	3.93E-04	0.00E+00	6.81E-05	2.63E-05	2.30E-05	0.00E+00	0.00E+00
93	K mz	UAF	D73	2	232-234	5.32E-04	1.80E-04	2.02E-04	3.23E-04	5.45E-05	4.57E-05	1.92E-05	0.00E+00	3.36E-06	1.25E-06
93	K mz	UAF	D73	3	232-234	2.50E-03	3.39E-04	2.53E-04	3.45E-04	1.02E-04	3.67E-05	2.76E-05	6.31E-06	6.31E-06	2.34E-06
94	K mz	UAF	D73	1	228	2.00E-03	0.00E+00	1.76E-04	1.86E-04	0.00E+00	3.86E-05	6.69E-06	0.00E+00	7.02E-06	0.00E+00
94	K mz	UAF	D73	2	228	0.00E+00	1.66E-04	7.76E-05	4.00E-04	5.01E-05	6.60E-05	5.77E-05	3.09E-06	0.00E+00	1.15E-06
94	K mz	UAF	D73	3	228	1.09E-03	3.69E-04	1.72E-04	3.31E-04	1.11E-04	5.78E-05	4.84E-05	6.87E-06	6.87E-06	2.55E-06
95	K mz	UAF	D73	1	231	1.43E-03	0.00E+00	1.78E-04	3.53E-04	0.00E+00	6.46E-05	4.66E-05	0.00E+00	0.00E+00	0.00E+00
95	K mz	UAF	D73	2	231	1.36E-03	4.61E-04	0.00E+00	5.27E-04	6.96E-05	6.94E-05	8.18E-06	4.29E-06	4.29E-06	1.59E-06
95	K mz	UAF	D73	3	231	5.70E-04	3.86E-04	1.81E-04	3.22E-04	1.17E-04	3.95E-05	3.01E-05	7.19E-06	7.19E-06	2.67E-06
92	K mz	UAF	D77	1	234-236	3.13E-04	0.00E+00	4.95E-05	7.10E-03	0.00E+00	2.11E-04	1.54E-04	0.00E+00	0.00E+00	0.00E+00
92	K mz	UAF	D77	2	234-236	2.40E-03	1.06E-04	3.30E-04	7.53E-04	3.20E-05	1.15E-04	8.27E-05	3.29E-06	3.29E-06	7.33E-07
92	K mz	UAF	D77	3	234-236	1.17E-03	1.80E-04	4.05E-04	7.36E-04	5.45E-05	7.39E-05	5.38E-05	5.37E-06	2.28E-05	1.25E-06
93	K mz	UAF	D77	1	236-238	3.34E-03	7.29E-04	5.49E-04	7.26E-04	1.59E-04	7.80E-05	5.31E-05	9.04E-06	9.04E-06	0.00E+00
93	K mz	UAF	D77	2	236-238	1.20E-03	0.00E+00	3.62E-04	3.87E-04	0.00E+00	5.33E-05	2.09E-05	0.00E+00	0.00E+00	1.28E-06
93	K mz	UAF	D77	3	236-238	5.97E-04	4.05E-04	2.08E-04	3.75E-04	1.22E-04	3.41E-05	7.18E-06	7.54E-06	7.54E-06	2.80E-06
94	K mz	UAF	D77	1	235-238	2.10E-03	0.00E+00	4.25E-04	4.40E-04	0.00E+00	6.19E-05	2.24E-05	0.00E+00	0.00E+00	0.00E+00
94	K mz	UAF	D77	2	235-238	1.17E-03	1.98E-04	0.00E+00	4.27E-04	5.97E-05	6.43E-05	7.71E-05	3.68E-06	3.68E-06	1.37E-06
94	K mz	UAF	D77	3	235-238	4.45E-03	3.02E-03	1.41E-03	2.89E-03	9.11E-04	5.27E-04	3.64E-04	5.62E-05	5.62E-05	2.09E-05
95	K mz	UAF	D77	1	231	0.00E+00	0.00E+00	0.00E+00	4.64E-04	0.00E+00	6.67E-05	2.52E-05	0.00E+00	0.00E+00	0.00E+00
95	K mz	UAF	D77	2	231	1.14E-03	3.86E-04	1.81E-04	3.70E-04	5.83E-05	8.14E-05	6.85E-06	3.59E-06	3.59E-06	1.34E-06
95	K mz	UAF	D77	3	231	1.91E-03	4.05E-04	2.46E-04	4.38E-04	1.22E-04	5.85E-05	5.74E-05	7.54E-06	7.54E-06	2.80E-06

SAMPLE INFORMATION (levels below detection set at detection limit)						MODEL CALCULATIONS (2) TUi=(PAHiw)/(10 day LC50iw)										(3) Σ (TUi)
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)-pyrene	Total Toxic Units
92	B	UAF	37	1	48-58	9.33E-07	0.00E+00	4.42E-06	1.93E-05	0.00E+00	1.99E-05	2.69E-06	2.69E-06	4.86E-06	0.00E+00	5.47E-05
92	B	UAF	37	2	48-58	2.86E-07	1.05E-07	1.23E-06	2.83E-06	1.70E-07	1.05E-05	9.56E-07	9.56E-07	2.87E-07	3.70E-07	1.77E-05
92	B	UAF	37	3	48-58	2.85E-07	1.45E-07	1.22E-06	1.16E-06	2.36E-07	3.92E-06	2.38E-07	2.38E-07	1.03E-06	5.12E-07	8.98E-06
93	B	UAF	37	1	49-50	3.96E-07	0.00E+00	1.79E-06	2.98E-06	0.00E+00	3.10E-06	8.83E-07	8.83E-07	0.00E+00	0.00E+00	1.00E-05
93	B	UAF	37	2	49-50	0.00E+00	1.71E-07	8.05E-07	2.09E-06	2.78E-07	4.21E-07	0.00E+00	0.00E+00	4.68E-07	6.04E-07	4.84E-06
93	B	UAF	37	3	49-50	2.54E-07	3.11E-07	6.27E-07	2.25E-06	5.06E-07	1.68E-06	8.51E-07	8.51E-07	8.51E-07	1.10E-06	9.29E-06
94	B	UAF	37	1	27	0.00E+00	0.00E+00	8.98E-07	1.47E-06	0.00E+00	1.66E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.03E-06
94	B	UAF	37	2	27	2.80E-07	1.71E-07	8.05E-07	2.91E-06	2.78E-07	5.89E-06	4.68E-07	4.68E-07	4.68E-07	6.04E-07	1.23E-05
94	B	UAF	37	3	27	3.50E-07	3.56E-07	1.20E-06	3.61E-06	5.80E-07	5.87E-06	9.75E-07	9.75E-07	9.75E-07	1.26E-06	1.61E-05
95	B	UAF	37	1	51	1.40E-07	0.00E+00	8.62E-07	2.31E-06	0.00E+00	4.71E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.02E-06
95	B	UAF	37	2	51	5.78E-07	1.86E-07	8.75E-07	3.53E-06	3.03E-07	4.21E-06	5.09E-07	5.09E-07	5.09E-07	6.57E-07	1.19E-05
95	B	UAF	37	3	51	5.18E-07	3.17E-07	8.52E-07	2.97E-06	5.16E-07	4.75E-06	8.67E-07	8.67E-07	8.67E-07	1.12E-06	1.36E-05
93	B	LTEMP	GOC-s(1)	1	34	3.60E-07	7.33E-08	3.29E-07	9.46E-07	1.59E-07	1.50E-06	6.02E-07	6.02E-07	1.07E-06	6.04E-07	6.25E-06
93	B	LTEMP	GOC-s(1)	2	28	3.96E-07	8.55E-08	2.87E-07	1.07E-06	3.25E-07	1.19E-06	5.46E-07	5.46E-07	1.17E-06	4.03E-07	6.02E-06
93	B	LTEMP	GOC-s(1)	3	28	2.80E-07	8.55E-08	3.95E-07	1.12E-06	4.87E-07	1.21E-06	5.85E-07	5.85E-07	1.29E-06	6.04E-07	6.64E-06
93	B	LTEMP	GOC-s(2)	1	28	2.62E-07	6.42E-08	2.52E-07	1.39E-06	2.78E-07	2.00E-06	6.44E-07	6.44E-07	1.17E-06	8.31E-07	7.53E-06
93	B	LTEMP	GOC-s(2)	2	27	2.24E-07	6.84E-08	2.30E-07	7.69E-07	1.67E-07	1.68E-06	7.49E-07	7.49E-07	8.43E-07	7.25E-07	6.21E-06
93	B	LTEMP	GOC-s(2)	3	33	1.87E-07	2.85E-08	1.92E-07	6.05E-07	9.28E-08	7.71E-07	3.90E-07	3.90E-07	4.68E-07	3.02E-07	3.43E-06
94	B	LTEMP	GOC-s(3)	1	30	4.49E-07	1.29E-07	4.34E-07	1.77E-06	2.10E-07	1.43E-06	6.18E-07	6.18E-07	1.15E-06	5.70E-07	7.38E-06
94	B	LTEMP	GOC-s(3)	2	31	4.10E-07	1.18E-07	3.97E-07	7.74E-07	1.44E-07	1.09E-06	4.84E-07	4.84E-07	1.21E-06	5.21E-07	5.63E-06
94	B	LTEMP	GOC-s(3)	3	31	5.11E-07	1.65E-07	6.63E-07	3.04E-06	7.50E-07	9.71E-06	3.87E-06	3.87E-06	3.96E-06	4.76E-06	3.13E-05
94	B	LTEMP	GOC-s(4)	1	27	4.47E-07	1.09E-07	4.89E-07	1.41E-06	3.55E-07	1.16E-06	4.98E-07	4.98E-07	1.79E-06	5.14E-07	7.28E-06
94	B	LTEMP	GOC-s(4)	2	25	4.50E-07	3.06E-08	2.05E-07	3.43E-07	9.94E-08	6.76E-07	1.67E-07	1.67E-07	5.85E-07	3.24E-07	3.05E-06
94	B	LTEMP	GOC-s(4)	3	21	3.78E-07	1.63E-07	5.02E-07	2.24E-06	4.42E-07	3.61E-06	1.11E-06	1.11E-06	1.86E-06	1.73E-06	1.31E-05
95	B	LTEMP	GOC-s(5)	1	30	3.93E-07	9.00E-08	3.53E-07	9.37E-07	4.40E-07	3.17E-06	2.71E-06	2.71E-06	2.79E-06	2.23E-06	1.58E-05
95	B	LTEMP	GOC-s(5)	2	32	4.41E-07	9.51E-08	2.66E-07	9.10E-07	1.55E-07	1.01E-06	6.94E-07	6.94E-07	1.39E-06	7.83E-07	6.44E-06
95	B	LTEMP	GOC-s(5)	3	33	3.89E-07	1.58E-07	2.66E-07	7.52E-07	6.70E-07	8.57E-07	8.67E-07	8.67E-07	1.47E-06	7.83E-07	7.08E-06
95	B	LTEMP	GOC-s(6)	1	28	3.13E-07	2.30E-07	4.72E-07	1.40E-06	3.74E-07	2.13E-06	6.99E-07	6.99E-07	1.96E-06	9.02E-07	9.18E-06
95	B	LTEMP	GOC-s(6)	2	30	3.60E-07	1.81E-07	5.66E-07	1.26E-06	3.80E-07	1.66E-06	8.51E-07	8.51E-07	2.55E-06	8.24E-07	9.49E-06
95	B	LTEMP	GOC-s(6)	3	26	3.90E-07	3.37E-07	3.30E-07	2.45E-07	2.28E-07	1.52E-06	5.37E-07	5.37E-07	1.54E-07	5.94E-07	4.87E-06
95	C	US ACE	1	1	7*	1.15E-04	1.41E-04	2.37E-04	1.76E-04	2.30E-04	3.47E-04	3.86E-04	3.86E-04	3.86E-04	4.98E-04	2.90E-03
95	C	US ACE	1	2	7*	1.18E-04	1.45E-04	2.43E-04	1.81E-04	2.36E-04	3.56E-04	3.96E-04	3.96E-04	3.96E-04	5.11E-04	2.98E-03
95	C	US ACE	2	1	8*	8.00E-05	9.78E-05	1.64E-04	5.55E-04	1.59E-04	7.29E-04	2.68E-04	2.68E-04	3.16E-04	3.45E-04	2.98E-03
95	C	US ACE	3	1	7*	7.79E-05	9.53E-05	1.60E-04	6.12E-04	2.49E-04	1.56E-03	3.39E-04	3.39E-04	1.18E-03	3.36E-04	4.96E-03
95	C	US ACE	4	1	7*	8.28E-05	1.01E-04	1.70E-04	1.26E-04	1.65E-04	2.49E-04	2.77E-04	2.77E-04	2.77E-04	3.57E-04	2.08E-03
95	C	US ACE	5	1	9	9.23E-05	1.13E-04	1.90E-04	1.41E-04	1.84E-04	2.78E-04	3.09E-04	3.09E-04	3.09E-04	3.99E-04	2.32E-03
95	C	US ACE	6	1	7	8.72E-05	1.07E-04	1.79E-04	1.33E-04	1.73E-04	2.62E-04	2.92E-04	2.92E-04	2.92E-04	3.76E-04	2.19E-03
94	C	UAF	E1D	1	5	*data not available*										
94	C	UAF	E1D	2	5	*data not available*										
94	C	UAF	E1D	3	5	*data not available*										

SAMPLE INFORMATION (levels below detection set at detection limit)						MODEL CALCULATIONS (2) TUi=(PAHiw)/(10 day LC50iw)										(3) Σ (TUi)
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)-pyrene	Total Toxic Units
94	C	UAF	E2D	1	10	9.13E-07	0.00E+00	3.12E-07	6.22E-06	6.05E-07	1.35E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.16E-05
94	C	UAF	E2D	2	10	6.69E-07	1.86E-07	1.31E-06	3.02E-06	0.00E+00	9.51E-06	1.53E-06	1.53E-06	1.02E-06	6.57E-07	1.94E-05
94	C	UAF	E2D	3	10	3.35E-07	3.72E-07	7.50E-07	3.34E-06	6.05E-07	8.50E-06	1.02E-06	1.02E-06	1.63E-06	1.31E-06	1.89E-05
94	C	UAF	E3D	1	20	5.83E-07	0.00E+00	2.99E-07	2.23E-07	0.00E+00	8.67E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.78E-06
94	C	UAF	E3D	2	20	3.91E-07	1.99E-07	1.67E-06	3.58E-06	3.24E-07	8.51E-06	1.63E-06	1.63E-06	1.52E-06	7.03E-07	2.02E-05
94	C	UAF	E3D	3	20	3.21E-07	3.56E-07	7.79E-07	2.98E-06	5.80E-07	5.35E-06	9.75E-07	9.75E-07	9.75E-07	1.26E-06	1.45E-05
93	C	UAF	E4S	1	20	4.96E-07	0.00E+00	2.99E-07	1.74E-06	0.00E+00	4.03E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.56E-06
93	C	UAF	E4S	2	20	6.12E-07	3.56E-07	7.79E-07	2.36E-06	2.90E-07	5.78E-06	4.88E-07	4.88E-07	4.88E-07	6.29E-07	1.23E-05
93	C	UAF	E4S	3	20	2.29E-06	3.62E-07	2.93E-06	7.73E-06	5.35E-07	1.05E-06	9.00E-07	9.00E-07	9.00E-07	1.16E-06	1.88E-05
94	C	UAF	W1D	1	5	0.00E+00	0.00E+00	0.00E+00	9.83E-07	0.00E+00	5.64E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.62E-06
94	C	UAF	W1D	2	5	4.98E-07	1.45E-07	1.07E-06	2.72E-06	2.36E-07	8.06E-06	8.73E-07	8.73E-07	1.19E-06	5.12E-07	1.62E-05
94	C	UAF	W1D	3	5	2.74E-07	3.35E-07	5.64E-07	2.35E-06	5.46E-07	3.63E-06	9.18E-07	9.18E-07	9.18E-07	1.18E-06	1.16E-05
94	C	UAF	W2D	1	30	6.50E-07	0.00E+00	8.56E-07	1.50E-06	0.00E+00	1.20E-05	2.79E-07	2.79E-07	6.69E-07	0.00E+00	1.62E-05
94	C	UAF	W2D	2	30	4.80E-07	1.22E-07	2.05E-07	2.81E-06	1.99E-07	2.92E-05	7.36E-07	7.36E-07	3.34E-07	4.32E-07	3.53E-05
94	C	UAF	W2D	3	30	6.26E-07	2.25E-07	7.19E-07	3.01E-06	3.66E-07	7.19E-06	1.29E-06	1.29E-06	1.97E-06	7.95E-07	1.75E-05
95	F	UAF	SGH-1	1		3.92E-07	1.71E-07	2.87E-07	1.28E-06	0.00E+00	4.21E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.55E-06
95	F	UAF	SGH-1	2		1.59E-07	4.67E-07	9.15E-07	3.59E-06	6.33E-07	2.39E-06	5.32E-07	5.32E-07	5.32E-07	6.87E-07	1.04E-05
95	F	UAF	SGH-1	3		6.73E-07	1.02E-06	2.32E-06	1.66E-05	1.39E-06	1.54E-06	9.00E-07	9.00E-07	9.00E-07	1.16E-06	2.74E-05
95	F	UAF	SGH-2	1		0.00E+00	0.00E+00	0.00E+00	1.70E-06	0.00E+00	4.11E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.81E-06
95	F	UAF	SGH-2	2		1.55E-07	1.90E-07	3.19E-07	1.42E-06	3.09E-07	3.18E-06	5.20E-07	5.20E-07	5.20E-07	6.71E-07	7.81E-06
95	F	UAF	SGH-2	3		2.86E-07	3.49E-07	5.87E-07	1.48E-06	5.68E-07	3.61E-06	9.56E-07	9.56E-07	9.56E-07	1.23E-06	1.10E-05
92	G	UAF	82	1	43-66	7.63E-07	2.70E-06	3.70E-06	1.96E-05	7.00E-06	3.97E-05	1.40E-05	1.40E-05	2.28E-05	1.92E-05	1.44E-04
92	G	UAF	82	2	43-66	5.75E-07	9.17E-08	1.08E-06	4.04E-06	8.40E-06	9.24E-06	2.09E-06	2.09E-06	2.51E-07	2.70E-05	5.48E-05
92	G	UAF	82	3	43-66	2.45E-07	4.71E-07	1.58E-06	5.77E-06	1.50E-06	9.04E-06	4.62E-06	4.62E-06	8.72E-06	4.61E-06	4.12E-05
92	G/K d	UAF	D33	1	53-71	1.49E-06	1.16E-06	3.01E-06	2.24E-05	1.29E-07	3.70E-05	2.16E-07	2.16E-07	0.00E+00	1.31E-05	7.87E-05
92	G/K d	UAF	D33	2	53-71	1.24E-06	2.29E-06	4.35E-06	2.55E-05	6.38E-06	5.48E-05	2.30E-05	2.30E-05	4.83E-05	3.68E-05	2.26E-04
92	G/K d	UAF	D33	3	53-71	5.02E-07	1.12E-06	2.84E-06	1.23E-05	1.07E-06	2.71E-05	8.58E-06	8.58E-06	3.00E-07	9.06E-06	7.15E-05
94	G/K d	UAF	D33	1	49-55	1.11E-07	7.33E-07	1.64E-06	7.56E-06	1.50E-06	1.05E-05	7.36E-06	7.36E-06	1.62E-05	1.90E-05	7.20E-05
94	G/K d	UAF	D33	2	49-55	3.24E-07	1.69E-06	3.44E-06	1.46E-05	2.92E-06	3.27E-05	1.15E-05	1.15E-05	1.19E-05	9.73E-06	1.00E-04
94	G/K d	UAF	D33	3	49-55	7.82E-07	1.36E-06	3.59E-06	2.32E-05	2.25E-06	4.78E-05	1.28E-05	1.28E-05	3.07E-05	2.09E-05	1.56E-04
95	G/K d	UAF	D33	1	55	2.57E-07	1.43E-07	8.72E-06	4.88E-06	6.50E-07	1.94E-05	5.15E-06	5.15E-06	1.67E-05	4.36E-05	1.05E-04
95	G/K d	UAF	D33	2	55	8.65E-07	4.82E-06	6.05E-06	2.76E-05	7.14E-06	3.92E-05	2.12E-05	2.12E-05	3.65E-05	3.29E-05	1.98E-04
95	G/K d	UAF	D33	3	55	7.81E-07	3.60E-06	5.90E-06	3.57E-05	8.93E-06	6.74E-05	2.20E-05	2.20E-05	3.27E-05	2.42E-05	2.23E-04
92	I	UAF	90	1	45-54	6.56E-08	0.00E+00	1.35E-07	7.31E-06	0.00E+00	1.61E-05	2.19E-07	2.19E-07	6.95E-06	0.00E+00	3.10E-05
92	I	UAF	90	2	45-54	2.94E-07	1.69E-07	1.03E-06	2.32E-06	1.03E-07	3.06E-06	5.78E-07	5.78E-07	1.21E-06	2.24E-07	9.57E-06
92	I	UAF	90	3	45-54	2.31E-07	8.82E-08	8.00E-07	1.74E-06	1.44E-07	1.30E-07	3.86E-07	3.86E-07	1.11E-06	3.11E-07	5.33E-06
93	I	UAF	91	1	44-50	0.00E+00	0.00E+00	0.00E+00	2.01E-06	0.00E+00	2.89E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.90E-06
93	I	UAF	91	2	44-50	1.06E-07	1.30E-07	4.36E-07	6.48E-07	2.11E-07	7.01E-07	3.55E-07	3.55E-07	7.09E-07	4.58E-07	4.11E-06
93	I	UAF	91	3	44-50	1.92E-07	2.34E-07	5.51E-07	2.28E-06	3.81E-07	8.64E-07	6.41E-07	6.41E-07	1.15E-06	8.28E-07	7.77E-06

SAMPLE INFORMATION (levels below detection set at detection limit)						MODEL CALCULATIONS (2) TUi=(PAHiw)/(10 day LC50iw)										(3) Σ (TUi)
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)-pyrene	Total Toxic Units
94	I	UAF	91	1	40	6.93E-08	0.00E+00	2.85E-07	9.94E-07	0.00E+00	7.91E-07	0.00E+00	0.00E+00	4.64E-07	0.00E+00	2.60E-06
94	I	UAF	91	2	40	3.23E-07	1.10E-07	4.79E-07	1.70E-06	1.78E-07	2.97E-06	3.00E-07	3.00E-07	0.00E+00	3.87E-07	6.74E-06
94	I	UAF	91	3	40	3.21E-07	2.31E-07	4.27E-07	1.82E-06	3.76E-07	3.24E-06	6.33E-07	6.33E-07	6.33E-07	8.17E-07	9.13E-06
94	I	UAF	91	1	40	6.93E-08	0.00E+00	2.85E-07	9.94E-07	0.00E+00	7.91E-07	0.00E+00	0.00E+00	4.64E-07	0.00E+00	2.60E-06
94	I	UAF	91	2	40	3.23E-07	1.10E-07	4.79E-07	1.70E-06	1.78E-07	2.97E-06	3.00E-07	3.00E-07	0.00E+00	3.87E-07	6.74E-06
94	I	UAF	91	3	40	3.21E-07	2.31E-07	4.27E-07	1.82E-06	3.76E-07	3.24E-06	6.33E-07	6.33E-07	6.33E-07	8.17E-07	9.13E-06
95	I	UAF	91	1	45	0.00E+00	0.00E+00	5.31E-07	2.14E-06	0.00E+00	2.33E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E-06
95	I	UAF	91	2	45	2.39E-07	1.13E-07	7.94E-07	2.22E-06	1.83E-07	3.21E-06	3.08E-07	3.08E-07	6.16E-07	3.98E-07	8.39E-06
95	I	UAF	91	3	45	2.09E-07	2.55E-07	8.58E-07	2.36E-06	4.16E-07	3.08E-06	6.99E-07	6.99E-07	6.99E-07	9.02E-07	1.02E-05
92	J	UAF	40	1	238-241	8.20E-07	0.00E+00	1.59E-06	4.83E-06	0.00E+00	1.23E-05	0.00E+00	0.00E+00	0.00E+00	1.89E-05	3.83E-05
92	J	UAF	40	2	238-241	4.50E-07	9.17E-08	1.23E-06	3.32E-06	1.49E-07	5.48E-06	8.36E-07	8.36E-07	4.18E-07	0.00E+00	1.28E-05
92	J	UAF	40	3	238-241	8.07E-08	1.65E-07	1.16E-06	2.05E-06	2.68E-07	4.61E-06	4.50E-07	4.50E-07	7.20E-07	5.81E-07	1.05E-05
93	J	UAF	40	1	235-237	5.44E-07	0.00E+00	1.22E-06	3.68E-06	0.00E+00	4.83E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-05
93	J	UAF	40	2	235-237	2.86E-07	1.75E-07	6.45E-07	1.44E-06	2.84E-07	1.46E-06	4.78E-07	4.78E-07	4.78E-07	6.17E-07	6.34E-06
93	J	UAF	40	3	235-237	1.32E-07	3.23E-07	2.71E-07	2.02E-06	5.25E-07	1.90E-06	8.83E-07	8.83E-07	8.83E-07	1.14E-06	8.96E-06
94	J	UAF	40	1	253	5.76E-07	5.37E-07	1.01E-06	1.51E-06	0.00E+00	9.90E-07	0.00E+00	0.00E+00	1.01E-06	0.00E+00	5.64E-06
94	J	UAF	40	2	253	1.23E-07	0.00E+00	7.06E-07	2.17E-06	2.44E-07	3.69E-06	4.11E-07	4.11E-07	0.00E+00	5.30E-07	8.29E-06
94	J	UAF	40	3	253	3.00E-07	3.06E-07	2.57E-07	2.18E-06	4.97E-07	3.00E-06	8.36E-07	8.36E-07	8.36E-07	1.08E-06	1.01E-05
95	J	UAF	40	1	239	5.95E-07	0.00E+00	9.18E-07	2.18E-06	0.00E+00	2.24E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.93E-06
95	J	UAF	40	2	239	5.54E-07	4.63E-07	9.58E-07	1.65E-06	2.90E-07	4.38E-07	4.88E-07	4.88E-07	4.88E-07	6.29E-07	6.44E-06
95	J	UAF	40	3	239	4.04E-07	3.29E-07	1.11E-06	3.04E-06	5.35E-07	5.42E-06	9.00E-07	9.00E-07	9.00E-07	1.16E-06	1.47E-05
92	J	UAF	45	1	244-245	5.07E-07	0.00E+00	5.06E-06	8.03E-06	0.00E+00	7.11E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.07E-05
92	J	UAF	45	2	244-245	6.62E-07	9.33E-08	1.31E-06	5.09E-06	1.52E-07	3.67E-06	2.55E-07	2.55E-07	2.55E-07	6.48E-06	1.82E-05
92	J	UAF	45	3	244-245	2.24E-07	1.71E-07	8.62E-07	2.22E-06	2.78E-07	4.46E-06	4.68E-07	4.68E-07	4.68E-07	6.04E-07	1.02E-05
93	J	UAF	45	1	245-246	1.35E-06	8.86E-07	2.31E-06	3.63E-06	7.96E-07	4.28E-06	1.76E-06	1.76E-06	1.92E-06	1.40E-06	2.01E-05
93	J	UAF	45	2	245-246	2.96E-07	0.00E+00	9.40E-07	1.85E-06	2.68E-07	1.38E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.73E-06
93	J	UAF	45	3	245-246	7.00E-07	3.29E-07	1.11E-06	1.48E-06	1.45E-06	1.54E-06	9.00E-07	9.00E-07	9.00E-07	1.16E-06	1.05E-05
94	J	UAF	45	1	253	1.25E-07	8.25E-07	1.33E-06	2.14E-06	0.00E+00	1.80E-06	0.00E+00	0.00E+00	1.51E-06	0.00E+00	7.73E-06
94	J	UAF	45	2	253	3.77E-07	0.00E+00	7.74E-07	2.10E-06	2.68E-07	2.83E-06	4.50E-07	4.50E-07	0.00E+00	5.81E-07	7.83E-06
94	J	UAF	45	3	253	2.33E-07	2.19E-07	1.84E-07	1.67E-06	3.57E-07	1.94E-06	6.00E-07	6.00E-07	6.00E-07	7.75E-07	7.18E-06
95	J	UAF	45	1	241	4.07E-07	0.00E+00	9.41E-07	2.33E-06	0.00E+00	2.14E-06	8.51E-07	8.51E-07	0.00E+00	0.00E+00	7.52E-06
95	J	UAF	45	2	241	5.66E-07	1.82E-07	1.04E-06	2.00E-06	2.96E-07	2.86E-06	0.00E+00	0.00E+00	4.98E-07	6.43E-07	8.09E-06
95	J	UAF	45	3	241	5.70E-07	3.17E-07	9.05E-07	2.45E-06	5.16E-07	5.22E-06	8.67E-07	8.67E-07	8.67E-07	1.12E-06	1.37E-05
92	J	UAF	50	1	243-247	1.72E-07	0.00E+00	1.95E-06	2.76E-05	0.00E+00	1.06E-05	0.00E+00	0.00E+00	2.88E-06	5.49E-06	4.87E-05
92	J	UAF	50	2	243-247	6.44E-07	8.15E-08	1.46E-06	4.88E-06	1.33E-07	5.47E-06	2.23E-07	2.23E-07	1.49E-06	0.00E+00	1.46E-05
92	J	UAF	50	3	243-247	3.60E-07	1.30E-07	1.13E-06	2.53E-06	2.11E-07	2.68E-06	3.55E-07	3.55E-07	5.68E-07	4.58E-07	8.77E-06
93	J	UAF	50	1	242-245	8.18E-07	5.00E-07	1.77E-06	3.85E-06	1.07E-06	5.05E-06	1.80E-06	1.80E-06	2.38E-06	2.32E-06	2.14E-05
93	J	UAF	50	2	242-245	4.22E-07	0.00E+00	6.85E-07	1.87E-06	0.00E+00	1.20E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-06
93	J	UAF	50	3	242-245	5.03E-07	2.67E-07	7.19E-07	2.44E-06	4.35E-07	1.77E-06	7.32E-07	7.32E-07	7.32E-07	9.44E-07	9.27E-06

SAMPLE INFORMATION (levels below detection set at detection limit)						MODEL CALCULATIONS (2) TUi=(PAHiw)/(10 day LC50iw)										(3) Σ (TUi)
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)-pyrene	Total Toxic Units
94	J	UAF	50	1	250	6.62E-07	0.00E+00	5.75E-07	1.40E-06	0.00E+00	1.07E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.71E-06
94	J	UAF	50	2	250	2.41E-07	1.34E-07	6.74E-07	3.07E-06	2.18E-07	6.31E-06	3.66E-07	3.66E-07	3.66E-07	4.72E-07	1.22E-05
94	J	UAF	50	3	250	3.33E-07	2.72E-07	6.39E-07	2.17E-06	4.42E-07	3.14E-06	7.43E-07	7.43E-07	7.43E-07	9.59E-07	1.02E-05
95	J	UAF	50	1	241	1.11E-07	0.00E+00	1.10E-06	2.75E-06	0.00E+00	3.74E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.69E-06
95	J	UAF	50	2	241	3.06E-07	1.34E-07	9.88E-07	2.40E-06	2.18E-07	2.69E-06	3.66E-07	3.66E-07	3.66E-07	4.72E-07	8.31E-06
95	J	UAF	50	3	241	4.12E-07	3.35E-07	1.13E-06	2.47E-06	5.46E-07	2.97E-06	9.18E-07	9.18E-07	9.18E-07	1.18E-06	1.18E-05
92	K	UAF	11	1	201-205	0.00E+00	0.00E+00	1.44E-06	2.87E-06	2.49E-06	3.54E-06	2.83E-06	2.83E-06	0.00E+00	0.00E+00	1.60E-05
92	K	UAF	11	2	201-205	7.56E-07	1.39E-07	1.55E-06	9.82E-07	0.00E+00	1.82E-06	2.91E-06	2.91E-06	6.33E-07	4.90E-07	1.22E-05
92	K	UAF	11	3	201-205	1.89E-06	2.31E-06	6.22E-06	6.35E-06	3.76E-06	5.34E-05	3.80E-06	3.80E-06	1.01E-05	8.17E-06	9.98E-05
93	K	UAF	11	1	206	0.00E+00	0.00E+00	1.18E-06	9.43E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.13E-06
93	K	UAF	11	2	206	4.00E-07	2.44E-07	4.11E-07	7.33E-07	3.98E-07	6.01E-07	1.34E-06	1.34E-06	6.69E-07	8.63E-07	6.99E-06
93	K	UAF	11	3	206	5.05E-07	4.75E-07	9.58E-07	1.13E-06	7.73E-07	1.17E-06	1.56E-06	1.56E-06	1.30E-06	1.68E-06	1.11E-05
94	K	UAF	11	1	206-207	1.89E-07	0.00E+00	0.00E+00	2.89E-07	0.00E+00	5.68E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-06
94	K	UAF	11	2	206-207	6.61E-07	2.38E-07	8.78E-07	1.19E-06	3.87E-07	2.22E-06	6.50E-07	6.50E-07	6.50E-07	8.39E-07	8.36E-06
94	K	UAF	11	3	206-207	4.00E-07	4.89E-07	8.21E-07	1.22E-06	7.96E-07	2.04E-06	1.34E-06	1.34E-06	1.34E-06	1.73E-06	1.15E-05
95	K	UAF	11	1	198	0.00E+00	0.00E+00	8.62E-07	1.23E-06	0.00E+00	2.63E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.72E-06
95	K	UAF	11	2	198	3.95E-07	2.19E-07	3.69E-07	1.86E-06	3.57E-07	2.59E-06	6.00E-07	6.00E-07	6.00E-07	7.75E-07	8.37E-06
95	K	UAF	11	3	198	3.68E-07	4.50E-07	8.32E-07	1.86E-06	7.33E-07	4.21E-06	1.23E-06	1.23E-06	1.23E-06	1.59E-06	1.37E-05
92	K	UAF	16	1	232-233	0.00E+00	0.00E+00	1.01E-06	1.33E-06	0.00E+00	1.36E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.70E-06
92	K	UAF	16	2	232-233	1.79E-07	2.19E-07	0.00E+00	9.31E-07	3.57E-07	0.00E+00	6.00E-07	6.00E-07	6.00E-07	7.75E-07	4.26E-06
92	K	UAF	16	3	232-233	3.50E-07	4.28E-07	7.19E-07	1.12E-06	6.96E-07	1.05E-06	1.17E-06	1.17E-06	1.17E-06	1.51E-06	9.39E-06
93	K	UAF	16	1	233	0.00E+00	0.00E+00	0.00E+00	1.32E-06	0.00E+00	2.48E-06	0.00E+00	0.00E+00	1.44E-06	0.00E+00	5.24E-06
93	K	UAF	16	2	233	3.59E-07	2.19E-07	7.37E-07	1.48E-06	3.57E-07	3.24E-06	6.00E-07	6.00E-07	0.00E+00	7.75E-07	8.36E-06
93	K	UAF	16	3	233	4.16E-07	4.62E-07	1.09E-06	1.91E-06	7.53E-07	3.41E-06	1.27E-06	1.27E-06	1.27E-06	1.63E-06	1.35E-05
94	K	UAF	16	1	238-240	4.66E-07	0.00E+00	1.16E-06	5.44E-06	0.00E+00	6.21E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E-05
94	K	UAF	16	2	238-240	3.50E-07	1.28E-07	9.34E-07	1.71E-06	2.09E-07	5.05E-06	1.40E-06	1.40E-06	3.51E-07	4.53E-07	1.20E-05
94	K	UAF	16	3	238-240	9.54E-08	1.94E-07	1.11E-06	3.89E-07	3.16E-07	4.30E-06	5.32E-07	5.32E-07	5.32E-07	6.87E-07	8.69E-06
95	K	UAF	16	1	239	1.71E-07	0.00E+00	8.41E-07	1.67E-06	0.00E+00	4.31E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.99E-06
95	K	UAF	16	2	239	7.70E-07	2.14E-07	7.19E-07	1.66E-06	3.48E-07	2.00E-06	5.85E-07	5.85E-07	5.85E-07	7.55E-07	8.22E-06
95	K	UAF	16	3	239	3.59E-07	4.39E-07	3.69E-07	1.48E-06	7.14E-07	4.75E-06	1.20E-06	1.20E-06	1.20E-06	1.55E-06	1.33E-05
92	K	UAF	32	1	237-241	3.87E-07	0.00E+00	9.79E-07	3.05E-06	0.00E+00	8.23E-06	0.00E+00	0.00E+00	2.99E-07	5.14E-06	1.81E-05
92	K	UAF	32	2	237-241	3.57E-07	1.09E-07	9.18E-07	2.73E-06	1.78E-07	5.64E-06	2.99E-07	2.99E-07	1.20E-06	0.00E+00	1.17E-05
92	K	UAF	32	3	237-241	8.75E-08	1.78E-07	4.79E-07	9.79E-07	2.90E-07	4.29E-06	4.88E-07	4.88E-07	9.75E-07	6.29E-07	8.89E-06
93	K	UAF	32	1	239-240	1.02E-06	7.51E-07	2.66E-06	2.97E-06	6.79E-07	4.41E-06	2.17E-06	2.17E-06	0.00E+00	1.77E-06	1.86E-05
93	K	UAF	32	2	239-240	1.71E-07	0.00E+00	8.41E-07	1.09E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.71E-07	0.00E+00	2.68E-06
93	K	UAF	32	3	239-240	4.56E-07	3.98E-07	6.69E-07	1.79E-06	6.48E-07	9.78E-07	1.09E-06	1.09E-06	1.09E-06	1.41E-06	9.61E-06
94	K	UAF	32	1	241	0.00E+00	0.00E+00	8.41E-07	2.61E-07	0.00E+00	5.13E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E-06
94	K	UAF	32	2	241	3.59E-07	2.19E-07	3.69E-07	1.70E-06	3.57E-07	3.13E-06	6.00E-07	6.00E-07	6.00E-07	7.75E-07	8.71E-06
94	K	UAF	32	3	241	4.44E-07	4.17E-07	7.71E-07	1.41E-06	6.79E-07	2.56E-06	1.14E-06	1.14E-06	1.14E-06	1.47E-06	1.12E-05

SAMPLE INFORMATION (levels below detection set at detection limit)						MODEL CALCULATIONS: (2) TUi=(PAHiw)/(10 day LC50iw)										(3) Σ (TUi)
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)-pyrene	Total Toxic Units
95	K	UAF	32	1	23	1.59E-07	0.00E+00	9.80E-07	1.99E-06	0.00E+00	3.92E-06	1.06E-06	1.06E-06	0.00E+00	0.00E+00	9.18E-06
95	K	UAF	32	2	235	4.56E-07	5.17E-07	3.34E-07	1.69E-06	3.24E-07	4.89E-07	0.00E+00	0.00E+00	5.44E-07	7.03E-07	5.06E-06
95	K	UAF	32	3	235	4.88E-07	3.98E-07	1.14E-06	1.44E-06	6.48E-07	4.40E-06	1.09E-06	1.09E-06	1.09E-06	1.41E-06	1.32E-05
92	K	UAF	80	1	87-92	9.41E-07	0.00E+00	2.38E-06	5.78E-06	0.00E+00	1.04E-05	4.36E-06	4.36E-06	8.88E-06	0.00E+00	3.71E-05
92	K	UAF	80	2	87-92	7.12E-08	1.45E-07	9.75E-07	6.59E-06	2.36E-07	1.65E-05	2.38E-07	2.38E-07	1.74E-05	5.12E-07	4.29E-05
92	K	UAF	80	3	87-92	3.44E-07	4.21E-07	1.65E-06	3.61E-06	3.65E-07	1.65E-06	1.23E-06	1.23E-06	6.37E-06	9.91E-07	1.79E-05
93	K	UAF	80	1	76-79	6.76E-07	8.85E-07	2.43E-06	4.31E-06	1.15E-06	9.06E-06	5.09E-06	5.09E-06	2.02E-06	0.00E+00	3.07E-05
93	K	UAF	80	2	76-79	1.25E-07	1.53E-07	5.13E-07	1.72E-06	2.49E-07	2.63E-06	9.20E-07	9.20E-07	4.10E-06	1.08E-06	1.24E-05
93	K	UAF	80	3	76-79	5.69E-07	3.19E-07	1.71E-06	5.07E-07	6.61E-07	4.85E-06	3.17E-06	3.17E-06	1.90E-06	3.38E-06	2.02E-05
94	K	UAF	80	1	85-88	3.75E-07	0.00E+00	8.21E-07	1.49E-06	0.00E+00	1.65E-06	9.20E-07	9.20E-07	5.02E-06	2.48E-06	1.37E-05
94	K	UAF	80	2	85-88	1.17E-07	1.43E-07	5.75E-07	1.82E-06	2.32E-07	6.24E-06	0.00E+00	0.00E+00	1.79E-06	0.00E+00	1.09E-05
94	K	UAF	80	3	85-88	4.50E-07	3.06E-07	7.19E-07	1.83E-06	4.97E-07	6.46E-06	8.36E-07	8.36E-07	1.42E-06	1.08E-06	1.44E-05
95	K	UAF	80	1	79	0.00E+00	0.00E+00	8.98E-07	2.67E-06	6.09E-07	8.02E-06	1.10E-06	1.10E-06	3.37E-06	0.00E+00	1.78E-05
95	K	UAF	80	2	79	2.33E-07	9.98E-07	2.40E-07	3.88E-06	6.50E-07	2.74E-05	3.90E-07	3.90E-07	3.90E-07	1.01E-06	3.56E-05
95	K	UAF	80	3	79	2.54E-07	3.11E-07	6.80E-07	3.92E-06	2.53E-07	1.53E-05	9.36E-07	9.36E-07	1.70E-06	1.10E-06	2.54E-05
93	K	UAF	82	1	89-93	1.32E-07	0.00E+00	1.30E-06	2.26E-06	2.63E-07	3.81E-06	2.03E-06	2.03E-06	2.30E-06	5.70E-07	1.47E-05
93	K	UAF	82	2	89-93	3.25E-07	3.97E-07	1.33E-06	4.43E-06	1.19E-06	7.29E-06	2.51E-06	2.51E-06	8.36E-07	1.29E-06	2.21E-05
93	K	UAF	82	3	89-93	2.33E-07	2.04E-07	8.21E-07	2.95E-06	4.64E-07	1.23E-05	5.57E-06	5.57E-06	7.53E-06	5.76E-06	4.14E-05
94	K	UAF	82	1	107	1.08E-07	1.29E-06	1.99E-06	1.03E-05	2.27E-06	1.68E-05	4.75E-06	4.75E-06	9.44E-06	6.51E-06	5.82E-05
94	K	UAF	82	2	107	6.65E-07	1.12E-06	2.22E-06	7.22E-06	1.37E-06	1.22E-05	3.99E-06	3.99E-06	6.60E-06	1.78E-06	4.12E-05
94	K	UAF	82	3	107	3.05E-07	1.56E-07	5.23E-07	2.45E-06	2.53E-07	6.42E-06	8.51E-07	8.51E-07	4.26E-07	5.49E-07	1.28E-05
95	K	UAF	82	1	79	0.00E+00	4.84E-07	8.68E-07	2.98E-06	9.46E-07	6.67E-06	6.63E-06	6.63E-06	8.30E-06	4.45E-06	3.80E-05
95	K	UAF	82	2	79	2.74E-07	1.68E-07	9.58E-07	2.18E-06	2.73E-07	5.28E-06	1.74E-06	1.74E-06	4.59E-07	1.90E-06	1.50E-05
95	K	UAF	82	3	79	1.03E-07	1.59E-06	3.04E-06	1.06E-05	2.83E-06	2.60E-06	1.12E-05	1.12E-05	3.79E-06	1.07E-06	4.79E-05
93	K	UAF	E5S	1	100	4.05E-07	0.00E+00	0.00E+00	1.41E-06	0.00E+00	1.66E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.47E-06
93	K	UAF	E5S	2	100	0.00E+00	2.14E-07	3.59E-07	1.34E-06	3.48E-07	2.00E-06	5.85E-07	5.85E-07	5.85E-07	7.55E-07	6.77E-06
93	K	UAF	E5S	3	100	3.59E-07	4.39E-07	7.37E-07	1.26E-06	7.14E-07	5.39E-07	1.20E-06	1.20E-06	1.20E-06	1.55E-06	9.20E-06
94	K	UAF	W3D	1	60	5.56E-07	0.00E+00	2.51E-06	8.05E-06	1.82E-06	3.32E-05	5.76E-06	5.76E-06	8.76E-06	1.47E-06	6.79E-05
94	K	UAF	W3D	2	60	3.03E-07	8.82E-08	1.51E-06	6.83E-06	8.61E-07	4.47E-05	3.81E-06	3.81E-06	4.49E-06	1.87E-06	6.83E-05
94	K	UAF	W3D	3	60	1.94E-07	2.38E-07	9.18E-07	4.84E-06	5.80E-07	2.73E-05	1.30E-06	1.30E-06	2.15E-06	4.20E-07	3.92E-05
93	K	UAF	W4S	1	60	2.85E-07	0.00E+00	1.38E-06	6.29E-06	0.00E+00	1.14E-05	1.21E-06	1.21E-06	2.86E-06	0.00E+00	2.47E-05
93	K	UAF	W4S	2	60	1.23E-07	1.50E-07	1.66E-06	5.92E-06	9.28E-07	1.20E-05	9.04E-07	9.04E-07	2.46E-06	5.30E-07	2.56E-05
93	K	UAF	W4S	3	60	1.81E-07	2.01E-07	8.79E-07	2.51E-06	3.28E-07	8.21E-06	6.06E-07	6.06E-07	1.21E-06	7.11E-07	1.55E-05
93	K	UAF	W5S	1	100											
93	K	UAF	W5S	2	100											
93	K	UAF	W5S	3	100											
93	K mz	LTEMP	AMT-S(1)	1	79	5.60E-07	1.96E-07	5.75E-07	2.17E-06	3.58E-07	3.24E-06	2.07E-06	2.07E-06	4.01E-06	2.59E-06	1.79E-05
93	K mz	LTEMP	AMT-S(1)	1	79	7.70E-07	1.92E-07	7.55E-07	2.91E-06	4.52E-07	3.31E-06	1.76E-06	1.76E-06	6.67E-06	2.04E-06	2.06E-05
93	K mz	LTEMP	AMT-S(1)	1	79	4.55E-07	1.07E-07	5.03E-07	2.03E-06	3.13E-07	2.58E-06	1.11E-06	1.11E-06	3.16E-06	1.28E-06	1.27E-05

SAMPLE INFORMATION						MODEL CALCULATIONS										
(levels below detection set at detection limit)																
						(2) TUi=(PAHiw)/(10 day LC50iw)										**(3)** Σ (TUi)
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)-pyrene	Total Toxic Units
93	K mz	LTEMP	AMT-S(2)	2	63	3.60E-07	9.78E-08	2.87E-07	1.37E-06	3.98E-07	2.40E-06	2.07E-06	2.07E-06	3.08E-06	2.07E-06	1.42E-05
93	K mz	LTEMP	AMT-S(2)	2	71	7.46E-07	1.14E-07	4.79E-07	1.92E-06	6.50E-07	2.94E-06	1.33E-06	1.33E-06	4.76E-06	2.42E-06	1.67E-05
93	K mz	LTEMP	AMT-S(2)	2	76	6.40E-07	9.04E-07	2.71E-06	2.61E-05	1.55E-06	2.52E-05	2.47E-06	2.47E-06	7.89E-06	2.85E-06	7.28E-05
94	K mz	LTEMP	AMT-S(3)	3	67	4.66E-07	3.49E-07	7.99E-07	3.44E-06	6.19E-07	7.63E-06	4.77E-06	4.77E-06	7.89E-06	4.59E-06	3.53E-05
94	K mz	LTEMP	AMT-S(3)	3	67	5.33E-07	1.09E-07	6.39E-07	1.97E-06	4.42E-07	2.94E-06	2.16E-06	2.16E-06	3.94E-06	2.01E-06	1.69E-05
94	K mz	LTEMP	AMT-S(3)	3	65	7.75E-07	3.36E-07	8.73E-07	3.74E-06	8.45E-07	8.79E-06	5.43E-06	5.43E-06	6.69E-06	4.75E-06	3.77E-05
94	K mz	LTEMP	AMT-S(4)	4	78	4.80E-07	1.28E-07	3.43E-07	1.21E-06	6.23E-07	1.95E-06	6.99E-07	6.99E-07	3.28E-06	2.16E-06	1.16E-05
94	K mz	LTEMP	AMT-S(4)	4	73	4.51E-07	3.31E-07	7.42E-07	3.79E-06	7.63E-07	8.28E-06	3.17E-06	3.17E-06	5.59E-06	3.80E-06	3.01E-05
94	K mz	LTEMP	AMT-S(4)	4	68	5.43E-07	2.30E-07	6.44E-07	3.73E-06	1.04E-06	1.19E-05	6.01E-06	6.01E-06	1.43E-05	7.85E-06	5.23E-05
95	K mz	LTEMP	AMT-S(5)	1	67	6.87E-06	4.21E-07	8.85E-07	3.06E-06	7.28E-07	1.81E-06	1.66E-06	1.66E-06	8.36E-06	2.05E-06	2.75E-05
95	K mz	LTEMP	AMT-S(5)	2	78	7.00E-06	2.28E-07	6.71E-07	4.06E-06	1.48E-06	2.66E-06	4.84E-06	4.84E-06	7.34E-06	2.22E-06	3.53E-05
95	K mz	LTEMP	AMT-S(5)	3	68	4.66E-06	4.28E-07	1.35E-06	4.57E-06	6.53E-07	1.38E-06	1.68E-06	1.68E-06	7.17E-06	7.55E-07	2.43E-05
95	K mz	LTEMP	AMT-S(6)	1	70	7.56E-07	2.47E-06	4.74E-06	3.19E-05	8.20E-06	6.29E-05	4.94E-05	4.94E-05	5.91E-05	4.13E-05	3.10E-04
95	K mz	LTEMP	AMT-S(6)	2	67	4.79E-07	3.83E-07	6.81E-07	2.50E-06	5.13E-07	5.76E-06	2.03E-06	2.03E-06	5.48E-06	2.78E-06	2.26E-05
95	K mz	LTEMP	AMT-S(6)	3	77	5.07E-07	2.35E-07	5.39E-07	1.63E-06	2.78E-07	3.15E-06	1.76E-06	1.76E-06	8.66E-06	2.72E-06	2.12E-05
92	K mz	UAF	D25	1	160-167	8.93E-08	6.19E-07	1.84E-07	4.18E-06	0.00E+00	7.88E-06	2.49E-06	2.49E-06	3.39E-06	0.00E+00	2.13E-05
92	K mz	UAF	D25	2	160-167	1.37E-07	0.00E+00	9.02E-07	1.97E-06	1.64E-07	4.70E-06	1.19E-06	1.19E-06	2.75E-07	6.75E-06	1.73E-05
92	K mz	UAF	D25	3	160-167	2.64E-07	1.61E-07	5.97E-07	1.29E-06	2.63E-07	3.81E-06	2.65E-07	2.65E-07	3.00E-06	5.70E-07	1.05E-05
93	K mz	UAF	D25	1	96-98	0.00E+00	0.00E+00	2.44E-07	1.81E-06	0.00E+00	4.21E-06	1.43E-06	1.43E-06	1.67E-06	5.12E-07	1.13E-05
93	K mz	UAF	D25	2	96-98	2.41E-07	1.47E-07	9.42E-07	1.81E-06	2.40E-07	3.41E-06	1.53E-06	1.53E-06	1.61E-06	2.40E-06	1.39E-05
93	K mz	UAF	D25	3	96-98	6.25E-07	3.06E-07	1.64E-06	2.94E-06	4.97E-07	4.66E-06	2.01E-06	2.01E-06	1.59E-06	1.08E-06	1.73E-05
94	K mz	UAF	D25	1	79	0.00E+00	0.00E+00	8.67E-07	1.63E-06	0.00E+00	3.20E-06	2.68E-06	2.68E-06	6.32E-06	8.15E-06	2.55E-05
94	K mz	UAF	D25	2	79	1.19E-07	2.90E-07	5.36E-07	2.21E-06	4.72E-07	7.98E-06	1.83E-06	1.83E-06	2.30E-06	1.33E-06	1.89E-05
94	K mz	UAF	D25	3	79	2.33E-07	3.42E-07	9.10E-07	3.85E-06	4.64E-07	8.41E-06	1.56E-06	1.56E-06	6.16E-06	5.04E-07	2.40E-05
95	K mz	UAF	D25	1	73	0.00E+00	2.24E-06	2.37E-06	3.15E-06	4.52E-07	4.94E-06	3.16E-07	3.16E-07	2.01E-05	4.08E-07	3.43E-05
95	K mz	UAF	D25	2	73	8.23E-08	4.21E-06	5.01E-06	7.14E-06	5.57E-07	2.00E-05	4.19E-06	4.19E-06	7.62E-05	3.06E-06	1.25E-04
95	K mz	UAF	D25	3	73	1.94E-07	2.83E-06	2.00E-07	4.63E-06	1.93E-07	1.53E-05	3.51E-06	3.51E-06	8.06E-06	3.53E-06	4.20E-05
93	K mz	UAF	D33	1	84-87	2.39E-07	2.92E-07	1.44E-06	3.49E-06	5.09E-07	7.13E-06	3.08E-06	3.08E-06	2.46E-06	1.55E-06	2.33E-05
93	K mz	UAF	D33	2	84-87	0.00E+00	0.00E+00	1.46E-06	4.50E-06	4.88E-07	8.34E-06	4.11E-06	4.11E-06	1.00E-05	1.70E-06	3.47E-05
93	K mz	UAF	D33	3	84-87	1.61E-07	1.97E-07	1.02E-06	4.40E-06	6.40E-07	5.32E-06	3.71E-06	3.71E-06	2.42E-06	2.15E-06	2.37E-05
92	K mz	UAF	D51	1	105-110	7.61E-07	0.00E+00	3.13E-06	4.50E-06	0.00E+00	1.24E-05	0.00E+00	0.00E+00	1.24E-05	3.07E-06	3.63E-05
92	K mz	UAF	D51	2	105-110	4.43E-07	1.43E-07	8.62E-07	3.60E-06	2.32E-07	5.33E-06	3.90E-07	3.90E-07	1.15E-05	0.00E+00	2.29E-05
92	K mz	UAF	D51	3	105-110	9.10E-07	7.41E-07	3.07E-06	2.60E-06	1.11E-06	6.80E-06	2.73E-06	2.73E-06	2.34E-07	5.04E-07	2.14E-05
93	K mz	UAF	D51	1	88-122	2.50E-07	0.00E+00	1.13E-06	2.14E-06	0.00E+00	3.45E-06	1.25E-06	1.25E-06	1.92E-06	0.00E+00	1.14E-05
93	K mz	UAF	D51	2	88-122	1.17E-07	1.43E-07	9.10E-07	2.28E-06	2.32E-07	3.72E-06	1.64E-06	1.64E-06	1.95E-06	5.04E-07	1.31E-05
93	K mz	UAF	D51	3	88-122	6.06E-07	2.85E-07	9.10E-07	2.74E-06	4.64E-07	1.47E-06	2.11E-06	2.11E-06	2.26E-06	1.01E-06	1.40E-05
94	K mz	UAF	D51	1	98-100	0.00E+00	0.00E+00	8.36E-07	1.13E-06	7.59E-07	1.07E-06	1.45E-06	1.45E-06	4.26E-06	5.16E-06	1.61E-05
94	K mz	UAF	D51	2	98-100	1.32E-07	1.61E-07	0.00E+00	1.90E-06	0.00E+00	8.02E-06	0.00E+00	0.00E+00	2.30E-06	0.00E+00	1.25E-05
94	K mz	UAF	D51	3	98-100	2.46E-07	3.00E-07	5.04E-07	1.84E-06	4.88E-07	5.90E-06	8.21E-07	8.21E-07	1.64E-06	1.06E-06	1.36E-05

SAMPLE INFORMATION (levels below detection set at detection limit)						MODEL CALCULATIONS (2) TUi=(PAHiw)/(10 day LC50iw)										(3) Σ (TUi)
Year	Area	Data	Station	Rep.	Depth	naphthalene	acenaphthene	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benz(a)anthracene	chrysene	benzo(a)-pyrene	Total Toxic Units
95	K mz	UAF	D51	1	79	0.00E+00	1.56E-07	7.32E-07	3.42E-06	0.00E+00	1.00E-05	2.21E-06	2.21E-06	4.17E-06	0.00E+00	2.29E-05
95	K mz	UAF	D51	2	79	3.50E-07	6.56E-07	1.15E-06	3.56E-06	2.32E-07	9.53E-06	1.09E-06	1.09E-06	6.01E-06	5.04E-07	2.42E-05
95	K mz	UAF	D51	3	79	2.19E-07	6.42E-07	1.71E-06	4.01E-06	4.35E-07	1.02E-05	3.44E-06	3.44E-06	5.71E-06	9.44E-07	3.07E-05
92	K mz	UAF	D69	1	99-128	4.82E-07	0.00E+00	1.18E-06	4.31E-06	0.00E+00	1.34E-05	0.00E+00	0.00E+00	1.84E-06	7.83E-05	9.95E-05
92	K mz	UAF	D69	2	99-128	3.93E-07	1.50E-07	1.46E-06	3.00E-06	3.61E-06	6.94E-06	4.11E-07	4.11E-07	8.95E-06	0.00E+00	2.53E-05
92	K mz	UAF	D69	3	99-128	8.00E-07	7.94E-07	3.29E-06	3.01E-06	2.49E-07	2.25E-07	6.69E-07	6.69E-07	8.70E-06	5.40E-07	1.89E-05
93	K mz	UAF	D69	1	101-105	2.57E-07	2.85E-07	1.49E-06	2.67E-06	0.00E+00	6.17E-06	3.90E-07	3.90E-07	8.90E-06	0.00E+00	2.05E-05
93	K mz	UAF	D69	2	101-105	2.37E-07	0.00E+00	1.42E-06	2.66E-06	2.14E-07	5.44E-06	2.52E-06	2.52E-06	1.80E-06	9.30E-07	1.77E-05
93	K mz	UAF	D69	3	101-105	1.17E-07	2.85E-07	5.75E-07	2.07E-06	4.64E-07	1.89E-06	1.95E-06	1.95E-06	2.19E-06	1.41E-06	1.29E-05
94	K mz	UAF	D69	1	73	3.39E-07	1.30E-07	7.84E-07	2.20E-06	2.11E-07	4.08E-06	2.13E-06	2.13E-06	4.11E-06	5.59E-06	2.17E-05
94	K mz	UAF	D69	2	73	1.17E-07	3.14E-07	6.71E-07	4.02E-06	5.57E-07	1.21E-05	3.51E-06	3.51E-06	3.67E-06	2.52E-06	3.09E-05
94	K mz	UAF	D69	3	73	4.66E-07	5.13E-07	1.10E-06	5.84E-06	1.21E-06	1.21E-05	4.37E-06	4.37E-06	8.90E-06	2.01E-06	4.08E-05
95	K mz	UAF	D69	1	68	0.00E+00	0.00E+00	7.04E-07	2.49E-06	0.00E+00	4.46E-06	9.56E-07	9.56E-07	0.00E+00	0.00E+00	9.56E-06
95	K mz	UAF	D69	2	68	1.27E-07	1.56E-07	0.00E+00	1.71E-06	2.53E-07	8.26E-06	1.19E-06	1.19E-06	2.04E-06	1.98E-06	1.69E-05
95	K mz	UAF	D69	3	68	3.04E-07	3.72E-07	6.25E-07	1.25E-06	6.05E-07	4.11E-06	5.09E-07	5.09E-07	1.02E-06	1.31E-06	1.06E-05
92	K mz	UAF	D73	1	236-241	7.15E-07	0.00E+00	1.53E-06	8.26E-06	0.00E+00	8.41E-06	0.00E+00	0.00E+00	3.23E-06	0.00E+00	2.21E-05
92	K mz	UAF	D73	2	236-241	6.12E-07	2.85E-07	1.38E-06	2.00E-06	1.74E-07	5.70E-06	1.46E-06	1.46E-06	0.00E+00	3.78E-07	1.35E-05
92	K mz	UAF	D73	3	236-241	8.57E-08	1.75E-07	9.39E-07	1.31E-06	2.84E-07	3.61E-06	4.78E-07	4.78E-07	4.78E-07	6.17E-07	8.45E-06
93	K mz	UAF	D73	1	232-234	2.98E-07	0.00E+00	9.18E-07	1.64E-06	0.00E+00	1.88E-06	3.49E-06	3.49E-06	0.00E+00	0.00E+00	1.17E-05
93	K mz	UAF	D73	2	232-234	1.52E-07	1.86E-07	7.50E-07	1.35E-06	3.03E-07	1.37E-06	0.00E+00	0.00E+00	5.09E-07	6.57E-07	5.28E-06
93	K mz	UAF	D73	3	232-234	7.14E-07	3.49E-07	9.39E-07	1.44E-06	5.68E-07	1.97E-06	9.56E-07	9.56E-07	9.56E-07	1.23E-06	1.01E-05
94	K mz	UAF	D73	1	228	5.72E-07	0.00E+00	6.53E-07	7.77E-07	0.00E+00	4.78E-07	0.00E+00	0.00E+00	1.06E-06	0.00E+00	3.55E-06
94	K mz	UAF	D73	2	228	0.00E+00	1.71E-07	2.87E-07	1.67E-06	2.78E-07	4.12E-06	4.68E-07	4.68E-07	0.00E+00	6.04E-07	8.07E-06
94	K mz	UAF	D73	3	228	3.11E-07	3.80E-07	6.39E-07	1.38E-06	6.19E-07	3.46E-06	1.04E-06	1.04E-06	1.04E-06	1.34E-06	1.12E-05
95	K mz	UAF	D73	1	231	4.08E-07	0.00E+00	6.59E-07	1.47E-06	0.00E+00	3.33E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.87E-06
95	K mz	UAF	D73	2	231	3.89E-07	4.75E-07	0.00E+00	2.20E-06	3.87E-07	5.84E-07	6.50E-07	6.50E-07	6.50E-07	8.39E-07	6.82E-06
95	K mz	UAF	D73	3	231	1.63E-07	3.98E-07	6.69E-07	1.34E-06	6.48E-07	2.15E-06	1.09E-06	1.09E-06	1.09E-06	1.41E-06	1.00E-05
92	K mz	UAF	D77	1	234-236	8.93E-08	0.00E+00	1.84E-07	2.96E-05	0.00E+00	1.10E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.09E-05
92	K mz	UAF	D77	2	234-236	6.85E-07	1.09E-07	1.22E-06	3.14E-06	1.78E-07	5.91E-06	4.98E-07	4.98E-07	4.98E-07	3.86E-07	1.31E-05
92	K mz	UAF	D77	3	234-236	3.35E-07	1.86E-07	1.50E-06	3.07E-06	3.03E-07	3.84E-06	8.14E-07	8.14E-07	3.46E-06	6.57E-07	1.50E-05
93	K mz	UAF	D77	1	236-238	9.56E-07	7.51E-07	2.03E-06	3.02E-06	8.83E-07	3.80E-06	1.37E-06	1.37E-06	1.37E-06	0.00E+00	1.56E-05
93	K mz	UAF	D77	2	236-238	3.42E-07	0.00E+00	1.34E-06	1.61E-06	0.00E+00	1.50E-06	0.00E+00	0.00E+00	0.00E+00	6.71E-07	5.47E-06
93	K mz	UAF	D77	3	236-238	1.71E-07	4.17E-07	7.71E-07	1.56E-06	6.79E-07	5.13E-07	1.14E-06	1.14E-06	1.14E-06	1.47E-06	9.01E-06
94	K mz	UAF	D77	1	235-238	6.00E-07	0.00E+00	1.57E-06	1.83E-06	0.00E+00	1.60E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.61E-06
94	K mz	UAF	D77	2	235-238	3.33E-07	2.04E-07	0.00E+00	1.78E-06	3.31E-07	5.51E-06	5.57E-07	5.57E-07	5.57E-07	7.19E-07	1.05E-05
94	K mz	UAF	D77	3	235-238	1.27E-06	3.11E-06	5.23E-06	1.20E-05	5.06E-06	2.60E-05	8.51E-06	8.51E-06	8.51E-06	1.10E-05	8.92E-05
95	K mz	UAF	D77	1	231	0.00E+00	0.00E+00	0.00E+00	1.93E-06	0.00E+00	1.80E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.74E-06
95	K mz	UAF	D77	2	231	3.25E-07	3.98E-07	6.69E-07	1.54E-06	3.24E-07	4.89E-07	5.44E-07	5.44E-07	5.44E-07	7.03E-07	6.08E-06
95	K mz	UAF	D77	3	231	5.46E-07	4.17E-07	9.12E-07	1.82E-06	6.79E-07	4.10E-06	1.14E-06	1.14E-06	1.14E-06	1.47E-06	1.34E-05

SAMPLE INFORMATION (levels below detection set at detection limit)						Total Toxic Units	MODEL RESULTS		
Year	Area	Data	Station	Rep.	Depth	∑(TUi) x100 (%)	***Probability of Toxicity:*** with regression limits (mortality>24%)	***Probability of Uncertain Toxicity:*** with regression limits (13%>mortality<24%)	***Probability of No Toxicity:*** with regression limits (mortality<13%)
92	B	UAF	37	1	48-58	0.01	5.00	20.00	80.00
92	B	UAF	37	2	48-58	0.00	5.00	20.00	80.00
92	B	UAF	37	3	48-58	0.00	5.00	20.00	80.00
93	B	UAF	37	1	49-50	0.00	5.00	20.00	80.00
93	B	UAF	37	2	49-50	0.00	5.00	20.00	80.00
93	B	UAF	37	3	49-50	0.00	5.00	20.00	80.00
94	B	UAF	37	1	27	0.00	5.00	20.00	80.00
94	B	UAF	37	2	27	0.00	5.00	20.00	80.00
94	B	UAF	37	3	27	0.00	5.00	20.00	80.00
95	B	UAF	37	1	51	0.00	5.00	20.00	80.00
95	B	UAF	37	2	51	0.00	5.00	20.00	80.00
95	B	UAF	37	3	51	0.00	5.00	20.00	80.00
93	B	LTEMP	GOC-s(1)	1	34	0.00	5.00	20.00	80.00
93	B	LTEMP	GOC-s(1)	2	28	0.00	5.00	20.00	80.00
93	B	LTEMP	GOC-s(1)	3	28	0.00	5.00	20.00	80.00
93	B	LTEMP	GOC-s(2)	1	28	0.00	5.00	20.00	80.00
93	B	LTEMP	GOC-s(2)	2	27	0.00	5.00	20.00	80.00
93	B	LTEMP	GOC-s(2)	3	33	0.00	5.00	20.00	80.00
94	B	LTEMP	GOC-s(3)	1	30	0.00	5.00	20.00	80.00
94	B	LTEMP	GOC-s(3)	2	31	0.00	5.00	20.00	80.00
94	B	LTEMP	GOC-s(3)	3	31	0.00	5.00	20.00	80.00
94	B	LTEMP	GOC-s(4)	1	27	0.00	5.00	20.00	80.00
94	B	LTEMP	GOC-s(4)	2	25	0.00	5.00	20.00	80.00
94	B	LTEMP	GOC-s(4)	3	21	0.00	5.00	20.00	80.00
95	B	LTEMP	GOC-s(5)	1	30	0.00	5.00	20.00	80.00
95	B	LTEMP	GOC-s(5)	2	32	0.00	5.00	20.00	80.00
95	B	LTEMP	GOC-s(5)	3	33	0.00	5.00	20.00	80.00
95	B	LTEMP	GOC-s(6)	1	28	0.00	5.00	20.00	80.00
95	B	LTEMP	GOC-s(6)	2	30	0.00	5.00	20.00	80.00
95	B	LTEMP	GOC-s(6)	3	26	0.00	5.00	20.00	80.00
95	C	US ACE	1	1	7*	0.29	5.00	20.00	80.00
95	C	US ACE	1	2	7*	0.30	5.00	20.00	80.00
95	C	US ACE	2	1	8*	0.30	5.00	20.00	80.00
95	C	US ACE	3	1	7*	0.50	5.00	20.00	80.00
95	C	US ACE	4	1	7*	0.21	5.00	20.00	80.00
95	C	US ACE	5	1	9	0.23	5.00	20.00	80.00
95	C	US ACE	6	1	7	0.22	5.00	20.00	80.00
94	C	UAF	E1D	1	5	*data not available*	*data not available*	*data not available*	*data not available*
94	C	UAF	E1D	2	5	*data not available*	*data not available*	*data not available*	*data not available*
94	C	UAF	E1D	3	5	*data not available*	*data not available*	*data not available*	*data not available*

SAMPLE INFORMATION (levels below detection set at detection limit)						Total Toxic Units	MODEL RESULTS		
Year	Area	Data	Station	Rep.	Depth	∑(TUi) x100 (%)	***Probability of Toxicity:*** with regression limits (mortality>24%)	***Probability of Uncertain Toxicity:*** with regression limits (13%>mortality<24%)	***Probability of No Toxicity:*** with regression limits (mortality<13%)
94	C	UAF	E2D	1	10	0.00	5.00	20.00	80.00
94	C	UAF	E2D	2	10	0.00	5.00	20.00	80.00
94	C	UAF	E2D	3	10	0.00	5.00	20.00	80.00
94	C	UAF	E3D	1	20	0.00	5.00	20.00	80.00
94	C	UAF	E3D	2	20	0.00	5.00	20.00	80.00
94	C	UAF	E3D	3	20	0.00	5.00	20.00	80.00
93	C	UAF	E4S	1	20	0.00	5.00	20.00	80.00
93	C	UAF	E4S	2	20	0.00	5.00	20.00	80.00
93	C	UAF	E4S	3	20	0.00	5.00	20.00	80.00
94	C	UAF	W1D	1	5	0.00	5.00	20.00	80.00
94	C	UAF	W1D	2	5	0.00	5.00	20.00	80.00
94	C	UAF	W1D	3	5	0.00	5.00	20.00	80.00
94	C	UAF	W2D	1	30	0.00	5.00	20.00	80.00
94	C	UAF	W2D	2	30	0.00	5.00	20.00	80.00
94	C	UAF	W2D	3	30	0.00	5.00	20.00	80.00
95	F	UAF	SGH-1	1		0.00	5.00	20.00	80.00
95	F	UAF	SGH-1	2		0.00	5.00	20.00	80.00
95	F	UAF	SGH-1	3		0.00	5.00	20.00	80.00
95	F	UAF	SGH-2	1		0.00	5.00	20.00	80.00
95	F	UAF	SGH-2	2		0.00	5.00	20.00	80.00
95	F	UAF	SGH-2	3		0.00	5.00	20.00	80.00
92	G	UAF	82	1	43-66	0.01	5.00	20.00	80.00
92	G	UAF	82	2	43-66	0.01	5.00	20.00	80.00
92	G	UAF	82	3	43-66	0.00	5.00	20.00	80.00
92	G/K d	UAF	D33	1	53-71	0.01	5.00	20.00	80.00
92	G/K d	UAF	D33	2	53-71	0.02	5.00	20.00	80.00
92	G/K d	UAF	D33	3	53-71	0.01	5.00	20.00	80.00
94	G/K d	UAF	D33	1	49-55	0.01	5.00	20.00	80.00
94	G/K d	UAF	D33	2	49-55	0.01	5.00	20.00	80.00
94	G/K d	UAF	D33	3	49-55	0.02	5.00	20.00	80.00
95	G/K d	UAF	D33	1	55	0.01	5.00	20.00	80.00
95	G/K d	UAF	D33	2	55	0.02	5.00	20.00	80.00
95	G/K d	UAF	D33	3	55	0.02	5.00	20.00	80.00
92	I	UAF	90	1	45-54	0.00	5.00	20.00	80.00
92	I	UAF	90	2	45-54	0.00	5.00	20.00	80.00
92	I	UAF	90	3	45-54	0.00	5.00	20.00	80.00
93	I	UAF	91	1	44-50	0.00	5.00	20.00	80.00
93	I	UAF	91	2	44-50	0.00	5.00	20.00	80.00
93	I	UAF	91	3	44-50	0.00	5.00	20.00	80.00

SAMPLE INFORMATION (levels below detection set at detection limit)						Total Toxic Units	MODEL RESULTS		
						∑(TUi) x100 (%)	***Probability of Toxicity:*** with regression limits (mortality>24%)	***Probability of Uncertain Toxicity:*** with regression limits (13%>mortality<24%)	***Probability of No Toxicity:*** with regression limits (mortality<13%)
Year	Area	Data	Station	Rep.	Depth				
94	I	UAF	91	1	40	0.00	5.00	20.00	80.00
94	I	UAF	91	2	40	0.00	5.00	20.00	80.00
94	I	UAF	91	3	40	0.00	5.00	20.00	80.00
94	I	UAF	91	1	40	0.00	5.00	20.00	80.00
94	I	UAF	91	2	40	0.00	5.00	20.00	80.00
94	I	UAF	91	3	40	0.00	5.00	20.00	80.00
95	I	UAF	91	1	45	0.00	5.00	20.00	80.00
95	I	UAF	91	2	45	0.00	5.00	20.00	80.00
95	I	UAF	91	3	45	0.00	5.00	20.00	80.00
92	J	UAF	40	1	238-241	0.00	5.00	20.00	80.00
92	J	UAF	40	2	238-241	0.00	5.00	20.00	80.00
92	J	UAF	40	3	238-241	0.00	5.00	20.00	80.00
93	J	UAF	40	1	235-237	0.00	5.00	20.00	80.00
93	J	UAF	40	2	235-237	0.00	5.00	20.00	80.00
93	J	UAF	40	3	235-237	0.00	5.00	20.00	80.00
94	J	UAF	40	1	253	0.00	5.00	20.00	80.00
94	J	UAF	40	2	253	0.00	5.00	20.00	80.00
94	J	UAF	40	3	253	0.00	5.00	20.00	80.00
95	J	UAF	40	1	239	0.00	5.00	20.00	80.00
95	J	UAF	40	2	239	0.00	5.00	20.00	80.00
95	J	UAF	40	3	239	0.00	5.00	20.00	80.00
92	J	UAF	45	1	244-245	0.00	5.00	20.00	80.00
92	J	UAF	45	2	244-245	0.00	5.00	20.00	80.00
92	J	UAF	45	3	244-245	0.00	5.00	20.00	80.00
93	J	UAF	45	1	245-246	0.00	5.00	20.00	80.00
93	J	UAF	45	2	245-246	0.00	5.00	20.00	80.00
93	J	UAF	45	3	245-246	0.00	5.00	20.00	80.00
94	J	UAF	45	1	253	0.00	5.00	20.00	80.00
94	J	UAF	45	2	253	0.00	5.00	20.00	80.00
94	J	UAF	45	3	253	0.00	5.00	20.00	80.00
95	J	UAF	45	1	241	0.00	5.00	20.00	80.00
95	J	UAF	45	2	241	0.00	5.00	20.00	80.00
95	J	UAF	45	3	241	0.00	5.00	20.00	80.00
92	J	UAF	50	1	243-247	0.00	5.00	20.00	80.00
92	J	UAF	50	2	243-247	0.00	5.00	20.00	80.00
92	J	UAF	50	3	243-247	0.00	5.00	20.00	80.00
93	J	UAF	50	1	242-245	0.00	5.00	20.00	80.00
93	J	UAF	50	2	242-245	0.00	5.00	20.00	80.00
93	J	UAF	50	3	242-245	0.00	5.00	20.00	80.00

SAMPLE INFORMATION (levels below detection set at detection limit)						Total Toxic Units	MODEL RESULTS		
						∑(TUi) x100 (%)	***Probability of Toxicity:*** with regression limits	***Probability of Uncertain Toxicity:*** with regression limits	***Probability of No Toxicity:*** with regression limits
Year	Area	Data	Station	Rep.	Depth		(mortality>24%)	(13%>mortality<24%)	(mortality<13%)
94	J	UAF	50	1	250	0.00	5.00	20.00	80.00
94	J	UAF	50	2	250	0.00	5.00	20.00	80.00
94	J	UAF	50	3	250	0.00	5.00	20.00	80.00
95	J	UAF	50	1	241	0.00	5.00	20.00	80.00
95	J	UAF	50	2	241	0.00	5.00	20.00	80.00
95	J	UAF	50	3	241	0.00	5.00	20.00	80.00
92	K	UAF	11	1	201-205	0.00	5.00	20.00	80.00
92	K	UAF	11	2	201-205	0.00	5.00	20.00	80.00
92	K	UAF	11	3	201-205	0.01	5.00	20.00	80.00
93	K	UAF	11	1	206	0.00	5.00	20.00	80.00
93	K	UAF	11	2	206	0.00	5.00	20.00	80.00
93	K	UAF	11	3	206	0.00	5.00	20.00	80.00
94	K	UAF	11	1	206-207	0.00	5.00	20.00	80.00
94	K	UAF	11	2	206-207	0.00	5.00	20.00	80.00
94	K	UAF	11	3	206-207	0.00	5.00	20.00	80.00
95	K	UAF	11	1	198	0.00	5.00	20.00	80.00
95	K	UAF	11	2	198	0.00	5.00	20.00	80.00
95	K	UAF	11	3	198	0.00	5.00	20.00	80.00
92	K	UAF	16	1	232-233	0.00	5.00	20.00	80.00
92	K	UAF	16	2	232-233	0.00	5.00	20.00	80.00
92	K	UAF	16	3	232-233	0.00	5.00	20.00	80.00
93	K	UAF	16	1	233	0.00	5.00	20.00	80.00
93	K	UAF	16	2	233	0.00	5.00	20.00	80.00
93	K	UAF	16	3	233	0.00	5.00	20.00	80.00
94	K	UAF	16	1	238-240	0.00	5.00	20.00	80.00
94	K	UAF	16	2	238-240	0.00	5.00	20.00	80.00
94	K	UAF	16	3	238-240	0.00	5.00	20.00	80.00
95	K	UAF	16	1	239	0.00	5.00	20.00	80.00
95	K	UAF	16	2	239	0.00	5.00	20.00	80.00
95	K	UAF	16	3	239	0.00	5.00	20.00	80.00
92	K	UAF	32	1	237-241	0.00	5.00	20.00	80.00
92	K	UAF	32	2	237-241	0.00	5.00	20.00	80.00
92	K	UAF	32	3	237-241	0.00	5.00	20.00	80.00
93	K	UAF	32	1	239-240	0.00	5.00	20.00	80.00
93	K	UAF	32	2	239-240	0.00	5.00	20.00	80.00
93	K	UAF	32	3	239-240	0.00	5.00	20.00	80.00
94	K	UAF	32	1	241	0.00	5.00	20.00	80.00
94	K	UAF	32	2	241	0.00	5.00	20.00	80.00
94	K	UAF	32	3	241	0.00	5.00	20.00	80.00

SAMPLE INFORMATION (levels below detection set at detection limit)						Total Toxic Units	MODEL RESULTS		
						∑(TUi) x100 (%)	***Probability of Toxicity:*** with regression limits (mortality>24%)	***Probability of Uncertain Toxicity:*** with regression limits (13%>mortality<24%)	***Probability of No Toxicity:*** with regression limits (mortality<13%)
Year	Area	Data	Station	Rep.	Depth				
95	K	UAF	32	1	23	0.00	5.00	20.00	80.00
95	K	UAF	32	2	235	0.00	5.00	20.00	80.00
95	K	UAF	32	3	235	0.00	5.00	20.00	80.00
92	K	UAF	80	1	87-92	0.00	5.00	20.00	80.00
92	K	UAF	80	2	87-92	0.00	5.00	20.00	80.00
92	K	UAF	80	3	87-92	0.00	5.00	20.00	80.00
93	K	UAF	80	1	76-79	0.00	5.00	20.00	80.00
93	K	UAF	80	2	76-79	0.00	5.00	20.00	80.00
93	K	UAF	80	3	76-79	0.00	5.00	20.00	80.00
94	K	UAF	80	1	85-88	0.00	5.00	20.00	80.00
94	K	UAF	80	2	85-88	0.00	5.00	20.00	80.00
94	K	UAF	80	3	85-88	0.00	5.00	20.00	80.00
95	K	UAF	80	1	79	0.00	5.00	20.00	80.00
95	K	UAF	80	2	79	0.00	5.00	20.00	80.00
95	K	UAF	80	3	79	0.00	5.00	20.00	80.00
93	K	UAF	82	1	89-93	0.00	5.00	20.00	80.00
93	K	UAF	82	2	89-93	0.00	5.00	20.00	80.00
93	K	UAF	82	3	89-93	0.00	5.00	20.00	80.00
94	K	UAF	82	1	107	0.01	5.00	20.00	80.00
94	K	UAF	82	2	107	0.00	5.00	20.00	80.00
94	K	UAF	82	3	107	0.00	5.00	20.00	80.00
95	K	UAF	82	1	79	0.00	5.00	20.00	80.00
95	K	UAF	82	2	79	0.00	5.00	20.00	80.00
95	K	UAF	82	3	79	0.00	5.00	20.00	80.00
93	K	UAF	E5S	1	100	0.00	5.00	20.00	80.00
93	K	UAF	E5S	2	100	0.00	5.00	20.00	80.00
93	K	UAF	E5S	3	100	0.00	5.00	20.00	80.00
94	K	UAF	W3D	1	60	0.01	5.00	20.00	80.00
94	K	UAF	W3D	2	60	0.01	5.00	20.00	80.00
94	K	UAF	W3D	3	60	0.00	5.00	20.00	80.00
93	K	UAF	W4S	1	60	0.00	5.00	20.00	80.00
93	K	UAF	W4S	2	60	0.00	5.00	20.00	80.00
93	K	UAF	W4S	3	60	0.00	5.00	20.00	80.00
93	K	UAF	W5S	1	100	*data not available*	*data not available*	*data not available*	*data not available*
93	K	UAF	W5S	2	100	*data not available*	*data not available*	*data not available*	*data not available*
93	K	UAF	W5S	3	100	*data not available*	*data not available*	*data not available*	*data not available*
93	K mz	LTEMP	AMT-S(1)	1	79	0.00	5.00	20.00	80.00
93	K mz	LTEMP	AMT-S(1)	1	79	0.00	5.00	20.00	80.00
93	K mz	LTEMP	AMT-S(1)	1	79	0.00	5.00	20.00	80.00

SAMPLE INFORMATION (levels below detection set at detection limit)						Total Toxic Units	MODEL RESULTS		
						∑(TUi) x100 (%)	***Probability of Toxicity:*** with regression limits	***Probability of Uncertain Toxicity:*** with regression limits	***Probability of No Toxicity:*** with regression limits
Year	Area	Data	Station	Rep.	Depth		(mortality>24%)	(13%>mortality<24%)	(mortality<13%)
93	K mz	LTEMP	AMT-S(2)	2	63	0.00	5.00	20.00	80.00
93	K mz	LTEMP	AMT-S(2)	2	71	0.00	5.00	20.00	80.00
93	K mz	LTEMP	AMT-S(2)	2	76	0.01	5.00	20.00	80.00
94	K mz	LTEMP	AMT-S(3)	3	67	0.00	5.00	20.00	80.00
94	K mz	LTEMP	AMT-S(3)	3	67	0.00	5.00	20.00	80.00
94	K mz	LTEMP	AMT-S(3)	3	65	0.00	5.00	20.00	80.00
94	K mz	LTEMP	AMT-S(4)	4	78	0.00	5.00	20.00	80.00
94	K mz	LTEMP	AMT-S(4)	4	73	0.00	5.00	20.00	80.00
94	K mz	LTEMP	AMT-S(4)	4	68	0.01	5.00	20.00	80.00
95	K mz	LTEMP	AMT-S(5)	1	67	0.00	5.00	20.00	80.00
95	K mz	LTEMP	AMT-S(5)	2	78	0.00	5.00	20.00	80.00
95	K mz	LTEMP	AMT-S(5)	3	68	0.00	5.00	20.00	80.00
95	K mz	LTEMP	AMT-S(6)	1	70	0.03	5.00	20.00	80.00
95	K mz	LTEMP	AMT-S(6)	2	67	0.00	5.00	20.00	80.00
95	K mz	LTEMP	AMT-S(6)	3	77	0.00	5.00	20.00	80.00
92	K mz	UAF	D25	1	160-167	0.00	5.00	20.00	80.00
92	K mz	UAF	D25	2	160-167	0.00	5.00	20.00	80.00
92	K mz	UAF	D25	3	160-167	0.00	5.00	20.00	80.00
93	K mz	UAF	D25	1	96-98	0.00	5.00	20.00	80.00
93	K mz	UAF	D25	2	96-98	0.00	5.00	20.00	80.00
93	K mz	UAF	D25	3	96-98	0.00	5.00	20.00	80.00
94	K mz	UAF	D25	1	79	0.00	5.00	20.00	80.00
94	K mz	UAF	D25	2	79	0.00	5.00	20.00	80.00
94	K mz	UAF	D25	3	79	0.00	5.00	20.00	80.00
95	K mz	UAF	D25	1	73	0.00	5.00	20.00	80.00
95	K mz	UAF	D25	2	73	0.01	5.00	20.00	80.00
95	K mz	UAF	D25	3	73	0.00	5.00	20.00	80.00
93	K mz	UAF	D33	1	84-87	0.00	5.00	20.00	80.00
93	K mz	UAF	D33	2	84-87	0.00	5.00	20.00	80.00
93	K mz	UAF	D33	3	84-87	0.00	5.00	20.00	80.00
92	K mz	UAF	D51	1	105-110	0.00	5.00	20.00	80.00
92	K mz	UAF	D51	2	105-110	0.00	5.00	20.00	80.00
92	K mz	UAF	D51	3	105-110	0.00	5.00	20.00	80.00
93	K mz	UAF	D51	1	88-122	0.00	5.00	20.00	80.00
93	K mz	UAF	D51	2	88-122	0.00	5.00	20.00	80.00
93	K mz	UAF	D51	3	88-122	0.00	5.00	20.00	80.00
94	K mz	UAF	D51	1	98-100	0.00	5.00	20.00	80.00
94	K mz	UAF	D51	2	98-100	0.00	5.00	20.00	80.00
94	K mz	UAF	D51	3	98-100	0.00	5.00	20.00	80.00

SAMPLE INFORMATION (levels below detection set at detection limit)						Total Toxic Units	MODEL RESULTS		
						∑(TUi) x100 (%)	***Probability of Toxicity:*** with regression limits	***Probability of Uncertain Toxicity:*** with regression limits	***Probability of No Toxicity:*** with regression limits
Year	Area	Data	Station	Rep.	Depth		(mortality>24%)	(13%>mortality<24%)	(mortality<13%)
95	K mz	UAF	D51	1	79	0.00	5.00	20.00	80.00
95	K mz	UAF	D51	2	79	0.00	5.00	20.00	80.00
95	K mz	UAF	D51	3	79	0.00	5.00	20.00	80.00
92	K mz	UAF	D69	1	99-128	0.01	5.00	20.00	80.00
92	K mz	UAF	D69	2	99-128	0.00	5.00	20.00	80.00
92	K mz	UAF	D69	3	99-128	0.00	5.00	20.00	80.00
93	K mz	UAF	D69	1	101-105	0.00	5.00	20.00	80.00
93	K mz	UAF	D69	2	101-105	0.00	5.00	20.00	80.00
93	K mz	UAF	D69	3	101-105	0.00	5.00	20.00	80.00
94	K mz	UAF	D69	1	73	0.00	5.00	20.00	80.00
94	K mz	UAF	D69	2	73	0.00	5.00	20.00	80.00
94	K mz	UAF	D69	3	73	0.00	5.00	20.00	80.00
95	K mz	UAF	D69	1	68	0.00	5.00	20.00	80.00
95	K mz	UAF	D69	2	68	0.00	5.00	20.00	80.00
95	K mz	UAF	D69	3	68	0.00	5.00	20.00	80.00
92	K mz	UAF	D73	1	236-241	0.00	5.00	20.00	80.00
92	K mz	UAF	D73	2	236-241	0.00	5.00	20.00	80.00
92	K mz	UAF	D73	3	236-241	0.00	5.00	20.00	80.00
93	K mz	UAF	D73	1	232-234	0.00	5.00	20.00	80.00
93	K mz	UAF	D73	2	232-234	0.00	5.00	20.00	80.00
93	K mz	UAF	D73	3	232-234	0.00	5.00	20.00	80.00
94	K mz	UAF	D73	1	228	0.00	5.00	20.00	80.00
94	K mz	UAF	D73	2	228	0.00	5.00	20.00	80.00
94	K mz	UAF	D73	3	228	0.00	5.00	20.00	80.00
95	K mz	UAF	D73	1	231	0.00	5.00	20.00	80.00
95	K mz	UAF	D73	2	231	0.00	5.00	20.00	80.00
95	K mz	UAF	D73	3	231	0.00	5.00	20.00	80.00
92	K mz	UAF	D77	1	234-236	0.00	5.00	20.00	80.00
92	K mz	UAF	D77	2	234-236	0.00	5.00	20.00	80.00
92	K mz	UAF	D77	3	234-236	0.00	5.00	20.00	80.00
93	K mz	UAF	D77	1	236-238	0.00	5.00	20.00	80.00
93	K mz	UAF	D77	2	236-238	0.00	5.00	20.00	80.00
93	K mz	UAF	D77	3	236-238	0.00	5.00	20.00	80.00
94	K mz	UAF	D77	1	235-238	0.00	5.00	20.00	80.00
94	K mz	UAF	D77	2	235-238	0.00	5.00	20.00	80.00
94	K mz	UAF	D77	3	235-238	0.01	5.00	20.00	80.00
95	K mz	UAF	D77	1	231	0.00	5.00	20.00	80.00
95	K mz	UAF	D77	2	231	0.00	5.00	20.00	80.00
95	K mz	UAF	D77	3	231	0.00	5.00	20.00	80.00