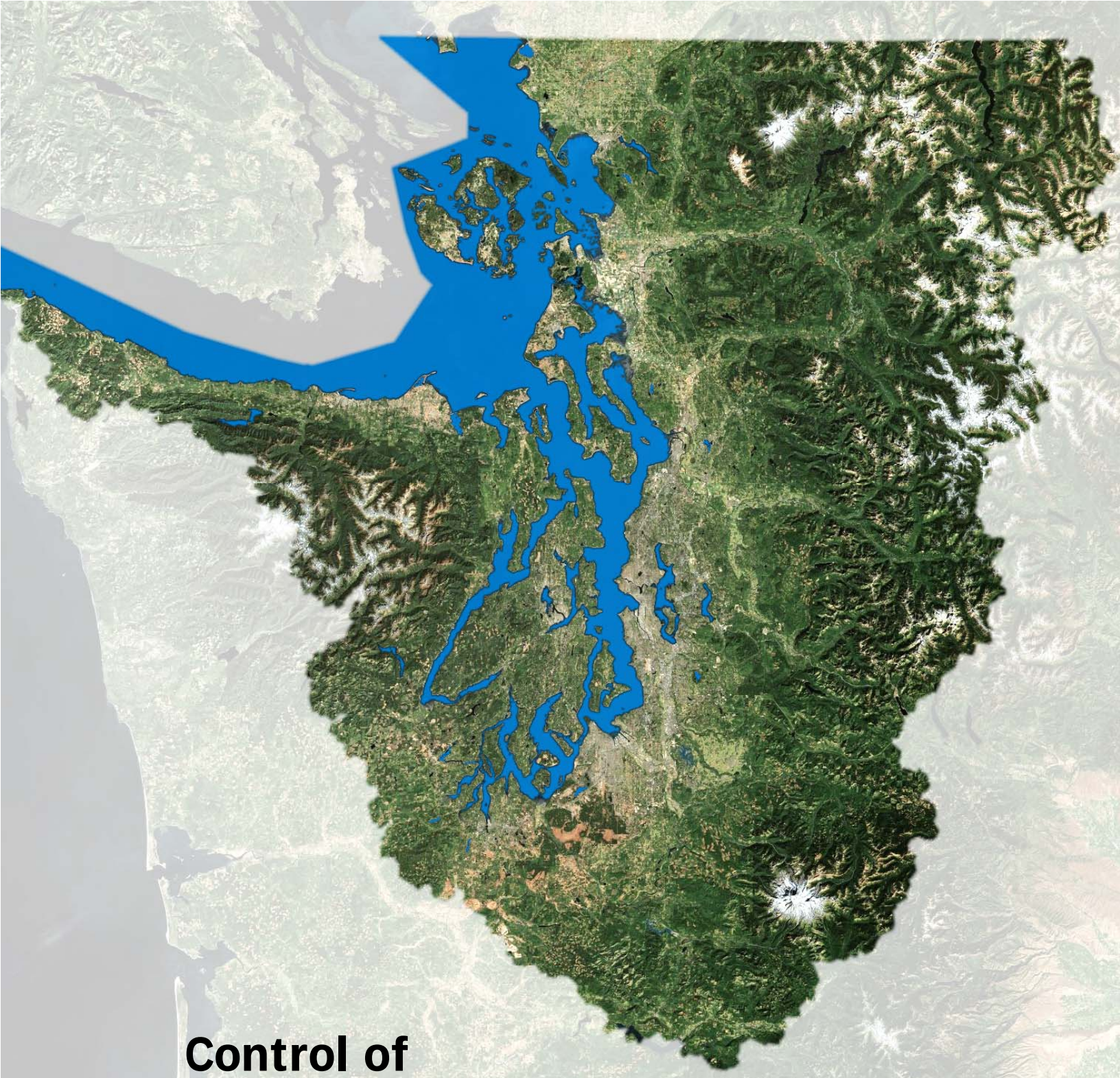

Control of Toxic Chemicals in Puget Sound

Phase 2: Improved Estimates of Loadings from Dischargers of Municipal and Industrial Wastewater

DEPARTMENT OF ECOLOGY
State of Washington

EnviroVision Corp

HERRERA ENVIRONMENTAL CONSULTANTS

Control of Toxic Chemicals in Puget Sound

Phase 2: Improved Estimates of Loadings from Dischargers of Municipal and Industrial Wastewater

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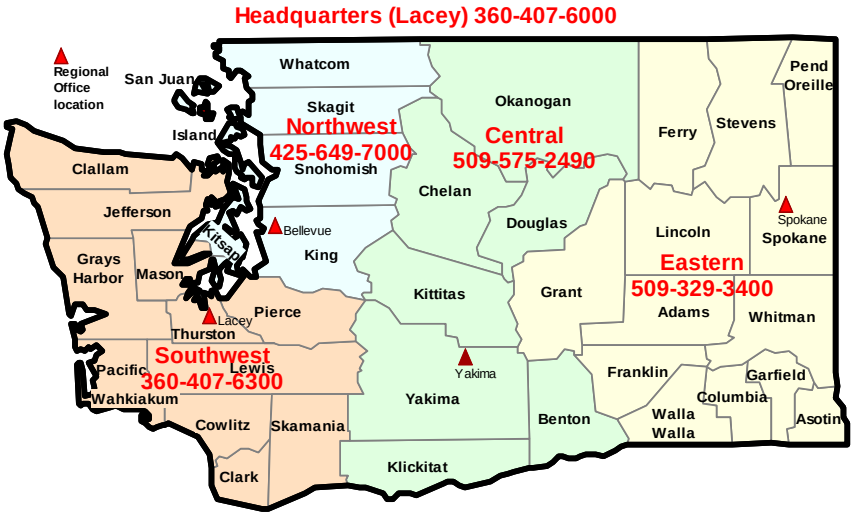

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Executive Summary

Recent estimates of toxic chemical loading from municipal and industrial wastewater dischargers to Puget Sound have been incomplete (Phase 1 study by Hart Crowser et al., 2007). Ecology conducted this Phase 2 study to refine its understanding of the wastewater loading pathway. The key differences between this Phase 2 study and the Phase 1 study were:

- Phase 2 used data from 125 facilities, while Phase 1 used data from only 84 facilities.
- Phase 2 used more recent monitoring data, collected from 2003 through 2007.
- Phase 2 considered 137 pollutants, while Phase 1 focused on only 17 chemicals of concern.

The reported total volume of wastewater discharged from permitted point sources to the Puget Sound Basin was approximately 174,000 million gallons per year (mgy). The majority of the discharge (75 percent) was from municipal wastewater treatment plants. Most of this volume came from just a few of the facilities; the top 15 individual dischargers combined discharged 76 percent of the total. (For comparison, 174,000 mgy is less than 1 percent of the total inflow to Puget Sound from all the rivers and direct groundwater discharges in the Puget Sound Basin.)

The water quality data used in this study had several limitations. First, few pollutants (only seven) had enough data to support development of credible loading estimates. A second limitation was the inconsistent and sometimes high detection limits reported for many of the chemicals. A third significant limitation concerned the estimated pollutant loadings for industrial facilities. Depending upon the pollutant, only 10 to 23 of a total of 75 industrial facilities could be included in the loading calculations. Also, an important simplifying assumption was that 100 percent of the pollutants in wastewater discharges that flowed into the rivers and streams of the Puget Sound Basin eventually reached the marine waters of Puget Sound. Thus, the loading estimates did not account for natural processes that might capture or degrade some of the toxic chemicals before they reached Puget Sound.

The primary conclusion from this Phase 2 analysis is that the contributions of toxic chemicals from wastewater dischargers were small relative to the total loadings from all of the major loading sources to Puget Sound (including, for example, atmospheric deposition and surface runoff). For those pollutants with sufficient data, the estimated portion of the total loadings from wastewater dischargers ranged from 1.4 to 7.0 percent of the total loading to Puget Sound. Surface runoff has been the largest contributing source of toxic chemicals to Puget Sound. For those pollutants with sufficient data, the estimated portion of the total loadings from wastewater dischargers ranged from 1.9 to 8.9 percent of the total loading from surface runoff to Puget Sound.

With the exception of chloroform and mercury, municipal wastewater treatment plants discharged significantly more toxic chemicals than did industrial dischargers – from 1.4 to 5.9

times as much of the seven selected pollutants. The primary reason for the relative difference in toxic chemical loadings between wastewater dischargers was not whether they were municipal or industrial facilities, but rather the relative sizes of the discharges. The estimated loadings were greatest from those areas of the Puget Sound Basin containing multiple and/or large dischargers: Commencement Bay, Main Basin, Port Gardner, and the Strait of Georgia.

More than 80 percent of the priority pollutants analyzed in wastewater discharges were either absent at detectable concentrations or detected in only one or two samples. The large proportion of non-detect values prevented accurate estimation of loadings for many of the contaminants.

Ecology should place more emphasis on controlling releases of toxic chemicals from the geographic area(s) with the greatest density of dischargers, and on those permittees who discharge large volumes, discharge chemicals that pose high threats, or discharge to ecologically sensitive or valuable areas of Puget Sound. Ecology should not use the loading estimates developed in this study for evaluating individual facilities, or for evaluating the effectiveness of pollutant reduction measures implemented at those facilities over time.

Ecology and the U.S. Environmental Protection Agency (EPA) should require all permitted wastewater dischargers to monitor the flow of their discharges with enough regularity to report accurate average annual flows and frequently enough to help account for seasonal variations in both ecological risks and facility operations (more than current permits require). The agencies should work together to standardize the required analytical methods and detection limits in their permits so that permittees will use the same or readily comparable analytical methods and the lowest achievable detection limits.

Ecology's next step should include collection of new data to improve future loading estimates and to provide data sufficient for tracking reductions in toxic chemical loadings to Puget Sound. Ecology should collect targeted samples and analyze them using methods that attain smaller detection limits. Ecology should develop more realistic assumptions about the fate of toxic chemicals discharged into the freshwater streams and rivers of the Puget Sound Basin, collect ambient and wastewater monitoring data to validate those assumptions, and incorporate this information into improved versions of the Ecology Puget Sound Box Model. Also, as Ecology and the U.S. EPA identify emerging potential threats from other toxic chemicals (for example, polybrominated diphenyl ethers, fluorinated organic compounds, bisphenol A, and pharmaceuticals and personal care products), they should (or should require permittees to) collect and analyze wastewater samples for those newly identified pollutants.

Introduction

As a consequence of the Governor's Puget Sound Initiative, the Washington Department of Ecology (Ecology), Puget Sound Partnership, U.S. Environmental Protection Agency (EPA), and other interested parties are collaborating in a multi-year effort to protect and restore the overall health of the Puget Sound ecosystem. Characterizing the existing contribution of toxic pollutants to Puget Sound through various pathways is an important step for prioritizing possible future actions. A Phase 1 study (Hart Crowser et al. 2007) was completed to support this goal. In that study, readily available information was used to characterize and quantify the loadings to the Puget Sound Basin for a prioritized list of toxic chemicals arising from the following pathways:

- Surface runoff
- Atmospheric deposition
- Wastewater loading
- Combined sewer overflows
- Direct spills

In the Phase 1 study, the data used to develop the loading estimates for municipal and industrial wastewater facilities were limited to historical monitoring data that were stored electronically. However, considerable relevant monitoring information was also available on paper but not in an electronic format. The wastewater loading estimates were therefore incomplete. The report for the Phase 1 project recommended that Ecology conduct further analyses to refine its understanding of the wastewater loading pathway in the Puget Sound Basin.

In response to the recommendations of the Phase 1 toxics loading project, Ecology retained EnviroVision Corporation, who teamed with Herrera Environmental Consultants, Inc. (Herrera), to refine the initial toxic chemical loading estimates from the Phase 1 project and to incorporate additional information on toxic chemical loadings from permitted dischargers of wastewater. The project team was composed of EnviroVision, Herrera, and Ecology, and received advice from the members of a technical project work group (listed on page iii). As part of this Phase 2 effort, the project team conducted a more thorough search for wastewater discharge data for a wider list of priority pollutants from permitted dischargers to the Puget Sound Basin, incorporated the information into an electronic database, and then refined the toxic chemical loading estimates.

The key differences between the wastewater loading database developed for this Phase 2 study and the Phase 1 study are:

- The data reviewed in Phase 2 were obtained from a variety of sources, resulting in a total of 180 facilities included in the database and 125 facilities represented in the pollutant loading calculations. The Phase 1 study had used data from only 84 facilities.

- The Phase 2 project team used only the most recent data set collected within the past 5 years for each facility (2003 through 2007). The Phase 1 study used all electronically available data for facilities sampled from 2002 through 2006. If multiple results for a chemical parameter were available for a facility, the Phase 1 study used the average concentration in the loading calculations.
- The Phase 2 database lists 137 pollutants, including most EPA priority pollutants, as compared to the 17 pollutants that the Phase 1 study reviewed.

Similar to the Phase 1 study, in this Phase 2 analysis the project team estimated pollutant loadings from 14 different "study areas" in the Puget Sound Basin. These study areas correspond to those upland areas used by Ecology for its Puget Sound Box Model. Figure 1 illustrates the locations of the study areas.

The purpose of this study was not to estimate pollutant loadings from individual facilities but rather to provide a comparative and spatial analysis of the different municipal and industrial loading sources for each of the 14 study areas in the Puget Sound Basin. Therefore, we organized the tables, graphics, and analyses to enhance those comparisons. Estimates of loadings from individual facilities are in the appendices.

This report describes the methods and results of this study, and provides a discussion, conclusions, and recommendations. We have tried to simplify the information presented in the main body of the report. The more detailed facility information, calculations, and loading results are included as appendices. In addition to this report, EnviroVision has provided Ecology with an electronic copy of the Access database developed for this study.

Methods

Data Sources

Ecology took the first step in collecting and organizing information and data on the National Pollutant Discharge Elimination System (NPDES) and state permits that are currently in effect in the Puget Sound Basin for dischargers of industrial and municipal wastewater. The basic information for each permitted facility included facility name, location, type of discharge, and often the annual average discharge volume. Ecology provided this information through various pathways and formats including: an Excel® spreadsheet, a CD with scanned lab reports, tabular data, an ftp site, and as hard copy. Monitoring data included: permittee-reported flow measurements and summaries, laboratory reports, and summaries of pollutant concentrations. The original sources of these data included Ecology's Water Quality Permit Life Cycle System (WPLCS) database, discharge monitoring reports prepared by permittees, communications from Ecology permit managers, and spreadsheets from the U.S. EPA.

In 2006 and 2007, Ecology requested larger municipal treatment plants and some industrial dischargers to conduct supplemental mercury monitoring using an improved analysis method. Ecology provided these data in a separate spreadsheet. These were the only mercury data included in the database; mercury data provided via other sources were not used due to data quality concerns. To avoid the inclusion of data that may have been generated using outdated analytical methodologies or that were no longer representative of current wastewater discharges, we used only data for samples collected from 2002 through 2007. In cases where multiple analytical results existed for a given chemical at a facility, we used only the most recent data.

Database Development

Facility List

Ecology provided an initial list of 199 state-regulated facilities or outfalls that discharged wastewater, as well as 54 U.S. EPA-regulated facilities, for a total of 253 permitted facilities for use in developing a database of point source discharges to Puget Sound. The list included both direct discharges to Puget Sound as well as those facilities that discharged to lakes, streams, or rivers that in turn discharged to Puget Sound. A complete list of these facilities is provided as Appendix A. The project team's first step in developing the database was to sort through the facility list and discard any facilities that did not discharge wastewater effluent to surface waters in the Puget Sound Basin. Facilities removed from the list included those that:

- Discharged almost entirely stormwater, for which flow data typically did not exist.
- Were closed or inactive.

- Discharged to groundwater or to a municipal wastewater treatment facility.
- Were overwater facilities with no measurable discharge (for example, fish or shellfish farms).
- Discharged sporadically (for example, water used for fire training).
- Were shipyards whose discharges consisted of water that had entered the dock or lock areas.
- Were primarily pass-through facilities (for example, hatcheries).

The project team eliminated 73 facilities or outfalls for these reasons. The remaining 180 facilities were those that best represented the facilities currently discharging wastewater effluent to Puget Sound. Of these 180 facilities, 105 (58 percent) were municipal wastewater treatment facilities, and 75 (42 percent) were industrial facilities.

Several permitted dischargers used multiple outfalls. If a particular facility had, for example, two discharge locations, we retained for the loading analysis only the one that carried primarily wastewater, and we discarded the results from the outfall that discharged entirely or almost entirely stormwater. Only one facility had two outfalls that both discharged primarily wastewater – the Everett Sewage Treatment Plant (Loehr, L. Pers. Comm.). In this case, we used the data from both of the outfalls in the toxics loading database.

The project team's next step in preparing the facility list was to consider for each discharger whether discharge volume and pollutant concentration data were available. Of the 105 municipal facilities, 10 had neither flow nor priority pollutant data and therefore were not included in the pollutant loading calculations. Another 40 municipal treatment plants did not have priority pollutant data, but did have discharge flow data. Based on the assumption that effluents from municipal facilities have similar pollutant characteristics, we used the available municipal discharge data to estimate the pollutant character data for these 40 facilities. The method used for these estimates is described in the Pollutant Loading Calculations section below.

Of the 75 industrial facilities, a total of 25 industrial facilities lacked flow data. The number of industrial facilities that lacked pollutant concentration data varied by pollutant. Since no reasonable assumption could be made to allow estimating the effluent character of these different industries, industrial facilities with no flow or concentration data were retained in the master list but were not included in the loading calculations. As a consequence, the maximum number of industrial facilities represented in the loading calculations for any one pollutant was 23. For example, while we had copper data paired with flow data for 23 industrial facilities, we had total phenolics data paired with flow data for only 10 industrial facilities. (Appendix A-1 indicates that a total of 30 industrial facilities were included in the loading calculations. This apparent discrepancy between the maximum of 23 included in any pollutant loading calculation and the total of 30 shown in Appendix A was due to different pollutants having been analyzed in different industrial discharges.)

Ultimately, the total number of facilities included in the pollutant loading calculations and evaluation was 125. However, for any one pollutant the number of facilities included in the calculations was much smaller than this. As indicated in Table 1, the maximum number of entries (or facilities) for any one pollutant was 79. Appendix A contains the full list of point source dischargers to the Puget Sound Basin. Within Appendix A, Table A-1 lists those point source dischargers whom we included in the database and indicates which of these we included in the pollutant loading calculations. Table A-2 lists those dischargers whom we excluded from the database and the rationale for their exclusion.

Water Quality Data

The database identifies 137 priority pollutants or composites of pollutants (for example, total phenolics), including metals and organic pollutants. Table 1 provides a complete list of the pollutants and summarizes the number of values in the database for each pollutant. This table also specifies the number of data values available from municipal versus industrial facilities, as well as the number of data values that were less than the analytical method detection limits (the "non-detect values"). The total number of values for each pollutant ranged from 0 to 79 out of the maximum possible 180 (one from each facility). For all pollutants the majority of the data values were from municipal wastewater treatment works. A majority of pollutants (113 out of 137) either were never detected in quantifiable amounts or were detected in only one or two samples.

The majority of the pollutant data in the database were from laboratory analysis reports that were complete in terms of sample identification, date, results, and laboratory quality assurance (QA) checks. However, in a fair number of cases, the available data were incomplete or provided in a manner that made them difficult to use. Some common problems included:

- No reported method detection limit (MDL) or method reporting limit (MRL).
- An MDL, but no MRL.
- General information lacking (for example, unidentified outfall, no sample date, no method listed).
- Unreadable copies and missing pages on lab reports.
- Apparent outliers or unit reporting errors.

After entering the data into spreadsheets, we performed a QA check of the data entries. The data entry QA procedure involved randomly selecting 10 percent of the facility data sets for separate verification. If data entry errors were detected, another 10 percent were selected from the remaining list. An additional QA check was conducted to verify all values that seemed particularly high against the original data sheets and to correct them if necessary. In one case, an analytical report noted a particularly high value as having "possible contribution of laboratory background" (that is, a value of 140 ug/L for *bis*(2-ethylhexyl)phthalate). However, since the

laboratory did not reject this value, we also retained it and labeled it as a "qualified value." Due to inherent problems with quantifying pollutant loadings when concentrations were below the MDL or MRL, we selected a subset of seven pollutants for the loading calculations. These seven water quality pollutants were: copper, lead, mercury, zinc, *bis*(2-ethylhexyl)phthalate (BEHP), chloroform, and total phenolics. We selected copper, lead, and zinc because they were best represented in the data set, and they had been evaluated in other studies (Trim et al., 2008 and Hart Crowser et al., 2007). We selected mercury because the data were newer and of a greater quality than had been available previously. The criteria for selecting the organic pollutants were: each chemical needed a minimum of 20 data values, and 10 or more of those values must be greater than or equal to the detection limit.

Discharge Volume or Flow Data

The project team gathered wastewater flow data that permitted dischargers had reported to Ecology for the later of either 2006 or 2007, as available. The source documents were sometimes inconsistent in reporting flow rates. Reports variously listed flows as: "average," "average monthly," "average annual," "maximum," and "permit limit flows." We used the average flow expressed on a daily basis to calculate pollutant loadings when it was available. (If flows were expressed as average annual or monthly average, we converted them to a daily average.) The order of preference was to use any type of "average" flow, then "permit limit flows," and finally "maximum flows," which were assumed to be permit maximums and not design maximums. Only four industrial facilities (identified in Appendix A) required us to use permit limit flows in the pollutant loading calculations. (Other industrial facilities had only permit limit flow data also, but since they did not have pollutant concentration data available either, we did not include them in the loading calculations). We did not use reported maximum flows in any of the pollutant loading calculations. The 10 municipal facilities without flow data were those tribal and federal facilities regulated by the U.S. EPA.

Pollutant Loading Calculations

The project team developed point source annual loading rates for seven toxic chemicals for each of the 14 study areas in Puget Sound. These rates were largely based on average annual flows and the most recent pollutant concentration data, as described above. We assumed that 100 percent of the calculated pollutant load was discharged to Puget Sound even if the discharge occurred into a river many miles upstream of the Sound. We calculated loading rates separately for municipal and industrial sources.

We used the following equations in calculating loading rates:

$$L_{municipal} = \sum_i Q_i C_i + C_{median} \sum Q_{unsampled}$$

$$L_{industrial} = \sum_j Q_j C_j$$

Where: Q_i and C_i = Individual municipal flows and concentrations.
Q_j and C_j = Individual industrial flows and concentrations.
C_{median} = Median municipal concentration.
$Q_{unsampled}$ = Unsampled municipal flows.
$L_{municipal}$ and $L_{industrial}$ = Municipal and industrial loading rates, respectively.

Since the concentrations of toxic chemicals among the municipal wastewater treatment plants were not normally distributed, we used their median concentration (C_{median}), rather than their average concentration, as a better representation of their central tendency for extrapolating their contribution to the total loading. Unsampled municipal flows ($Q_{unsampled}$) were the reported annual flows from the municipal wastewater treatment plants where no analytical results existed for any of the seven subject toxic chemicals. To account for the impact of non-detect values on the results, we repeated these calculations three times, handling the non-detect values in three different ways:

- For a high estimate of loading, we replaced non-detect values with the MRL if it were available. If the MRL were not available, we replaced them with the MDL.
- For an intermediate estimate of loading, we replaced non-detect values with the value of one-half the MRL if it were available. If the MRL were not available, we replaced them with one-half the MDL.
- For the lowest estimate of loading, we assigned zero concentrations to the non-detect values.

In a limited number of cases (less than five for any pollutant of concern), data consisted of non-detect values with no specified MDL or MRL. In these cases, we used the mean of the reporting limits from the other analyses of that pollutant.

We wanted to depict the range of loading estimates as affected by the different ways of handling non-detect values, but did not want the text and tables to become too confusing. Therefore, we consistently used the intermediate estimate (the estimate based on one-half the MDL or MRL) and depicted the range in loadings by using the "±" symbol to indicate the differences that can be attributed to the different non-detect handling methods. In the text we have referred to this "±" as the "uncertainty" or "absolute uncertainty" associated with the loading estimates. When we report the uncertainty as a percentage we have used the term "relative uncertainty."

To extrapolate the loading from municipal facilities for which no pollutant concentration data were available (for the seven selected toxic chemicals), we performed a regression analysis (using log transformed data) to determine whether pollutant concentrations could be predicted from facility size (that is, discharge volume). However, since there was no correlation ($r^2 < 0.05$) between flow and pollutant concentrations, the regression approach was not used for

extrapolation. Instead, we calculated the median concentrations from the municipal facilities for which there were data and applied those to the remaining municipal facilities. For this extrapolation, we calculated the median concentrations based on the concentration distributions in which we had replaced non-detect values with one-half the MDL or MRL.

The project team estimated loading rates for industrial sources as the product of reported concentrations and reported average annual flows. Again we computed three estimates of loading rates, by applying the different assumptions about the non-detect values, as described above. We did not estimate loading rates from industrial facilities that did not have pollutant concentration data. Since industrial sources are a heterogeneous group likely to have more variability in effluent concentrations than municipal wastewater treatment plants, we considered them unlikely to be well represented by a single median concentration.

As part of the final submittal for this project, EnviroVision provided to Ecology the entire database, including facility information, water quality data, and the detailed loading calculations.

Results

Facility Summary

The project team identified a total of 253 permitted wastewater dischargers in the Puget Sound Basin. We excluded 73 of these facilities from the database because they did not discharge wastewater effluent, leaving 180 facilities in the database.

The total number of facilities included in the pollutant loading calculations and evaluation ranged from 105 to 118 (58 to 66 percent of the total number of permittees) depending on the chemical. Appendix A provides detailed information on each facility and how it was handled in the database and calculations.

Table 2 is a summary of the number and type of dischargers in each of the study areas in the Puget Sound Basin. The majority (58 percent) were municipal dischargers. The Commencement Bay, Main Basin, and Strait of Georgia study areas had the greatest number of wastewater dischargers, and a large percentage of these were industrial.

Water Quality Summary

General results from the water quality data include the following:

- The database identifies 137 pollutants, but 113 of these were either never detected or detected in only one or two samples.
- No facility reported results for all of the water quality pollutants.
- No single pollutant was reported by all of the facilities.
- The range in detection limits (MDLs and MRLs) was wide for most of the pollutants, except mercury.
- Results for metals were reported most frequently.

Table 3 summarizes the ranges of pollutant concentrations measured for the seven selected pollutants and the ranges of the reported MDLs and MRLs reported. As shown, with the exception of zinc, the ranges of the limits extended over orders of magnitude, which made comparisons and calculations somewhat difficult to interpret.

Discharge Volumes

Table 4 summarizes the estimated annual volume of wastewater discharged from each of the different Puget Sound study areas. The known or reported total volume of effluent discharged to Puget Sound from point sources was approximately 174,000 million gallons per year (mgy). The majority of the discharge (130,000 mgy or 75 percent) was from municipal wastewater treatment plants. (For comparison purposes, 174,000 mgy is only approximately 0.45 percent of the total inflow to Puget Sound from all the rivers and direct groundwater discharges in the Basin.) Since no data for discharge volume were available for 25 industrial facilities and 10 federal and tribal municipal facilities, the total estimated discharge volume entering Puget Sound as indicated by Table 4 was slightly underestimated. Table 4 also shows the number of facilities in each study area that were not represented in the discharge calculation. Ten of the study areas had three or fewer facilities that did not report the volume of their discharges. The Main Basin, Port Gardner, Strait of Georgia, and Whidbey Basin study areas each had four to six facilities that did not report flow. Appendix A contains a list of those facilities lacking flow data, and therefore not included in this discharge volume estimate.

Figure 1 depicts the relative volume of wastewater discharged into each Puget Sound study area. As expected, three of the 14 study areas (Commencement Bay, Main Basin, and Port Gardner) received 72 percent of the total estimated wastewater discharge. In all of the study areas except Admiralty Inlet, Elliott Bay, San Juan Islands, and Strait of Juan de Fuca, municipal facilities were responsible for the majority of the discharge volume. Most of the discharge volume was accounted for by just a few of the facilities; the top 15 individual dischargers combined discharged 131,000 mgy, 76 percent of the total wastewater discharge.

Pollutant Loading Analysis

The following paragraphs summarize the calculated pollutant loadings to Puget Sound for each of the seven toxic chemicals analyzed in this study. These estimates do not include toxic chemical loadings from those facilities, whether industrial or municipal, for which discharge volume information was not available. Also, these estimates do not include toxic chemical loadings from those industrial facilities for which pollutant concentration data were not available. (As described in the Methods section, we did extrapolate toxic chemical loadings from estimated pollutant concentrations for municipal facilities for which concentration data were not available). Tables 5 through 11 summarize the estimated loadings of each of the seven pollutants from municipal and industrial sources in each study area, along with the number of facilities that were not included in the loading estimates. Since different industries sampled and analyzed different pollutants, the numbers of facilities not included in the estimates varies from one pollutant to the next. For example, in the entire Puget Sound Basin, 52 industrial facilities were not included in the copper loading analysis (Table 5), but 65 were not included for total phenolics (Table 11). The calculated loading attributed to municipal wastewater systems did include the values extrapolated from those facilities for which concentration data were missing, and was therefore a relatively more complete estimate of the total loading than was the estimate for the permitted industrial facilities.

The project team calculated the toxic chemical loadings by replacing all non-detect values with one-half the MDL or MRL. We have depicted the range in pollutant loadings that can be attributed to different methods of handling non-detect values (that is, assigning 0 or the MDL or MRL) by using the "±" symbol to signify the upper and lower range. Appendix B contains pollutant loading estimates as calculated for individual municipal and industrial wastewater treatment facilities. Note that due to the often highly variable concentrations of individual chemicals in wastewater, the calculations shown in Appendix B may not accurately represent the character of the discharge from any particular facility.

Copper

The total copper loading from wastewater point sources to Puget Sound was 8,760 ± 42 kg/year (Table 5). This load was slightly greater than the Phase 1 estimate of 7,200 kg/year (Hart Crowser et al. 2007).

Municipal facilities accounted for 86 percent (7,490 ±12 kg/year) of the total copper loading from permitted wastewater dischargers to Puget Sound. The three largest municipal sources of copper represented 63 percent of the total municipal copper loading and 54 percent of the total copper loading to Puget Sound. The loading from municipal facilities was slightly underestimated because 10 of the 105 municipal facilities were not represented in the loading calculation.

The total reported industrial copper loading was 1,270 ± 30 kg/year. Combined, the three largest industrial sources of copper represented 79 percent of the total reported industrial copper loading and 11 percent of total copper loading from permitted wastewater dischargers to Puget Sound. The industrial loading may have been underestimated because only 23 of the 75 permitted industrial facilities were represented in the calculation.

Lead

The total lead loading from wastewater point sources to Puget Sound from both municipal and industrial discharges was estimated to be 1,580 ± 492 kg/year (Table 6). The total estimated point source loading of lead was much less than the Phase 1 estimate of 4,710 kg/year (Hart Crowser et al. 2007).

Municipal sources contributed most of the lead loading from permitted wastewater dischargers (69 percent or 1,090 kg/year). However, the single municipal source that discharged the most lead (169 kg/year) reported non-detect analytical results, that is, the concentration of lead was too small to detect. (This example illustrates how the manner one treats non-detect values can generate misleading results. By assigning a value of one-half the detection limit to non-detect values, all dischargers will have a non-zero load. Ultimately, the reason these municipal sources appeared to be the largest loading sources for lead was because they discharged large volumes of wastewater, not because they had high concentrations of lead.) The loading from municipal facilities may have been slightly underestimated since 10 of the 105 municipal facilities were not represented in the loading calculation.

The total industrial lead loading was 491 ± 24 kg/year. The three largest industrial sources combined represented 92 percent of the total industrial lead load and 29 percent of the total load from permitted wastewater dischargers to Puget Sound. The industrial loading may have been underestimated because only 19 of 75 industrial facilities were represented in the calculation.

Mercury

The mercury loading to Puget Sound was 9.34 kg/year (Table 7). This load was approximately two-thirds of the Phase 1 estimate of 15 kg/year (Hart Crowser et al. 2007).

The total municipal loading was 2.35 kg/year, nearly 26 percent of the total load from permitted wastewater dischargers. The three largest municipal sources contributed 20 percent of the municipal load to Puget Sound and 5 percent of the total point source load to Puget Sound. The loading from municipal facilities was slightly underestimated since 10 of the 105 municipal facilities were not represented in the loading calculation.

The industrial mercury loading was 6.99 kg/year, approximately 75 percent of the total loading from permitted wastewater dischargers. The three largest industrial lead sources accounted for 92 percent of the total industrial mercury load and 69 percent of the total mercury load to Puget Sound. The industrial loading was underestimated because only 13 of 75 industrial facilities were represented in the calculation.

Zinc

The total zinc loading to Puget Sound was 28,500 ± 48 kg/year (Table 8). This load was substantially greater than the Phase 1 estimate of 18,100 kg/year (Hart Crowser et al. 2007).

Most (23,100 ± 2 kg/year, 81 percent of the total) of the reported loading from permitted wastewater dischargers was from municipal sources. Combined, the three largest municipal zinc sources represented 52 percent of the total municipal loading of zinc to Puget Sound and 42 percent of total loading of zinc. The loading from municipal facilities was slightly underestimated since 10 of the 105 municipal facilities were not represented in the loading calculation.

The total reported industrial zinc loading from permitted wastewater dischargers was 5,400 ± 47 kg/year. The three largest industrial zinc sources combined represented 74 percent of the reported industrial zinc loading to Puget Sound and 14 percent of the total loading of zinc. The industrial zinc loading was underestimated because only 18 of 75 industrial discharges were included in the calculation.

bis(2-Ethylhexyl)phthalate

The total *bis*(2-ethylhexyl)phthalate (BEHP) loading was 4,030 ± 622 kg/year (Table 9). This load was more than an order of magnitude greater than the Phase 1 estimate of 82 kg/year (Hart Crowser et al. 2007). However, the Phase 1 study found very little data available for BEHP.

Most (2,770 ± 106 kg/year, 69 percent of the total) of the loading was from municipal wastewater treatment sources. The three largest municipal sources represented 54 percent of municipal BEHP loading to Puget Sound and 37 percent of total BEHP loading from permitted wastewater dischargers to Puget Sound. The loading from municipal facilities was underestimated because 10 of the 105 municipal facilities were not represented in the loading calculation.

The sum of the industrial wastewater BEHP loadings was 1,260 ± 517 kg/year. Two of the three largest industrial sources of BEHP reported analytical results that were below the method detection limit. The industrial BEHP loading was underestimated because only 12 of 75 industrial discharges were included in the calculation.

Chloroform

The total chloroform loading from permitted wastewater dischargers to Puget Sound was 1,120 ± 118 kg/year (Table 10). The Phase 1 study did not identify loadings of chloroform.

The total municipal chloroform loading was 438 ± 56.7 kg/year or 39 percent of the total loading. The three largest municipal sources combined comprised 40 percent of the total municipal loading to Puget Sound and 16 percent of the total loading to Puget Sound. The loading from municipal facilities may have been slightly underestimated because 10 of the 105 municipal facilities were not represented in the loading calculation.

The industrial chloroform loading was 681 ± 61.8 kg/year. The three large industrial chloroform sources accounted for 96 percent of the industrial chloroform load and 58 percent of the total chloroform load from permitted wastewater dischargers to Puget Sound. The industrial chloroform loading was likely underestimated because only 13 of 75 industrial discharges were included in the calculation.

Total Phenolics

The total phenolics loading from permitted wastewater dischargers to Puget Sound was 9,440 ± 2,060 kg/year (Table 11). The Phase 1 study did not identify loadings of total phenolics.

The total phenolics municipal loading was 5,450 ± 2,050 kg/year or 58 percent of the total. However, results for the six largest municipal sources were based upon assumed non-zero loads from facilities reporting non-detect values. Ten of the 105 municipal facilities were not represented in the loading calculation.

The total phenolics industrial loading was 3,990 ± 15.7 kg/year. The three largest sources combined represented approximately 96 percent of the total industrial total phenolics loading to Puget Sound, and 41 percent of the total phenolics loading from permitted wastewater dischargers to Puget Sound. The industrial total phenolics loading was underestimated because only 10 of 75 industrial discharges because included in the calculation.

Uncertainty from Reporting and Detection Limits

In Table 12, we present the absolute and relative uncertainty in the estimated total loading rates caused by the different methods of handling non-detect values. For copper, zinc, and mercury, the frequency of non-detect values was low, and substituting zero or the MDL or MRL in place of one-half the MDL or MRL affected the relative loading rates by less than 1 percent. For chloroform and BEHP, the different treatment of non-detect values affected the calculated loading rates by approximately 10 to 15 percent. The different treatment effect of non-detect values for total phenolics was 22 percent. The greatest frequency of non-detect values occurred for lead, resulting in a relative uncertainty for the loading estimates of 31 percent. The uncertainty calculated for each pollutant was directly related to the range in detection or reporting limits, as well as the frequency of non-detect values. (Table 3 summarizes the detection limit data for each pollutant.)

Many other sources of uncertainty influenced the loading estimates beyond the methods we used to handle non-detect values. The following Discussion section describes some of the key issues that may affect the reliability of the results of this study.

Discussion

Study Limitations

The water quality data used in this study had several limitations. First, there were few actual data values. Although the database included 180 facilities or outfalls, we could base total loading estimates on only 40 to 79 sample values for each of the selected pollutants (Table 1). Few of the toxic chemicals had enough data to support development of reliable loading estimates or comparisons among themselves or among their different sources. Only seven pollutants had sufficient data points for calculating credible loading estimates. Also, these seven toxic chemicals may not have been the best surrogates to represent either the variability in pollutant loadings or the most important threats to the water and/or habitat quality of Puget Sound. By design, the database included only one value per pollutant per facility and therefore may not provide the best representation of the average character of the discharge from that facility.

A second data limitation was the inconsistent and sometimes high detection limits reported for many of the toxic chemicals (Table 3). We addressed this issue by selecting pollutants for which we had 10 or more "quantifiable" data points, and then by assuming certain values for data below the detection limits and reporting the range of values as the uncertainty in the loading estimates. The effect of this limitation varied widely by pollutant. For copper, zinc, and mercury, the relative uncertainty of the loading estimates due to the MDLs and MRLs was less than 1 percent. However, for the other pollutants this uncertainty ranged from 10 to 31 percent (Table 12). This high variability may mask the impact of future efforts to reduce pollutant loadings to Puget Sound and make it difficult in the long-run to know whether toxic chemical reduction goals were actually met.

On an individual facility basis, our treatment of non-detect values can lead to misinterpretations. Large-flow facilities may have appeared as the greatest contributing sources even when their measured concentration values were below the detection limit. For example, as described in the Results section, two of the three industries that appeared to be the sources contributing the largest amounts of BEHP had reported non-detect values.

A third significant limitation concerned the estimated pollutant loadings for industrial facilities. Although the representation of municipal facilities was good, and we were able to extrapolate data for those municipal facilities for which we had no recent data, this was not the case for industrial facilities. Depending upon the pollutant, only 10 to 23 of a total of 75 industrial facilities were included in the loading calculations. Although all of the large industrial sources were likely included in these estimates of loadings to Puget Sound, the industrial load was not well represented.

Analysis of Wastewater Discharge Volume

A very effective method for evaluating the extent to which the database adequately reflects the total pollutant discharges to Puget Sound is to consider how much of the total expected discharge volume is accounted by the existing data. Appendix A contains a list of all the facilities included in the database and summarizes the data available for use in the discharge volume analysis and loading calculations. Discharge volume estimates were available for all but 10 municipal facilities, and all but 25 of the industrial facilities. Therefore, the majority of discharges were represented. Given that the top 15 reported dischargers by volume contributed 76 percent of the total discharge volume, it is likely that all of the large dischargers were included.

Figure 1 depicts the volume discharged from municipal and industrial facilities into each of the Puget Sound study areas. Correlation analysis showed that loading rates were, with a few exceptions, correlated more with flow than with concentration (Table 13). Since the volume of discharge generally had a greater impact on pollutant loading estimates than did the pollutant concentration, the discharge volume illustration alone (Figure 1) is a reasonable reflection of the expected variability and spatial distribution of pollutant loading to Puget Sound.

Analysis of Pollutant Loadings from Wastewater

Figures 3 through 9 depict the toxic chemical loadings for each of the seven pollutants to each of the 14 different study areas in the Puget Sound Basin. (Figure 2 explains the error bar notation used in Figures 3 through 9.) The figures show separately the calculated loadings for municipal and industrial facilities. The "whiskers" that extend above and below the tops of the bars visually depict the range in loadings produced by the different methods of handling non-detect values. More specifically, the bars show loads calculated with non-detect values assigned one-half the MRL or MDL, while the top and bottom whiskers show loads calculated with non-detect values assigned 1 or 0 times the MDL or MRL. For copper, mercury, and zinc the whiskers were nearly invisible, indicating that the issue of how non-detect values were handled was not significant for these pollutants. For lead, BEHP, and total phenolics, non-detect values significantly affected loading estimates for many of the study areas.

As shown in the figures, municipal facilities contributed more toxic chemicals in more study areas than did permitted industrial facilities. While the pollutant loadings shown in these figures were likely underestimated for industrial sources, we believe that this analysis has accounted for all of the major dischargers. People for Puget Sound listed 15 "major industrial facilities" in the report of toxic chemical loadings to Puget Sound (Trim et al. 2008). Our loading calculations represented 30 industrial facilities; 12 of these were among those in People for Puget Sound's list. However, as described previously, not all of these "major industrial facilities" had the data necessary for inclusion in the pollutant loading calculations. The absence of toxic chemical loading estimates for the remaining smaller facilities did not likely affect significantly the overall pollutant loading picture for Puget Sound.

The estimated loadings were greatest from those areas of the Puget Sound Basin containing multiple and/or large dischargers: Commencement Bay, Main Basin, Port Gardner, and the Strait of Georgia. Although we have developed reasonably good estimates of the relative magnitudes of toxic chemical loading rates, the loadings are not necessarily directly related to the level of threat posed by each of the study areas. An area with a high loading rate may have a higher capacity to assimilate pollutants, and an area with a relatively low estimate of pollutant loadings may already be stressed or exhibiting signs of poor water quality. Many factors drive the capacity of a given area of Puget Sound to assimilate pollutants, especially the total volume of marine water contained within the area and the amount of flushing it experiences through tidal action and river inflow.

The project team used the simplifying assumption that 100 percent of all wastewater discharges that flowed into the rivers and streams of the Puget Sound Basin eventually reached the marine waters of Puget Sound. Thus, we did not account for natural processes that might capture or degrade a substantial amount of those toxic chemicals before they reach Puget Sound.

Comparison to Other Studies

Two other studies in the past year provided estimates of toxic chemical loadings to the Puget Sound Basin. For comparison purposes, Table 14 provides a summary of the results from all three studies.

In a study conducted by the People for Puget Sound (Trim et al., 2008), the loading analysis included a total of 118 facilities, 15 of which were "major industrial facilities." The remainder were federal or municipal wastewater discharges and ten combined sewer overflows. As with this Phase 2 study, People for Puget Sound also extrapolated data for the municipal treatment plants that did not have priority pollutant data, though using a different method for the extrapolation. Given the uncertainties in the data and the different methodologies, the Phase 2 loading estimates reported herein matched well with the People for Puget Sound estimates ($\pm$0.1 to $\pm$38 percent of their average).

The Phase 1 toxics loading study (Hart Crowser et al., 2007) estimated toxic chemical loadings to Puget Sound from five pathways (wastewater, surface runoff, atmospheric deposition, combined sewer overflows, and direct spills). The contribution from wastewater was significantly less than that from surface runoff or atmospheric deposition. However, the authors limited the wastewater data to only those data that represented paired water quality and flow data and that were available electronically. Rather than limiting the loading analysis to the most recent data (as in this Phase 2 estimate), that study considered all of the readily available data for each facility from 2002 through 2006. The Phase 1 loading estimates for wastewater were developed from data representing 84 facilities, but 75 percent of them were industrial facilities. Even with these differences in the way the estimates were developed, the resultant toxic chemical loading estimates in the Phase 1 and Phase 2 studies matched reasonably well ($\pm$10 to $\pm$50 percent of their average) except for BEHP. The reason for this discrepancy was that this

Phase 2 study had available considerably more data for BEHP than did the Phase 1 study, which was based on only one data point.

Conclusions and Recommendations

1. Conclusions: The primary conclusion from this Phase 2 analysis of toxic chemical loading from permitted wastewater dischargers in the Puget Sound Basin can be summarized in three parts:

   a) The results were generally consistent with the estimates obtained in previous studies.

   b) The contributions of toxic chemicals from wastewater dischargers were small relative to the total loadings from all of the major loading sources to Puget Sound (including for example atmospheric deposition and surface runoff). For those pollutants with sufficient data, the estimated fractions of the total loadings from wastewater dischargers ranged from 1.4 to 7.0 percent of the total loading to Puget Sound.

   c) The contributions of toxic chemicals from wastewater dischargers were small relative to the loadings from surface runoff alone. For those pollutants with sufficient data, the estimated fractions of the total loadings from wastewater dischargers ranged from 1.9 to 8.9 percent of the total loading from surface runoff to Puget Sound.

   Recommendations: Within the context of other actions to control the release of toxic chemicals to Puget Sound (for example, via surface water runoff), Ecology should further focus its efforts to quantify toxic chemical loadings from wastewater dischargers by requiring additional monitoring by those permittees who pose the greatest threat to Puget Sound, based on their loadings of toxic chemicals.

2. Conclusions: Comparing municipal contributions with industrial contributions was difficult because the available data did not represent them equally well. While we were able to calculate or extrapolate loading estimates for most of the permitted municipal facilities in the Puget Sound Basin, we could estimate loadings for less than 30 percent of the industrial facilities. However, since there were twice as many municipal facilities as industrial facilities, and the database included all of the larger industrial facilities (those with the greatest flows), the relative total contributions of municipal and industrial dischargers were likely accurate. With the exception of chloroform and mercury, municipal wastewater treatment plants discharged significantly more toxic chemicals than did industrial dischargers – from 1.4 to 5.9 times as much of the seven selected pollutants.

   The primary reason for the relative difference in toxic chemical loadings between wastewater dischargers was not whether they were municipal or industrial facilities, but rather the relative sizes of the discharges. The 15 largest facilities by volume of discharge (of a total 125 facilities) were alone responsible for 76 percent of the total volume of wastewater discharged to Puget Sound and from 56 to 84 percent of the estimated toxic chemical loadings, depending on the chemical.

Recommendations: Ecology should place more emphasis on controlling releases of toxic chemicals from the geographic area(s) with the greatest density of dischargers, and on those permittees who discharge large volumes, discharge chemicals that pose high threats, or discharge to ecologically sensitive or valuable areas of Puget Sound. Ecology and the U.S. EPA should require all permitted wastewater dischargers to monitor the flow of their discharges with enough regularity to report accurate average annual flows. The permittees should also report the average flow for the specific days when they collect wastewater samples for analyses.

3. Conclusions: Limited time and budget for this study constrained the database development effort and necessitated that we use only the most recent analytical result for each pollutant in the loading calculations (one data entry per pollutant per facility). Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge. On a Puget Sound-wide scale, the results of this study provided an adequate relative comparison of toxic chemical loading. However, to the extent that the individual analytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.

   Recommendations: Ecology should not use the loading estimates developed in this study for evaluating individual facilities, or for evaluating the effectiveness of pollutant reduction measures implemented at those facilities over time.

   Since the sensitivity of some plants and animals to toxic chemicals changes during their lifetimes, Ecology should require collection and analyses of wastewater with greater frequency throughout the year to help account for variations in both ecological risks and facility operations.

   Ecology should develop an improved electronic database for managing the monitoring data of permittees. The database should be capable of accepting and self-loading electronic reports from permittees with negligible data entry by hand. Also, Ecology should maintain and add to the electronic database produced during this project to support long-term analyses of trends and tracking of changes in the discharges and loadings from both the various study areas and individual permittees.

4. Conclusions: The good news was that more than 80 percent of the priority pollutants analyzed in wastewater discharges were either absent at detectable concentrations or detected in only one or two samples. Non-detect values represented approximately 90 percent of the analytical results in the database.

   The bad news was that the large proportion of non-detect values prevented accurate estimation of loadings for many of the contaminants. The reported range and variability in method detection limits (MDLs) and method reporting limits (MRLs) was another large hindrance to calculating loadings. Of the 137 toxic chemicals reviewed, only seven were detected frequently enough to support development of pollutant loading estimates.

The handling of non-detect values can result in misinterpretations of the data. We used one-half of the MDL or MRL in the loading calculations when a pollutant was not present at a quantifiable concentration, that is, when it was less than the MDL or MRL. If the true concentration of the pollutant were less than this middle value, we have over-estimated the loading rate for that pollutant and that specific facility. If the true concentration were greater than this middle value, then we have under-estimated the loading for that pollutant and facility. In cases where the MDL or MRL was particularly high, the error in the loading estimates was more likely to be biased high.

Another artifact of this method for handling non-detect data was that facilities with larger discharge volumes often appeared as the largest contributors to the loading of a pollutant – *even when the pollutant was not detected*.

Recommendations: Ecology and the U.S. EPA should continue to require monitoring by all permitted wastewater dischargers to better characterize loading contributions from these sources. The agencies should work together to standardize the required analytical methods and detection limits in their permits so that permittees will ensure that their laboratories use the same or readily comparable analytical methods and the lowest achievable MDLs. The laboratories also should provide analytical results electronically to reduce the probability of data entry errors.

5. Conclusions: Three recent studies have estimated the toxic pollutant loadings from wastewater dischargers in the Puget Sound Basin based on existing monitoring data. Each study used different subsets of the existing data and applied different constraints and assumptions in its calculations. Since the results of the three studies are in general agreement given the fairly large uncertainties of their estimates, the estimated ranges of pollutant loadings are probably as good as they can reasonably be using the existing data. Additional analyses, without incorporating new data, would not likely significantly increase the level of confidence in the estimates.

   Recommendations: We do not recommend additional or more refined analysis of the existing data alone. If better estimates of toxic chemical loadings are necessary, Ecology should collect targeted samples and analyze them using methods that produce smaller MDLs. Also, as Ecology identifies emerging potential threats from other toxic chemicals (for example, polybrominated diphenyl ethers, fluorinated organic compounds, bisphenol A, and pharmaceuticals and personal care products), Ecology should (or should require permittees to) collect and analyze wastewater samples for those newly identified pollutants.

6. Conclusions: We have improved our characterization of the wastewater pathway through which toxic chemicals enter Puget Sound. These Phase 2 study results are adequate for assessing spatial variations and taking a broad look at relative pollutant loading contributions. However, due to the high level of uncertainty in the loading estimates, it may be difficult to establish quantifiable goals for pollutant reduction or to evaluate the success of reduction efforts.

Recommendations: Ecology's next step should include collection of new data to improve future loading estimates and to provide data sufficient for tracking reductions in toxic chemical loadings to Puget Sound. To accomplish this efficiently, Ecology should evaluate what it has learned to date, determine which pollutants and what pollutant pathways it needs to explore more, and collect additional samples from those dischargers, or in those locations or times, where additional data will significantly improve our understanding of the sources and pathways of toxic chemicals in Puget Sound.

Ecology should develop more realistic assumptions about the fate of toxic chemicals discharged into the freshwater streams and rivers of the Puget Sound Basin, collect ambient and wastewater monitoring data to validate those assumptions, and incorporate this information into improved versions of the Ecology Puget Sound Box Model. An improved understanding of the fate of toxic contaminants will help Ecology prioritize the threats to the entire Puget Sound ecosystem, whether in fresh or marine waters.

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Tables

Table 1. Total Number of Values and Number of Non-Detect Values for Each Chemical in the Database.

Chemical of Concern (a)	All Facilities		Municipal Facilities		Industrial Facilities	
	Values (b)	Non-Detect Values (c)	Values (b)	Non-Detect Values (c)	Values (b)	Non-Detect Values (c)
Copper	**79**	**14**	**54**	**5**	**25**	**9**
Zinc	**74**	**4**	**52**	**1**	**22**	**3**
Lead	**70**	**31**	**49**	**22**	**21**	**9**
Cadmium	62	48	48	40	14	8
Arsenic	58	34	43	26	15	8
Silver	57	44	43	32	14	12
Nickel	56	28	41	24	15	4
Chromium	55	34	39	27	16	7
Benzene	52	48	34	33	18	15
Selenium	52	39	40	31	12	8
Acenaphthene	51	51	38	38	13	13
Anthracene	51	51	38	38	13	13
Beryllium	51	47	39	36	12	11
Ethylbenzene	51	50	37	37	14	13
Naphthalene	51	51	38	38	13	13
Thallium	51	43	39	34	12	9
Toluene	51	44	37	31	14	13
1,1,2,2-Tetrachloroethane	50	50	37	37	13	13
Acenaphthylene	50	50	37	37	13	13
Benzo(a)anthracene	50	50	37	37	13	13
Benzo(k)fluoranthene	50	49	37	36	13	13
Bromoform	50	49	37	36	13	13
Chloroform	**50**	**34**	**37**	**24**	**13**	**10**
Chrysene	50	50	37	37	13	13
Dibenzo(a,h)anthracene	50	50	37	37	13	13
Fluoranthene	50	49	37	37	13	12
Fluorene	50	50	37	37	13	13
Phenanthrene	50	50	37	37	13	13
Pyrene	50	49	37	37	13	12
Vinyl chloride	50	48	37	36	13	12
1,1,1-Trichloroethane	49	49	37	37	12	12
1,1,2,-Trichloroethane	49	49	37	37	12	12
1,1-Dichloroethane	49	49	37	37	12	12
1,2,4,-Trichlorobenzene	49	49	37	37	12	12
Antimony	49	39	37	34	12	5
Benzo(a)pyrene	49	49	36	36	13	13
Benzo(g,h,i)perylene	49	48	36	35	13	13
Carbon tetrachloride	49	49	37	37	12	12
Chlorobenzene	49	49	37	37	12	12
Chlorodibromomethane	49	46	37	34	12	12
Chloroethane	49	49	37	37	12	12
Indeno(1,2,3-cd)pyrene	49	48	36	35	13	13
Tetrachloroethylene	49	47	36	34	13	13
1,2-Dichlorobenzene	48	47	37	36	11	11

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Chemical of Concern (a)	All Facilities		Municipal Facilities		Industrial Facilities	
	Values (b)	Non-Detect Values (c)	Values (b)	Non-Detect Values (c)	Values (b)	Non-Detect Values (c)
1,4-Dichlorobenzene	48	45	37	34	11	11
Chloromethane	48	47	36	35	12	12
Methylene chloride	48	45	36	33	12	12
Pentachlorophenol	48	46	34	33	14	13
2,4,6-Trichlorophenol	47	46	35	34	12	12
2,4-Dimethylphenol	47	46	35	35	12	11
2,4-Dinitrophenol	47	47	35	35	12	12
2,4-Dinitrotoluene	47	47	35	35	12	12
2,6-Dinitrotoluene	47	47	35	35	12	12
2-Chloronaphthalene	47	47	35	35	12	12
2-Nitrophenol	47	47	35	35	12	12
3,4-Benzofluoranthene	47	47	35	35	12	12
4-Bromophenylphenylether	47	47	35	35	12	12
4-Chlorophenylphenylether	47	47	35	35	12	12
4-Nitrophenol	47	47	35	35	12	12
***bis* (2-Ethylhexyl)phthalate**	**47**	**19**	**35**	**10**	**12**	**9**
Butylbenzylphthalate	47	46	35	34	12	12
Diethylphthalate	47	46	35	34	12	12
Dimethylphthalate	47	47	35	35	12	12
Di-N-butylphthalate	47	44	35	33	12	11
Hexachlorobenzene	47	47	35	35	12	12
Hexachlorocyclopentadiene	47	47	35	35	12	12
Phenol	47	41	34	28	13	13
1,3-Dichlorobenzene	46	46	35	35	11	11
2-Chlorophenol	46	46	34	34	12	12
3,3'-Dichlorobenzidine	46	46	34	34	12	12
bis (2-Chloroethoxy)methane	46	46	34	34	12	12
Di-N-octylphthalate	46	46	34	34	12	12
Hexachloroethane	46	46	34	34	12	12
N-Nitrosodi-N-propylamine	46	46	34	34	12	12
4,6-Dinitro-o-cresol	45	45	33	33	12	12
Benzidine	45	45	34	34	11	11
Dichlorobromomethane	45	39	35	30	10	9
Isophorone	45	45	33	33	12	12
Nitrobenzene	45	45	33	33	12	12
1,2-Dichloropropane	44	43	32	31	12	12
4-Chloro-3-methylphenol	44	44	32	32	12	12
bis (2-Chloroethyl)ether	44	44	32	32	12	12
Bromomethane	44	44	32	32	12	12
Cyanide	44	36	33	28	11	8
Mercury	**43**	**0**	**29**	**0**	**14**	**0**
N-Nitrosodiphenylamine	43	43	31	31	12	12
1,2-Dichloroethane	41	40	28	28	13	12
1,2-trans-Dichloroethylene	41	41	29	29	12	12

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Chemical of Concern (a)	All Facilities		Municipal Facilities		Industrial Facilities	
	Values (b)	Non-Detect Values (c)	Values (b)	Non-Detect Values (c)	Values (b)	Non-Detect Values (c)
Trichloroethylene	41	40	27	27	14	13
1,1-Dichloroethylene	40	40	27	27	13	13
1,3-Dichloropropylene	40	40	28	28	12	12
2,4-Dichlorophenol	40	40	28	28	12	12
2-Chloroethylvinyl ether	40	39	28	27	12	12
bis (2-Chloroisopropyl)ether	40	40	29	29	11	11
Total Phenolics	**40**	**28**	**29**	**24**	**11**	**4**
N-Nitrosodimethylamine	39	39	28	28	11	11
Acrolein	35	35	24	24	11	11
Acrylonitrile	35	34	24	23	11	11
1,2-Diphenylhydrazine	26	26	16	16	10	10
4,4'-DDD	24	24	14	14	10	10
4,4'-DDE	24	24	14	14	10	10
4,4'-DDT	24	22	14	13	10	9
Aldrin	23	23	13	13	10	10
Dieldrin	23	23	13	13	10	10
Endrin	23	23	13	13	10	10
Heptachlor epoxide	23	22	13	12	10	10
alpha-Endosulfan	22	22	12	12	10	10
beta-BHC	22	22	12	12	10	10
beta-Endosulfan	22	22	12	12	10	10
Chlordane	22	22	12	12	10	10
delta-BHC	22	22	12	12	10	10
Endosulfan sulfate	22	22	12	12	10	10
Endrin aldehyde	22	22	12	12	10	10
gamma-BHC	22	22	12	12	10	10
Heptachlor	22	22	12	12	10	10
PCB-1016 (Arochlor 1016)	22	22	13	13	9	9
PCB-1221 (Arochlor 1221)	22	22	13	13	9	9
PCB-1232 (Arochlor 1232)	22	22	13	13	9	9
PCB-1242 (Arochlor 1242)	22	22	13	13	9	9
PCB-1248 (Arochlor 1248)	22	22	13	13	9	9
PCB-1254 (Arochlor 1254)	22	22	13	13	9	9
PCB-1260 (Arochlor 1260)	22	22	13	13	9	9
alpha-BHC	21	20	12	11	9	9
Toxaphene	21	21	13	13	8	8
Total Dioxins (any isomers)	6	6	0	0	6	6
3-Nitrophenol	4	4	2	2	2	2
BETX	3	3	1	1	2	2
Total PAH	3	3	1	1	2	2
Total PCB	3	3	1	1	2	2
Asbestos	2	2	0	0	2	2
Toulene	1	0	0	0	1	0
Hexachlorobutadiene	0	0	0	0	0	0

Table 1. Total Number of Values and Number of Non-Detect Values for Each Chemical in the Database.

Chemical of Concern (a)	All Facilities		Municipal Facilities		Industrial Facilities	
	Values (b)	Non-Detect Values (c)	Values (b)	Non-Detect Values (c)	Values (b)	Non-Detect Values (c)
Nonylphenol	0	0	0	0	0	0
PBDEs	0	0	0	0	0	0
Total Furans (any isomers)	0	0	0	0	0	0
Total Toxic Organics	0	0	0	0	0	0
Triclopyr	0	0	0	0	0	0
Totals	5,323	4,843	3,807	3,470	1,516	1,373

(a) = **Bold** font indicates those chemicals for which loadings were calculated.
(b) = Indicates the total number of reported values (including those reported as non-detects) for the given parameter.
(c) = Indicates the number of values reported as non-detects

Table 2. Number of Dischargers in the Database for the 14 Puget Sound Study Areas.

Study Unit	Municipal Dischargers	Industrial Dischargers	Total
Admiralty Inlet	1	3	4
Elliott Bay	0	4	4
Commencement Bay	12	17	29
Hood Canal (north)	1	1	2
Hood Canal (south)	0	0	0
Main Basin	17	8	25
Port Gardner	11	4	15
San Juan Islands	9	3	12
Sinclair-Dyes Inlet	5	5	10
South Sound (east)	8	3	11
South Sound (west)	8	3	11
Strait of Georgia	11	15	26
Strait of Juan de Fuca	6	4	10
Whidbey Basin	16	5	21
Total	**105**	**75**	**180**

Table 3. Ranges of Chemical Concentrations and Detection and Reporting Limits in the Database.

Chemical of Concern	Measured Value (a)		Method Detection Limit		Method Reporting Limit	
	Minimum (µg/L)	Maximum (µg/L)	Minimum (µg/L)	Maximum (µg/L)	Minimum (µg/L)	Maximum (µg/L)
Copper	0.7	98	0.002	20	0.02	20
Lead	0.29	50	0.008	40	0.002	150
Mercury	0.000003	0.331	NA	NA	NA	NA
Zinc	0.07	353	0.06	24	0.5	32
bis (2-Ethylhexyl)phthalate	0.025	50	0.013	21	0.025	50
Chloroform	1	15	0.1	30	0.05	5
Total Phenolics	0.01	150	2	50	0.05	50

(a) = These ranges reflect only those data points for each chemical that fell within the quantifiable range (i.e., those greater or equal to the detection and/or reporting limits).

Table 4. Reported Wastewater Discharge Volumes for the 14 Puget Sound Study Areas.

Study Unit	Municipal Facilities (a)		Industrial Facilities (a)		Total Discharge (mgy)
	Discharge Volume (mgy)	Number of Facilities Not Reporting Flow	Discharge Volume (mgy)	Number of Facilities Not Reporting Flow	
Admiralty Inlet	338	0	4,380	1	4,718
Elliott Bay	0	0	70	2	70
Commencement Bay	12,126	0	11,510	3	23,636
Hood Canal (north)	4	0	0	1	4
Hood Canal (south)	0	0	0	0	0
Main Basin	77,621	0	1,111	4	78,732
Port Gardner	12,634	1	10,300	3	22,934
San Juan Islands	1,529	1	2,630	1	4,159
Sinclair-Dyes Inlet	3,798	0	2,490	3	6,287
South Sound (east)	7,540	1	2,592	2	10,132
South Sound (west)	4,243	0	6	0	4,249
Strait of Georgia	5,943	4	5,405	2	11,348
Strait of Juan de Fuca	1,160	1	3,151	1	4,311
Whidbey Basin	3,126	2	3	3	3,129
Total	**130,061**	**10**	**43,647**	**25**	**173,708**

The precision of the data in this table is only three significant figures.

mgy = Million gallons per year.

(a) = Facilities for which flow data were not reported are not included in the discharge volume.

Table 5. Estimated Annual Loadings of Copper from Point Source Wastewater Dischargers.

Study Area Name	Phase 2 Estimate of Loadings (a)							Total Phase 1 Wastewater Loadings (kg/year)
	Municipal Facilities (b)			Industrial Facilities (c)			Total Phase 2 Wastewater Loadings (kg/year)	
	Wastewater Loadings (kg/year)	Total Number of Facilities	Number of Facilities Not Included in Loading Estimates	Wastewater Loadings (kg/year)	Total Number of Facilities	Number of Facilities Not Included in Loading Estimates		
Admiralty Inlet	13.2	1	0	82.9	3	2	96.1	not estimated
Elliott Bay	0	0	0	0.33	4	3	0.33	not estimated
Commencement Bay	525	12	0	354	17	10	879	not estimated
Hood Canal (north)	0.16	1	0	0.00	1	1	0.16	not estimated
Hood Canal (south)	0	0	0	0.00	0	0	0	not estimated
Main Basin	3,810	17	0	31.3	8	7	3,840	not estimated
Port Gardner	275	11	1	359	4	3	634	not estimated
San Juan Islands	67.4	9	1	22.3	3	2	89.7	not estimated
Sinclair-Dyes Inlet	60.8	5	0	56.2	5	4	117	not estimated
South Sound (east)	561	8	1	304	3	2	865	not estimated
South Sound (west)	287	8	0	0.0000199	3	2	287	not estimated
Strait of Georgia	1,750	11	4	29.7	15	9	1,780	not estimated
Strait of Juan de Fuca	45.4	6	1	30.0	4	2	75.5	not estimated
Whidbey Basin	95.5	16	2	0	5	5	95.5	not estimated
Puget Sound Total	**7,490**	**105**	**10**	**1,270**	**75**	**52**	**8,760**	**7,200**

The precision of the data in this table is only two significant figures.

kg/year = Kilograms per year.

(a) = The estimated loadings were based on replacement of non-detect results with one-half the method detection limit or method reporting limit.

(b) = Municipal loadings included loadings from facilities for which flow and pollutant concentration data were available, as well as loadings estimated for facilities where flow data were available but pollutant concentration data were not.

(c) = Industrial loadings included loadings from only those facilities for which both flow and pollutant concentration data were available.

Table 6. Estimated Annual Loadings of Lead from Point Source Wastewater Dischargers.

Study Area Name	Phase 2 Estimate of Loadings (a)							Total Phase 1 Wastewater Loadings (kg/year)
	Municipal Facilities (b)			Industrial Facilities (c)			Total Phase 2 Wastewater Loadings (kg/year)	
	Wastewater Loadings (kg/year)	Total Number of Facilities	Number of Facilities Not Included in Loading Estimates	Wastewater Loadings (kg/year)	Total Number of Facilities	Number of Facilities Not Included in Loading Estimates		
Admiralty Inlet	1.41	1	0	16.6	3	2	18.0	not estimated
Elliott Bay	0	0	0	0	4	4	0.00	not estimated
Commencement Bay	107	12	0	30.2	17	13	137	not estimated
Hood Canal (north)	0.017	1	0	0	1	1	0.017	not estimated
Hood Canal (south)	0	0	0	0	0	0	0.00	not estimated
Main Basin	328	17	0	1.61	8	5	330	not estimated
Port Gardner	153	11	1	409	4	3	562	not estimated
San Juan Islands	3.04	9	1	4.47	3	2	7.51	not estimated
Sinclair-Dyes Inlet	201	5	0	0	5	5	201	not estimated
South Sound (east)	148	8	1	9.81	3	2	158	not estimated
South Sound (west)	10.0	8	0	0	3	3	10.0	not estimated
Strait of Georgia	123	11	4	9.73	15	9	132	not estimated
Strait of Juan de Fuca	4.83	6	1	9.32	4	2	14.1	not estimated
Whidbey Basin	10.7	16	2	0	5	5	10.7	not estimated
Puget Sound Total	**1,090**	**105**	**10**	**491**	**75**	**56**	**1,580**	**4,710**

The precision of the data in this table is only two significant figures.

kg/year = Kilograms per year.

(a) = The estimated loadings were based on replacement of non-detect results with one-half the method detection limit or method reporting limit.

(b) = Municipal loadings included loadings from facilities for which flow and pollutant concentration data were available, as well as loadings estimated for facilities where flow data were available but pollutant concentration data were not.

(c) = Industrial loadings included loadings from only those facilities for which both flow and pollutant concentration data were available.

Table 7. Estimated Annual Loadings of Mercury from Point Source Wastewater Dischargers.

Study Area Name	Phase 2 Estimate of Loadings (a)							Total Phase 1 Wastewater Loadings (kg/year)
	Municipal Facilities (b)			Industrial Facilities (c)			Total Phase 2 Wastewater Loadings (kg/year)	
	Wastewater Loadings (kg/year)	Total Number of Facilities	Number of Facilities Not Included in Loading Estimates	Wastewater Loadings (kg/year)	Total Number of Facilities	Number of Facilities Not Included in Loading Estimates		
Admiralty Inlet	0.00448	1	0	0.0779	3	2	0.0824	not estimated
Elliott Bay	0.00	0	0	0.00227	4	3	0.00227	not estimated
Commencement Bay	0.203	12	0	0.474	17	13	0.677	not estimated
Hood Canal (north)	0.0000533	1	0	0.00	1	1	0.0000533	not estimated
Hood Canal (south)	0.00	0	0	0.00	0	0	0.00	not estimated
Main Basin	1.34	17	0	0.00	8	8	1.34	not estimated
Port Gardner	0.202	11	1	5.42	4	3	5.62	not estimated
San Juan Islands	0.0310	9	1	0.673	3	1	0.704	not estimated
Sinclair-Dyes Inlet	0.0453	5	0	0.00	5	5	0.0453	not estimated
South Sound (east)	0.100	8	1	0.00	3	3	0.100	not estimated
South Sound (west)	0.0288	8	0	0.00	3	3	0.0288	not estimated
Strait of Georgia	0.194	11	4	0.250	15	12	0.444	not estimated
Strait of Juan de Fuca	0.176	6	1	0.0924	4	3	0.268	not estimated
Whidbey Basin	0.0280	16	2	0.00	5	5	0.0280	not estimated
Puget Sound Total	**2.35**	**105**	**10**	**6.99**	**75**	**62**	**9.34**	**15**

The precision of the data in this table is only two significant figures.

kg/year = Kilograms per year.

(a) = The estimated loadings were based on replacement of non-detect results with one-half the method detection limit or method reporting limit.

(b) = Municipal loadings included loadings from facilities for which flow and pollutant concentration data were available, as well as loadings estimated for facilities where flow data were available but pollutant concentration data were not.

(c) = Industrial loadings included loadings from only those facilities for which both flow and pollutant concentration data were available.

Table 8. Estimated Annual Loadings of Zinc from Point Source Wastewater Dischargers.

Study Area Name	Phase 2 Estimate of Loadings (a)							Total Phase 1 Wastewater Loadings (kg/year)
	Municipal Facilities (b)			Industrial Facilities (c)			Total Phase 2 Wastewater Loadings (kg/year)	
	Wastewater Loadings (kg/year)	Total Number of Facilities	Number of Facilities Not Included in Loading Estimates	Wastewater Loadings (kg/year)	Total Number of Facilities	Number of Facilities Not Included in Loading Estimates		
Admiralty Inlet	58.8	1	0	166	3	2	225	not estimated
Elliott Bay	0	0	0	0	4	4	0	not estimated
Commencement Bay	2,030	12	0	1,480	17	12	3,510	not estimated
Hood Canal (north)	0.70	1	0	0	1	1	0.70	not estimated
Hood Canal (south)	0	0	0	0	0	0	0	not estimated
Main Basin	9,350	17	0	99.1	8	7	9,450	not estimated
Port Gardner	1,070	11	1	1,980	4	3	3,050	not estimated
San Juan Islands	171	9	1	223	3	2	394	not estimated
Sinclair-Dyes Inlet	1,120	5	0	5.53	5	4	1,120	not estimated
South Sound (east)	2,130	8	1	589	3	2	2,720	not estimated
South Sound (west)	1,430	8	0	0	3	3	1,430	not estimated
Strait of Georgia	493	11	4	644	15	10	5,570	not estimated
Strait of Juan de Fuca	202	6	1	202	4	2	404	not estimated
Whidbey Basin	649	16	2	0	5	5	649	not estimated
Puget Sound Total	**23,100**	**105**	**10**	**5,400**	**75**	**57**	**28,500**	**18,100**

The precision of the data in this table is only two significant figures.

kg/year = Kilograms per year.

(a) = The estimated loadings were based on replacement of non-detect results with one-half the method detection limit or method reporting limit.

(b) = Municipal loadings included loadings from facilities for which flow and pollutant concentration data were available, as well as loadings estimated for facilities where flow data were available but pollutant concentration data were not.

(c) = Industrial loadings included loadings from only those facilities for which both flow and pollutant concentration data were available.

Table 9. Estimated Annual Loadings of *bis* (2-Ethylhexyl)phthalate from Point Source Wastewater Dischargers.

Study Area Name	Phase 2 Estimate of Loadings (a)							Total Phase 1 Wastewater Loadings (kg/year)
	Municipal Facilities (b)			Industrial Facilities (c)			Total Phase 2 Wastewater Loadings (kg/year)	
	Wastewater Loadings (kg/year)	Total Number of Facilities	Number of Facilities Not Included in Loading Estimates	Wastewater Loadings (kg/year)	Total Number of Facilities	Number of Facilities Not Included in Loading Estimates		
Admiralty Inlet	4.16	1	0	82.9	3	2	87.0	not estimated
Elliott Bay	0	0	0	0	4	4	0	not estimated
Commencement Bay	185	12	0	181	17	14	366	not estimated
Hood Canal (north)	0.05	1	0	0	1	1	0.05	not estimated
Hood Canal (south)	0	0	0	0	0	0	0	not estimated
Main Basin	564	17	0	1.55	8	7	566	not estimated
Port Gardner	341	11	1	187	4	3	529	not estimated
San Juan Islands	6.73	9	1	7.59	3	2	14.3	not estimated
Sinclair-Dyes Inlet	101	5	0	0	5	5	101	not estimated
South Sound (east)	371	8	1	0	3	3	371	not estimated
South Sound (west)	657	8	0	0	3	3	657	not estimated
Strait of Georgia	507	11	4	765	15	11	1,270	not estimated
Strait of Juan de Fuca	9.98	6	1	31.1	4	3	41.1	not estimated
Whidbey Basin	27.8	16	2	0	5	5	27.8	not estimated
Puget Sound Total	**2,770**	**105**	**10**	**1,260**	**75**	**63**	**4,030**	**82**

The precision of the data in this table is only two significant figures.

kg/year = Kilograms per year.

(a) = The estimated loadings were based on replacement of non-detect results with one-half the method detection limit or method reporting limit.

(b) = Municipal loadings included loadings from facilities for which flow and pollutant concentration data were available, as well as loadings estimated for facilities where flow data were available but pollutant concentration data were not.

(c) = Industrial loadings included loadings from only those facilities for which both flow and pollutant concentration data were available.

Table 10. Estimated Annual Loadings of Chloroform from Point Source Wastewater Dischargers.

Study Area Name	Phase 2 Estimate of Loadings (a)							Total Phase 1 Wastewater Loadings (kg/year)
	Municipal Facilities (b)			Industrial Facilities (c)			Total Phase 2 Wastewater Loadings (kg/year)	
	Wastewater Loadings (kg/year)	Total Number of Facilities	Number of Facilities Not Included in Loading Estimates	Wastewater Loadings (kg/year)	Total Number of Facilities	Number of Facilities Not Included in Loading Estimates		
Admiralty Inlet	0.640	1	0	41.4	3	2	42.1	not estimated
Elliott Bay	0	0	0	0	4	4	0	not estimated
Commencement Bay	25.4	12	0	226	17	13	251	not estimated
Hood Canal (north)	0.00761	1	0	0	1	1	0.00761	not estimated
Hood Canal (south)	0	0	0	0	0	0	0	not estimated
Main Basin	154	17	0	0.310	8	7	154	not estimated
Port Gardner	23.9	11	1	390	4	3	414	not estimated
San Juan Islands	10.1	9	1	8.04	3	2	18.2	not estimated
Sinclair-Dyes Inlet	36.2	5	0	0	5	5	36.2	not estimated
South Sound (east)	16.6	8	1	0	3	3	16.6	not estimated
South Sound (west)	64.3	8	0	0	3	3	64.3	not estimated
Strait of Georgia	90.0	11	4	6.99	15	11	97.0	not estimated
Strait of Juan de Fuca	7.69	6	1	8.81	4	3	16.5	not estimated
Whidbey Basin	8.59	16	2	0	5	5	8.59	not estimated
Puget Sound Total	**438**	**105**	**10**	**681**	**75**	**62**	**1,120**	not estimated

The precision of the data in this table is only two significant figures.

kg/year = Kilograms per year.

(a) = The estimated loadings were based on replacement of non-detect results with one-half the method detection limit or method reporting limit.

(b) = Municipal loadings included loadings from facilities for which flow and pollutant concentration data were available, as well as loadings estimated for facilities where flow data were available but pollutant concentration data were not.

(c) = Industrial loadings included loadings from only those facilities for which both flow and pollutant concentration data were available.

Table 11. Estimated Annual Loadings of Total Phenolics from Point Source Wastewater Dischargers.

Study Area Name	Phase 2 Estimate of Loadings (a)							Total Phase 1 Wastewater Loadings (kg/year)
	Municipal Facilities (b)			Industrial Facilities (c)			Total Phase 2 Wastewater Loadings (kg/year)	
	Wastewater Loadings (kg/year)	Total Number of Facilities	Number of Facilities Not Included in Loading Estimates	Wastewater Loadings (kg/year)	Total Number of Facilities	Number of Facilities Not Included in Loading Estimates		
Admiralty Inlet	12.8	1	0	2,490	3	2	2,500	not estimated
Elliott Bay	0	0	0	0	4	4	0.00	not estimated
Commencement Bay	955	12	0	1,150	17	15	2,100	not estimated
Hood Canal (north)	0.152	1	0	0	1	1	0.152	not estimated
Hood Canal (south)	0	0	0	0	0	0	0.00	not estimated
Main Basin	2,993	17	0	0	8	8	2,990	not estimated
Port Gardner	868	11	1	0	4	4	868	not estimated
San Juan Islands	66.9	9	1	3.19	3	1	70.1	not estimated
Sinclair-Dyes Inlet	56.1	5	0	0	5	5	56.1	not estimated
South Sound (east)	10.7	8	1	0	3	3	10.7	not estimated
South Sound (west)	161	8	0	0	3	3	161	not estimated
Strait of Georgia	180	11	4	233	15	11	413	not estimated
Strait of Juan de Fuca	43.9	6	1	118	4	3	162	not estimated
Whidbey Basin	106	16	2	0	5	5	106	not estimated
Puget Sound Total	**5,450**	**105**	**10**	**3,990**	**75**	**65**	**9,440**	not estimated

The precision of the data in this table is only two significant figures.

kg/year = Kilograms per year.

(a) = The estimated loadings were based on replacement of non-detect results with one-half the method detection limit or method reporting limit.

(b) = Municipal loadings included loadings from facilities for which flow and pollutant concentration data were available, as well as loadings estimated for facilities where flow data were available but pollutant concentration data were not.

(c) = Industrial loadings included loadings from only those facilities for which both flow and pollutant concentration data were available.

Table 12. Uncertainty in Loading Rate Estimates Due to Treatment of Non-Detect Values.

Chemical of Concern	Total Loading (a) (kg/year)	Absolute Uncertainty (b) (kg/year)	Relative Uncertainty (c)
Copper	8,760	±42	0.48%
Lead	1,580	±492	31%
Mercury	9.3	±0	0%
Zinc	28,500	±48	0.17%
bis(2-Ethylhexyl)phthalate	4,030	±622	15%
Chloroform	1,120	±118	10%
Total Phenolics	9,440	±2,060	22%

The precision of the data in this table is only three significant figures.

kg/year = Kilograms per year.

(a) = Based on assigning one-half of the method reporting limit or detection limit to non-detect values.

(b) = Based on assigning 0 or the method reporting limit or detection limit to non-detect values.

(c) = Absolute uncertainty divided by the total loading.

Table 13. Correlations Between Loading Rates, Flows, and Concentrations.

Chemical of Concern	Source Type	Discharge Volume *versus* Loading Rate (r^2)	Concentration *versus* Loading Rate (r^2)
Copper	Industrial	0.93	0.09
	Municipal	0.71	0.21
Lead	Industrial	0.85	0.01
	Municipal	0.53	0.36
Mercury	Industrial	0.70	0.25
	Municipal	0.55	0.90
Zinc	Industrial	0.88	0.00
	Municipal	0.73	0.25
bis(2-Ethylhexyl)phthalate	Industrial	0.82	0.21
	Municipal	0.54	0.56
Chloroform	Industrial	0.71	0.35
	Municipal	0.78	0.20
Total Phenolics	Industrial	0.50	0.66
	Municipal	0.43	0.57

Regression (r^2) values were calculated using log transformed data.

Table 14. Comparison of Wastewater Loading Estimates and Total Loadings to the Puget Sound Basin

Chemical of Concern (kilograms/year)	Wastewater Loading Estimates People for Puget Sound (a)			Loading Estimates Phase 1 (b)				Wastewater Loading Estimates Phase 2 (c)			Total Loadings to the Puget Sound Basin (h)
	Municipal	Industrial	Total Wastewater	Surface Runoff (d)	Atmospheric Deposition (e)	CSOs (f)	Total Wastewater	Municipal	Industrial (g)	Total Wastewater (g)	
Copper	**7,891**	**846**	**8,737**	**100,000** *(47,000 to 210,000)*	**31,000** *(3,100 to 150,000)*	**230**	**7,200** *(7,200 to 7,200)*	**7,490** *(7,480 to 7,500)*	**1,270** *(1,240 to 1,300)* (75/53)	**8,760** *(8,720 to 8,800)* (180/63)	**140,000** *(59,000 to 370,000)*
Lead	**3,296**	**252**	**3,548**	**84,000** *(32,000 to 230,000)*	**31,000** *(3,100 to 150,000)*	**140**	**4,700** *(380 to 9,100)*	**1,090** *(491 to 1,090)*	**491** *(467 to 515)* (75/57)	**1,580** *(1,090 to 2,070)* (180/67)	**117,000** *(36,000 to 380,000)*
Mercury	No estimate	No estimate	No estimate	**490** *(180 to 1,400)*	**31** *(6.2 to 160)*	**0.69**	**15** *(0 to 29)*	**2.35** *(2.35 to 2.35)*	**6.99** *(6.99 to 6.99)* (75/63)	**9.34** *(9.34 to 9.34)* (180/73)	**530** *(200 to 1,600)*
Zinc	**23,864**	**4,273**	**28,137**	**320,000** *(160,000 to 630,000)*	**60,000** *(6,000 to 310,000)*	**590**	**18,000** *(18,000 to 18,000)*	**23,100** *(23,100 to 23,100)*	**5,400** *(5,350 to 5,440)* (75/58)	**28,500** *(28,500 to 28,500)* (180/68)	**410,000** *(190,000 to 970,000)*
bis (2-Ethylhexyl)phthalate	**4,247**	No estimate	No estimate	**70,000** *(18,000 to 280,000)*	**3,100** *(310 to 16,000)*	**47**	**82** *(82 to 82)*	**2,770** *(2,670 to 2,880)*	**1,260** *(740 to 1,770)* (75/62)	**4,030** *(3,410 to 4,650)* (180/72)	**77,000** *(22,000 to 300,000)*
Chloroform	No estimate	No estimate	No estimate	no estimate	no estimate	no estimate	no estimate	**438** *(381 to 494)*	**681** *(620 to 743)* (75/63)	**1,120** *(1,000 to 1,240)* (180/73)	no estimate
Total Phenolics	No estimate	No estimate	No estimate	no estimate	no estimate	no estimate	no estimate	**5,450** *(3,410 to 7,500)*	**3,990** *(3,980 to 4,010)* (75/66)	**9,450** *(7,380 to 11,500)* (180/76)	no estimate

(a) = Based on Trim et al., 2008.
(b) = Based on Hart Crowser et al., 2007.
(c) = Best estimate using one-half (MDL or MRL) for non-detect results. *(Low to High estimates)* based on using Zero or (MDL or MRL), respectively, for non-detect results.
See Figures 2 through 8 for illustrations of the effects of using different assumptions for non-detect results.
(d) = Best estimate of the median; *(75% to 25% probability of exceedance)* from Table B-2 of Hart Crowser et al., 2007.
(e) = Best estimate; *(High to Low probability of exceedance)* from pp. 5-6 of Hart Crowser et al., 2007.
(f) = Combined sewer overflows, from Hart Crowser et al., 2007.
(g) = (Total / No Data) means: (Total number of facilities / Number of facilities not reporting results).
(h) = Sum of Phase 1 estimates for surface runoff, atmospheric deposition, and combined sewer overflows, and Phase 2 estimate for wastewater dischargers.

Figures

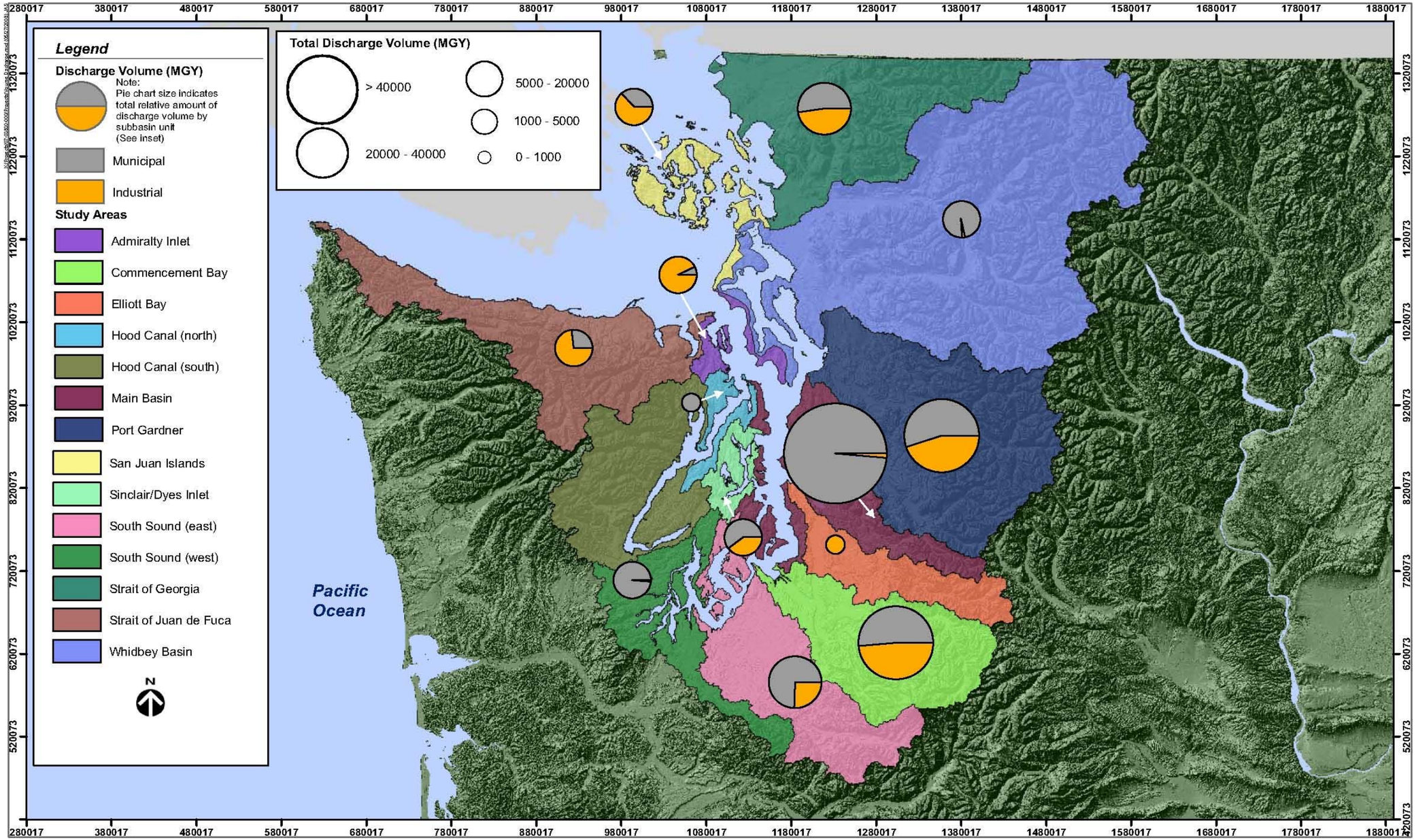

Figure 1. Total Reported Volume of Wastewater Discharges to the Puget Sound Basin by Permitted Municipal and Industrial Point Sources.

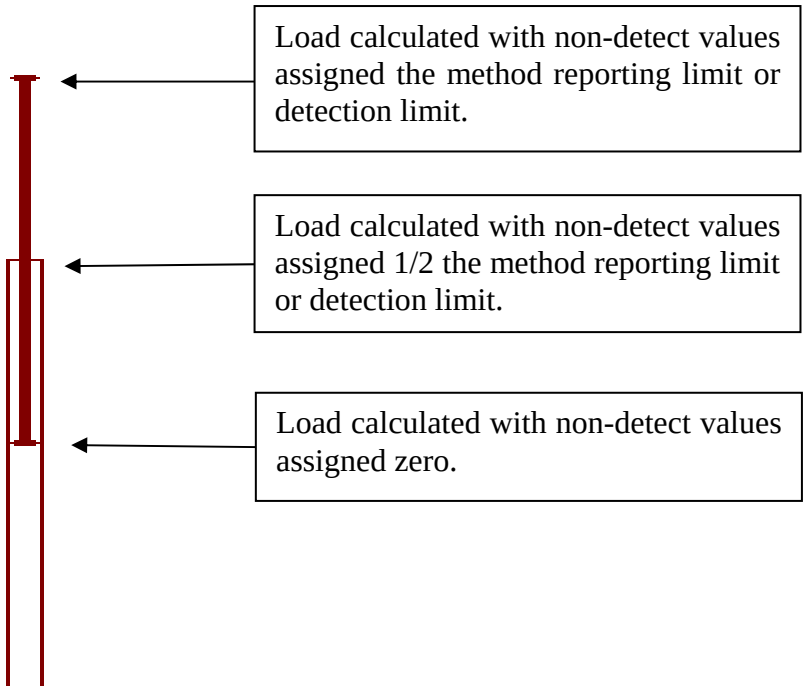

Figure 2. Explanation of Error Bars in Figures 3 through 9.

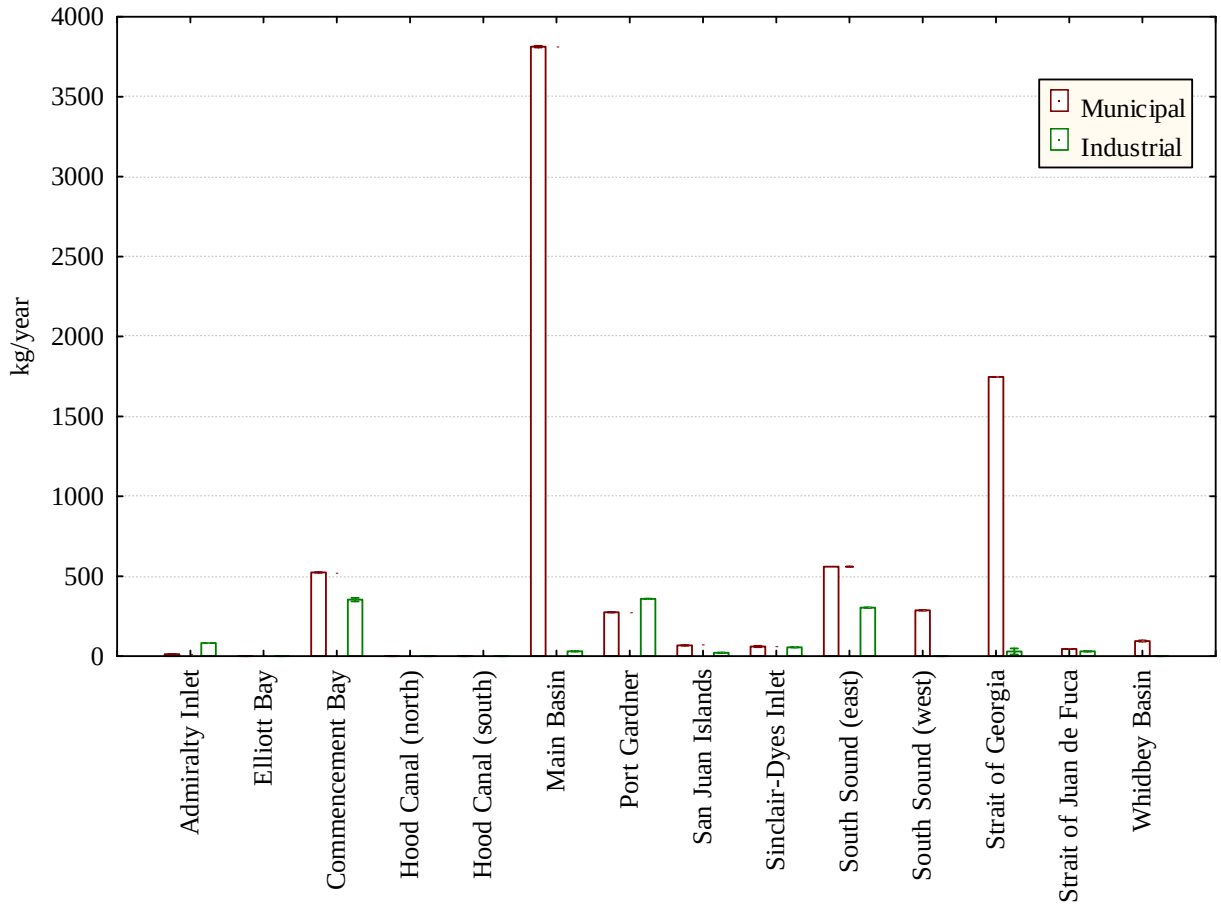

Figure 3. Copper Loadings from Wastewater Dischargers.

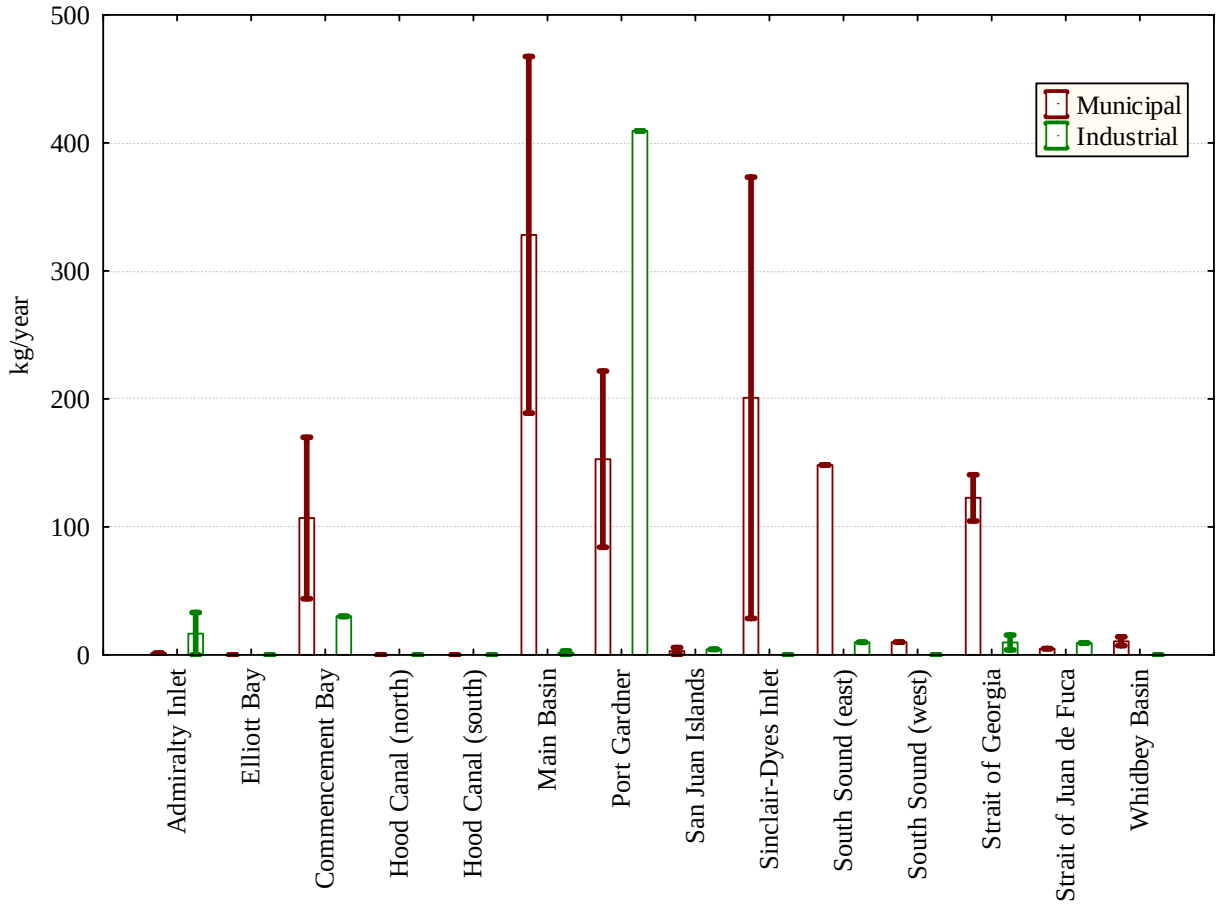

Figure 4. Lead Loadings from Wastewater Dischargers.

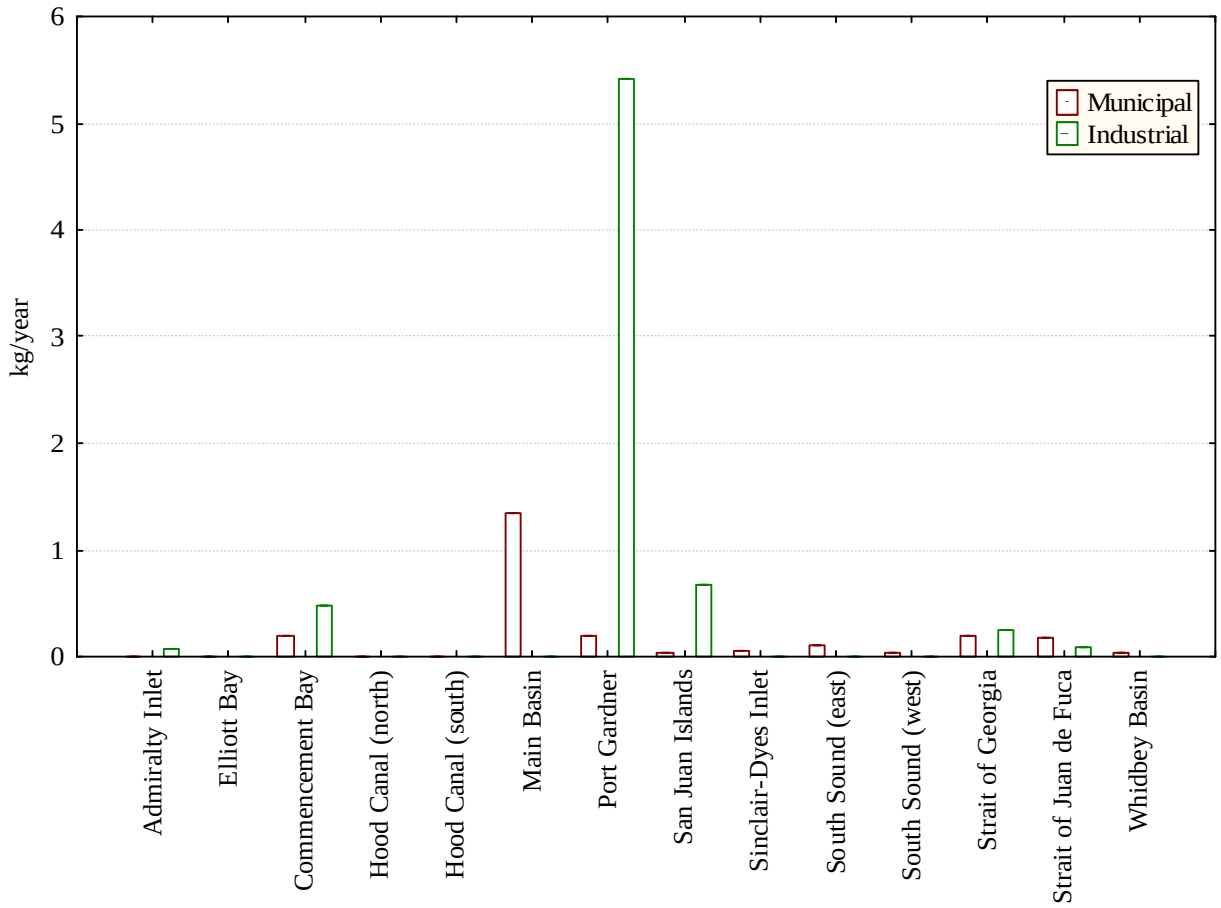

Figure 5. Mercury Loadings from Wastewater Dischargers.

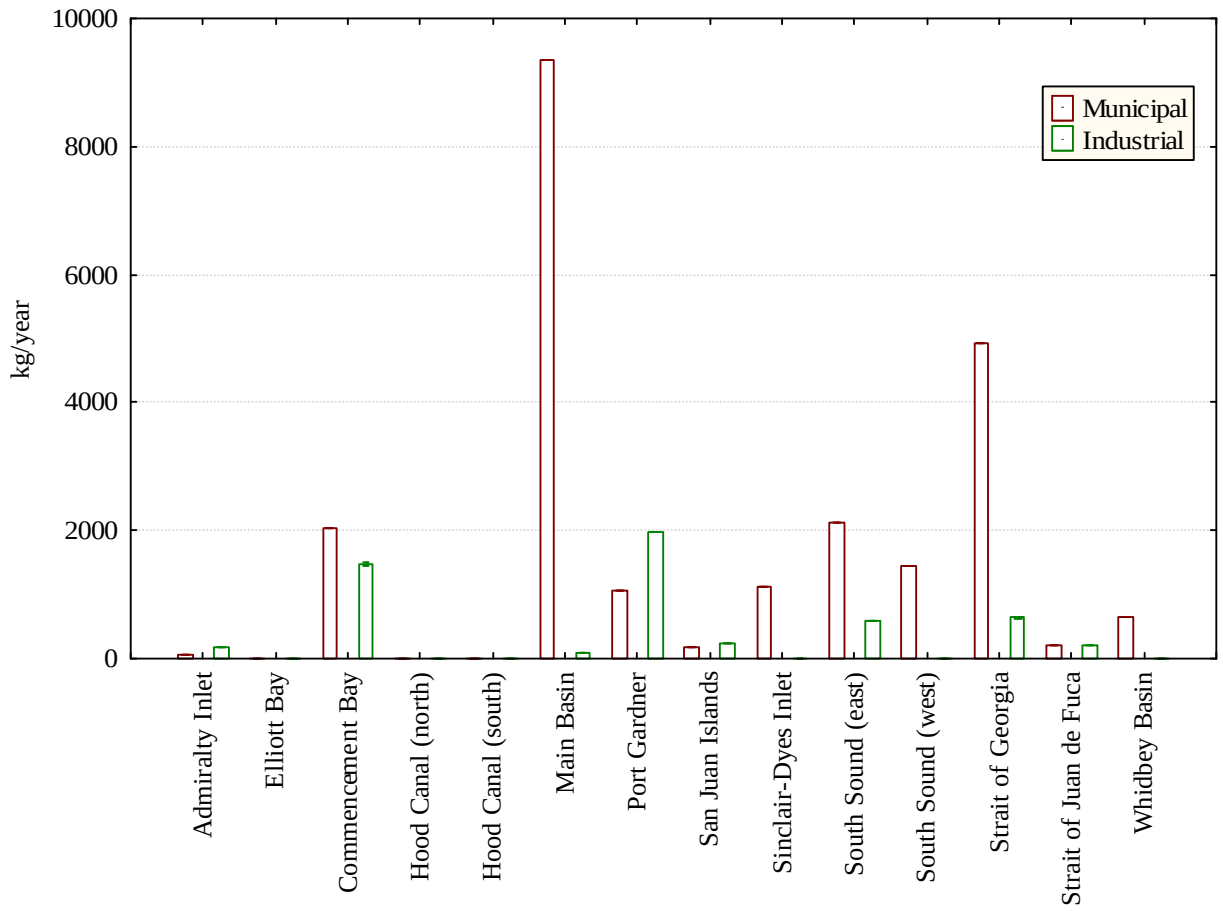

Figure 6. Zinc Loadings from Wastewater Dischargers.

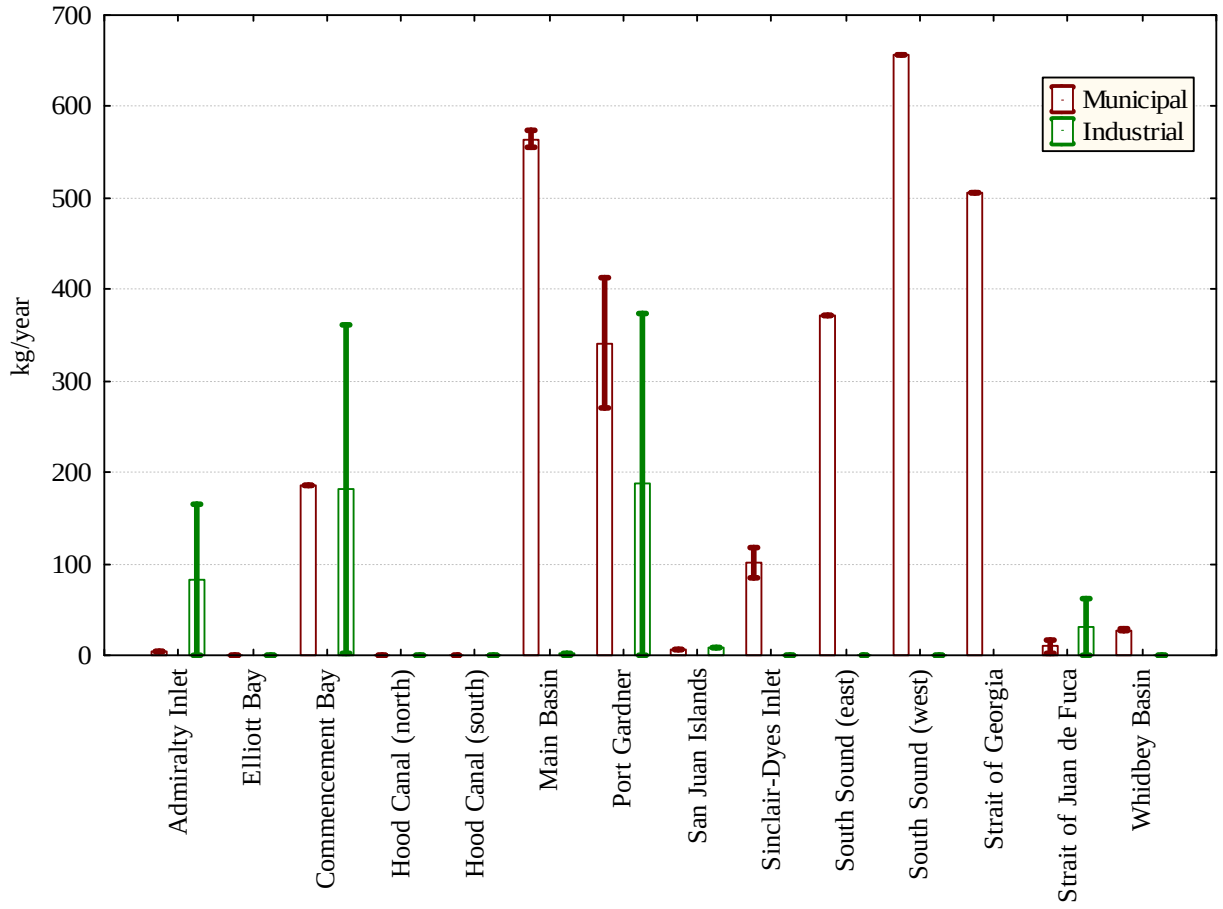

Figure 7. ***bis*(2-Ethylhexyl)phthalate Loadings from Wastewater Dischargers.**

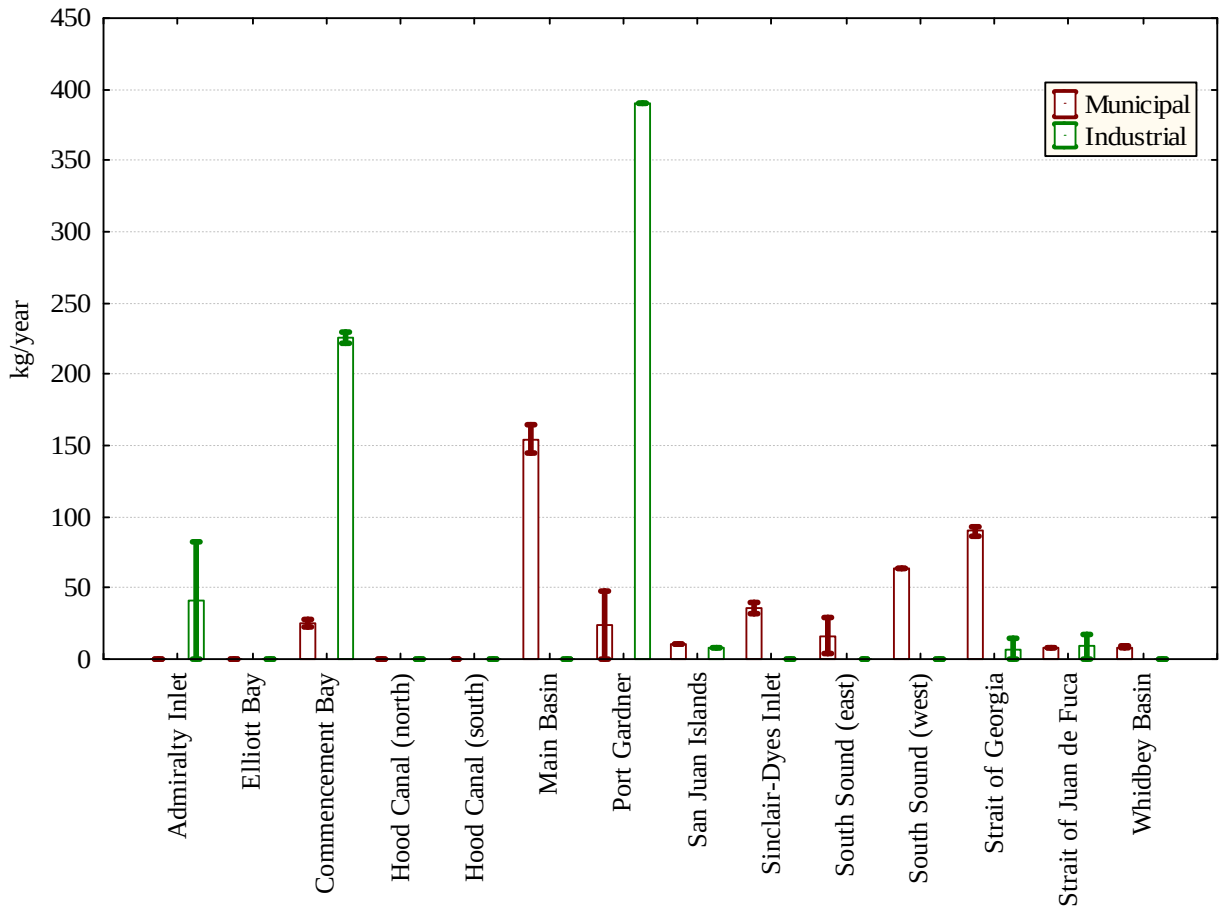

Figure 8. Chloroform Loadings from Wastewater Dischargers.

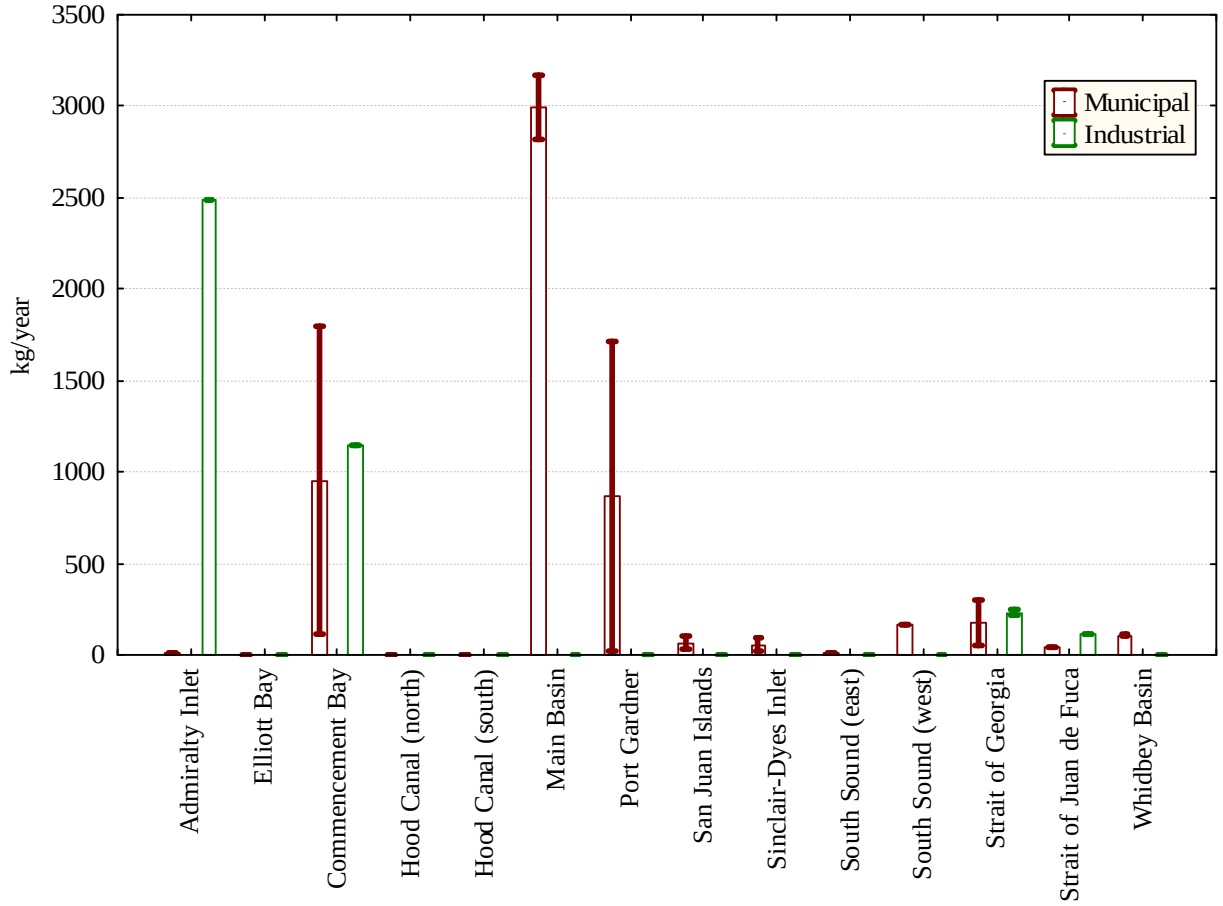

Figure 9. Total Phenolics Loadings from Wastewater Dischargers.

Appendices

Appendix A

Summary of Point Source Wastewater Discharge Facilities in the Puget Sound Basin

Table A-1: List of Permitted Point Source Facilities in the Database.

Study Area	Name of Permitted Discharger	Permit Number	Facility Type	Priority Pollutant Data (a)	Flow Data	Loading Calculated
Admiralty Inlet	Naval Ordnance CTR PAC Div.	WA0021997	Industry	None	None	No
Admiralty Inlet	New Day Fisheries Inc	WA0042048C	Industry	None	Average	No
Admiralty Inlet	Port Townsend Paper	WA0000922B	Industry	Yes	Average	Yes
Admiralty Inlet	Port Townsend Stp	WA0037052C	Municipal	None	Average	Extrapolated
Commencement Bay	Army, Mud Mountain Dam	WA0025623	Industry	None	None	No
Commencement Bay	Birds Eye Foods Inc	WA0037419C	Industry	Limited	Average	Yes
Commencement Bay	Buckley Stp	WA0023361C	Municipal	Yes	Average	Yes
Commencement Bay	Carbonado Stp	WA0020834C	Municipal	None	Average	Extrapolated
Commencement Bay	Cherrywood Mobile Home Manor	WA0037079B	Municipal	None	Average	Extrapolated
Commencement Bay	City of Sumner	WA0023353	Municipal	Limited	Average	Yes
Commencement Bay	Concrete Technology Corp	WA0001864C	Industry	None	Average	No
Commencement Bay	Enumclaw STP	WA0020575D	Municipal	Metals only	Average	Yes
Commencement Bay	Fleischmanns Vinegar	WA0038598D	Industry	None	Average	No
Commencement Bay	Graymont Western Us Inc	WA0001007D	Industry	Mercury Only	Average	Yes
Commencement Bay	Kapowsin Meats	WA0042145A	Industry	None	Average	No
Commencement Bay	McChord AFB	WA0025101	Industry	None	None	No
Commencement Bay	Occidental Chemical Corp	WA0037265E	Industry	Limited	Average	Yes
Commencement Bay	Orting Stp	WA0020303C	Municipal	Limited	Average	Yes
Commencement Bay	Pacific Functional Fluids	WA0038679E	Industry	Yes	Permit Limit	Yes
Commencement Bay	Pope Resources	WA0022292C	Industry	None	Average	No
Commencement Bay	Puyallup Stp	WA0037168D	Municipal	Yes	Average	Yes
Commencement Bay	Simpson Tacoma Kraft Co.	WA0000850B	Industry	Yes	Average	Yes
Commencement Bay	Sonoco - Sumner	WA0000884C	Industry	Yes	Average	Yes
Commencement Bay	Sound Refining Tacoma	WA0003204B	Industry	Limited	None	No
Commencement Bay	South Prairie Stp	WA0040479C	Municipal	None	Average	Extrapolated
Commencement Bay	Ssa Containers Inc	WA0040771C	Industry	None	Average	No
Commencement Bay	ST Services	WA0039501C	Industry	Yes	Average	Yes
Commencement Bay	Sumner Stp.	WA0023353	Municipal	Limited	Average	Yes
Commencement Bay	Tacoma Central No. 1	WA0037087B	Municipal	Metals only	Average	Yes
Commencement Bay	Tacoma North No. 3	WA0037214C	Municipal	Metals only	Average	Yes
Commencement Bay	US Oil & Refining Co.	WA001783B	Industry	Yes	Average	Yes
Commencement Bay	Western Wood Preserving Co	WA0040738C	Industry	Limited	Average	Yes
Commencement Bay	Wilkeson Stp	WA0023281C	Municipal	None	Average	Extrapolated
Elliott Bay	ConocoPhillips Renton	WA0001945E	Industry	Limited	None	No
Elliott Bay	Nucor Steel Seattle Inc	WA0031305C	Industry	Limited	Average	Yes
Elliott Bay	Pacific Coast Coal Co	WA0030830B	Industry	None	None	No
Elliott Bay	Seattle Steam	WA0001503D	Industry	Mercury Only	Permit Limit	Yes
Hood Canal (north)	Alderbrook Resort & Spa	WA0037753A	Municipal	None	Average	Extrapolated
Hood Canal (south)	Bangor Naval Submarine Base	WA0025577	Industry	None	None	No
Main Basin	Alderwood Stp	WA0020826D	Municipal	Mercury Only	Average	Extrapolated
Main Basin	Bainbridge Island City Wwtp	WA0020907D	Municipal	Yes	Average	Yes

Table A-1: List of Permitted Point Source Facilities in the Database.

Study Area	Name of Permitted Discharger	Permit Number	Facility Type	Priority Pollutant Data (a)	Flow Data	Loading Calculated
Main Basin	Bp Oil Service Station #11093	WA0031437C	Industry	Limited	Permit Limit	Yes
Main Basin	Edmonds Stp	WA0024058C	Municipal	Yes	Average	Yes
Main Basin	Fish and Wildlife Fisheries Research Center	WA0025798	Industry	None	None	No
Main Basin	Gig Harbor Stp	WA0023957B	Municipal	Yes	Average	Yes
Main Basin	Kitsap Cnty Kingston Wwtp	WA0032077A	Municipal	None	Average	Extrapolated
Main Basin	Kitsap Cnty Manchester	WA0023701D	Municipal	None	Average	Extrapolated
Main Basin	Lakota Stp	WA0022624D	Municipal	Metals only	Average	Yes
Main Basin	Lynnwood Stp	WA0024031E	Municipal	None	Average	Extrapolated
Main Basin	Metro Renton (King Co Renton)	WA0029581D	Municipal	Yes	Average	Yes
Main Basin	Metro West Point (King Co West Point)	WA0029181E	Municipal	Yes	Average	Yes
Main Basin	Midway Sewer District	WA0020958D	Municipal	Yes	Average	Yes
Main Basin	Miller Creek Wwtp	WA0022764D	Municipal	Yes	Average	Yes
Main Basin	NOAA-NMFS, NW & ALASKA Fisheries Center	WA0024899	Industry	None	None	No
Main Basin	North Bend Stp	WA0029351D	Municipal	Yes	Average	Yes
Main Basin	Olympus Terrace Stp	WA0023396C	Municipal	None	Average	Extrapolated
Main Basin	Paramount Petroleum	WA0003239D	Industry	Limited	Permit Limit	No
Main Basin	Paramount Petroleum Corp Lust Site	WA0031704B	Industry	Limited	Permit Limit	Yes
Main Basin	Redondo Stp	WA0023451D	Municipal	Yes	Average	Yes
Main Basin	Salmon Creek Wwtp	WA0022772E	Municipal	Yes	Average	Yes
Main Basin	SeaTac Airport	WA0024651E	Industry	Yes	Average	Yes
Main Basin	Vashon Stp (King Co-Vashon)	WA0022527E	Municipal	Yes	Average	Yes
Main Basin	Wa UW Medical Ctr	WA0030023E	Industry	None	Average	No
Main Basin	Westfarm Foods - Issaquah	WA0032034A	Industry	None	None	No
Port Gardner	Duvall Stp	WA0029513C	Municipal	Limited	Average	Yes
Port Gardner	Everett Stp BA52223	WA0024490C	Municipal	Yes	Average	Yes
Port Gardner	Everett Stp BA52224	WA0024490C	Municipal	Yes	Average	Yes
Port Gardner	Fort Lewis Defense Fuel Support Point	WA0025232	Industry	None	None	No
Port Gardner	Kimberly-Clark Worldwide, Inc	WA0000621A	Industry	Yes	Average	Yes
Port Gardner	Lake Stevens Sewer District	WA0020893D	Municipal	Yes	Average	Yes
Port Gardner	Marysville Stp	WA0022497C	Municipal	Yes	Permit Limit	Yes
Port Gardner	Monroe Stp	WA0020486D	Municipal	Yes	Average	Yes
Port Gardner	Naval Station Puget Sound	WAS025755	Industry	None	None	No
Port Gardner	Penn Cove Wwtp	WA0029386C	Municipal	None	Average	Extrapolated
Port Gardner	Snohomish Stp	WA0029548C	Municipal	Yes	Average	Yes
Port Gardner	Snoqualmie Wwtp	WA0022403C	Municipal	Yes	Average	Yes
Port Gardner	Sultan Wwtp	WA0023302D	Municipal	None	Average	Extrapolated
Port Gardner	Tulalip Tribe Big Flats Landfill	WA0025739	Industry	None	None	No
Port Gardner	Tulalip Tribes of Washington, Utilities District #1 WWTP	WA0024805	Municipal	None	None	No
San Juan Islands	Anacortes Wwtp	WA002057E	Municipal	Yes	Average	Yes
San Juan Islands	Eastsound Orcas Village	WA0030911D	Municipal	None	Average	Extrapolated
San Juan Islands	Eastsound Water District	WA0030571C	Municipal	None	Average	Extrapolated

Table A-1: List of Permitted Point Source Facilities in the Database.

Study Area	Name of Permitted Discharger	Permit Number	Facility Type	Priority Pollutant Data (a)	Flow Data	Loading Calculated
San Juan Islands	Fisherman Bay Stp	WA0030589D	Municipal	None	Average	Extrapolated
San Juan Islands	Friday Harbor Stp	WA0023582D	Municipal	Yes	Average	Yes
San Juan Islands	Naval Airsta Whidbey Island, Ault Field WWTP	WA0003468	Municipal	None	None	No
San Juan Islands	Naval Airsta. Whidbey Island	WA0022012	Industry	None	None	No
San Juan Islands	Oak Harbor Stp	WA0020567C	Municipal	Yes	Average	Yes
San Juan Islands	Roche Harbor Resort	WA0021822C	Municipal	None	Average	Extrapolated
San Juan Islands	Rosario Utilities	WA0029891D	Municipal	None	Average	Extrapolated
San Juan Islands	Shell Oil Products US	WA002941B	Industry	Limited	Average	Yes
San Juan Islands	Tesoro Refining And Marketing Co	WA0000761C	Industry	Yes	Average	Yes
Sinclair Dyes Inlet	Bremerton Stp	WA0029289E	Municipal	Yes	Average	Yes
Sinclair Dyes Inlet	EPA Manchester Laboratory	WA0025194	Industry	None	None	No
Sinclair Dyes Inlet	Fleet & Industrial Supply Cntr	WA0002780	Industry	Limited	Average	Yes
Sinclair Dyes Inlet	Kitsap Cnty Central Kitsap	WA0030520E	Municipal	Yes	Average	Yes
Sinclair Dyes Inlet	Kitsap Cnty Sewer Dist 7	WA0030317D	Municipal	None	Average	Extrapolated
Sinclair Dyes Inlet	Messenger House Care Center	WA0023469D	Municipal	Metals only	Average	Yes
Sinclair Dyes Inlet	Naval Undersea Warfare Center	WA0026026	Industry	None	None	No
Sinclair Dyes Inlet	Port Orchard Wwtp	WA0020346C	Municipal	Yes	Average	Yes
Sinclair Dyes Inlet	Puget Sound Naval Shipyard	WA0002062	Industry	Limited	Average	Yes
Sinclair Dyes Inlet	Suquamish STP (Kitsap Co.)	WA0023256	Industry	None	None	No
South Sound (east)	Army Defense, Reserve Center	WA0025267	Industry	None	None	No
South Sound (east)	Chambers Creek Stp	WA0039624	Municipal	Yes	Average	Yes
South Sound (east)	Eatonville Stp	WA0037231C	Municipal	None	Average	Extrapolated
South Sound (east)	For Lewis Depat. Of Public Works	WAS026638	Industry	None	None	No
South Sound (east)	Ft Lewis Water Pollution Cntl	WA0021954	Industry	Limited	Average	Yes
South Sound (east)	Rainier State School	WA0037923C	Municipal	Limited	Average	Yes
South Sound (east)	Shelton Stp	WA0023345C	Municipal	Yes	Average	Yes
South Sound (east)	Taylor Bay Stp	WA0037656B	Municipal	None	Average	Extrapolated
South Sound (east)	US NPS Paradise Wastewater Treatment	WA0025569	Municipal	None	None	No
South Sound (east)	WA DOC McNeil Island Stp	WA0040002C	Municipal	Yes	Average	Yes
South Sound (east)	Yelm Stp	WA0040762B	Municipal	Limited	Average	Yes
South Sound (west)	Boston Harbor Stp	WA0040291B	Municipal	None	Average	Extrapolated
South Sound (west)	Carlyon Beach Stp	WA0037915C	Municipal	None	Average	Extrapolated
South Sound (west)	Harstene Pointe Stp	WA0038377B	Municipal	None	Average	Extrapolated
South Sound (west)	LOTT	WA0037061	Municipal	Yes	Average	Yes
South Sound (west)	National Fish & Oyster	WA0038407C	Industry	None	Average	No
South Sound (west)	Olympia Oyster Co	WA0037133C	Industry	None	Average	No
South Sound (west)	Olympia Water & Sewer Inc	WA0021202B	Municipal	None	Average	Extrapolated
South Sound (west)	Port of Olympia Budd Inlet	WA0040533B	Industry	Limited	Average	Yes
South Sound (west)	Rustlewood Stp	WA0038075B	Municipal	Limited	Average	Yes
South Sound (west)	Seashore Villa Stp	WA0037273B	Municipal	None	Average	Extrapolated
South Sound (west)	Tamoshan Stp	WA0037290C	Municipal	None	Average	Extrapolated

Table A-1: List of Permitted Point Source Facilities in the Database.

Study Area	Name of Permitted Discharger	Permit Number	Facility Type	Priority Pollutant Data (a)	Flow Data	Loading Calculated
Strait of Georgia	Bellingham Stp	WA0023744D	Municipal	Yes	Average	Yes
Strait of Georgia	Birch Bay Stp	WA0029556C	Municipal	Yes	Average	Yes
Strait of Georgia	Blaine Seafood Processors	WA0031321C	Industry	None	Average	No
Strait of Georgia	Blaine Stp	WA0022641C	Municipal	Yes	Average	Yes
Strait of Georgia	Blau Oyster Co	WA0029262E	Industry	None	Average	No
Strait of Georgia	BP Cherry Point Refinery	WA0022900B	Industry	Yes	Average	Yes
Strait of Georgia	ConocoPhillips Ferndale Refinery	WA0002984B	Industry	Yes	Average	Yes
Strait of Georgia	Crystal Ocean Seafood Inc.	WA0026077	Industry	None	None	No
Strait of Georgia	Darigold Lynden Plant	WA002470C	Industry	Limited	Average	Yes
Strait of Georgia	Everson Stp	WA0020435D	Municipal	Yes	Average	Yes
Strait of Georgia	Ferndale Stp	WA0022454C	Municipal	Yes	Average	Yes
Strait of Georgia	Intalco Ferndale	WA002950B	Industry	Yes	Average	Yes
Strait of Georgia	Lehigh Northwest Cement Co	WA0001198B	Industry	Limited	Average	Yes
Strait of Georgia	Lummi Bay Sea Ponds	WA0025933	Industry	None	None	No
Strait of Georgia	Lummi Indian Business Council; Gooseberry Point WWTP	WA0025666	Municipal	None	None	No
Strait of Georgia	Lummi Indian Business Council; Sandy Point WWTP	WA0025658	Municipal	None	None	No
Strait of Georgia	Lynden Stp	WA0022578D	Municipal	Yes	Average	Yes
Strait of Georgia	Praxair Inc	WA0030350C	Industry	None	Permit Limit	No
Strait of Georgia	Puget Sound Energy Whitehorn	WA0030601E	Industry	None	Permit Limit	No
Strait of Georgia	SulExtrapolated Inc	WA0031283C	Industry	None	Average	No
Strait of Georgia	Swinomish Indian Tribal Community Industrial District WTP	WA0025062	Municipal	None	None	No
Strait of Georgia	Swinomish Reservation, Shelter Bay WWTP	WA0024422	Municipal	None	None	No
Strait of Georgia	Taylor Shellfish Farms Samish Bay	WA0002607E	Industry	None	Average	No
Strait of Georgia	Tenaska Cogeneration Plant	WA0031291B	Industry	Metals only	Average	Yes
Strait of Georgia	Wa Dfw Bellingham Hatchery	WA0031500B	Industry	None	Average	No
Strait of Georgia	Wa Parks Larrabee	WA0023787D	Municipal	None	Average	Extrapolated
Strait of Juan de Fuca	Battelle Marine Science Lab	WA0040649	Industry	Yes	Permit Limit	Yes
Strait of Juan de Fuca	Clallam Bay Correction Center Stp	WA0039845D	Municipal	None	Average	Extrapolated
Strait of Juan de Fuca	Clallam Bay Stp	WA0024431B	Municipal	None	Average	Extrapolated
Strait of Juan de Fuca	K Ply Inc	WA0038059C	Industry	Mercury Only	None	No
Strait of Juan de Fuca	Makah WWTP	WA0023213	Municipal	None	None	No
Strait of Juan de Fuca	Nippon Paper Industries USA Co.-Outfall 1	WA0002925C	Industry	Yes	Average	Yes
Strait of Juan de Fuca	Port Angeles Stp	WA0023973C	Municipal	Yes	Average	Yes
Strait of Juan de Fuca	Sekiu Stp	WA0024449B	Municipal	None	Average	Extrapolated
Strait of Juan de Fuca	Sequim Stp	WA0022349C	Municipal	Mercury Only	Average	Extrapolated
Strait of Juan de Fuca	Supreme Alaska Seafoods	WA0040720C	Industry	None	Average	No
Whidbey Basin	Arlington Stp	WA0022560E	Municipal	Yes	Average	Yes
Whidbey Basin	Burlington Wwtp	WA0020150C	Municipal	Metals only	Average	Yes
Whidbey Basin	Concrete Stp	WA0020851B	Municipal	None	Average	Extrapolated
Whidbey Basin	Coupeville Stp	WA0029378D	Municipal	None	Average	Extrapolated
Whidbey Basin	Erickson Farms Inc	WA0031771B	Industry	None	Average	No

Table A-1: List of Permitted Point Source Facilities in the Database.

Study Area	Name of Permitted Discharger	Permit Number	Facility Type	Priority Pollutant Data (a)	Flow Data	Loading Calculated
Whidbey Basin	Granite Falls Stp	WA0021130D	Municipal	Limited	Average	Yes
Whidbey Basin	La Connor Stp	WA0022446C	Municipal	Metals only	Average	Yes
Whidbey Basin	Langley Stp	WA0020702C	Municipal	None	Average	Extrapolated
Whidbey Basin	Mt Vernon Wwtp	WA0024074D	Municipal	Yes	Average	Yes
Whidbey Basin	Naval Airsta. Whidbey Island	WA0026557	Industry	None	None	No
Whidbey Basin	Seattle City Light Diablo	WA0029858D	Municipal	None	Average	Extrapolated
Whidbey Basin	Seattle City Light Newhalem	WA0029670D	Municipal	None	Average	Extrapolated
Whidbey Basin	Sedro Woolley Stp	WA0023752C	Municipal	Yes	Average	Yes
Whidbey Basin	Skagit Cnty 2 Big Lake	WA0030597C	Municipal	None	Average	Extrapolated
Whidbey Basin	Skagit Co. Sewer District #1 Sneeoosh	WA0029432	Municipal	None	None	No
Whidbey Basin	Skagit Valley Bulb Farm	WA0031763B	Industry	None	None	No
Whidbey Basin	Smith Morrison Farms	WA0031739B	Industry	None	Average	No
Whidbey Basin	Stanwood Stp	WA0020290E	Municipal	None	Average	Extrapolated
Whidbey Basin	Swinomish Indian Reservation	WAS025810	Municipal	None	None	No
Whidbey Basin	Warm Beach Campground	WA0029904C	Municipal	None	Average	Extrapolated
Whidbey Basin	Washington Bulb Co Inc	WA0031721B	Industry	None	None	No

(a) "Limited" indicates that data were available for ten or fewer priority pollutants.
"Yes" indicates that priority pollutant data were available for at least 11 pollutants.
"None" indicates that no priority pollutant data were available.

Table A-2: Facilities Excluded from the Point Source Database and Rationale.

Study Area ID	Name of Permit Holder	Permit No.	Facility Type	Rationale for Exclusoin
Admiralty Inlet	Marrowstone Field Station	WA0025879	Industry	Hatchery
Commencement Bay	Associated Petroleum Products Inc	WA0038784A	Industry	Stormwater discharge only
Commencement Bay	Atlas Castings & Technology	WA0022918C	Industry	No discharge to Puget Sound
Commencement Bay	Conocophillips Tacoma North Terminal	WA0000728C	Industry	Stormwater discharge only
Commencement Bay	Conocophillips Tacoma Terminal South	WA0003387D	Industry	Stormwater discharge only
Commencement Bay	Emerald Downs	WA0031496B	Industry	Stormwater discharge only
Commencement Bay	Emerald Queens Cascade Casino	WAR10A28I	Industry	Stormwater discharge only
Commencement Bay	Manke Lumber Co Superior Wood	WA0040339B	Industry	Stormwater discharge only
Commencement Bay	Marine Industries Northwest	WA0040444C	Industry	No discharge to Puget Sound
Commencement Bay	Mcfarland Cascade Pole & Lumber Co	WA0037953C	Industry	Stormwater discharge only
Commencement Bay	Microchip Technology Inc	WA0039578B	Industry	No discharge to Puget Sound
Commencement Bay	Occidental Chemical Corp	WA0037265E	Industry	No discharge to Puget Sound
Commencement Bay	Port Of Tacoma	WA0000931B	Industry	No discharge to Puget Sound
Commencement Bay	Puyallup Hatchery	WA0039748A	Industry	Hatchery
Commencement Bay	Schnitzer Steel Industries Tac	WA0040347D	Industry	Stormwater discharge only
Commencement Bay	White River Hatchery	WA0025753	Industry	Hatchery
Elliott Bay	Duwamish Shipyard	WA0030937C	Industry	No discharge to Puget Sound
Elliott Bay	Foss Maritime	WA0031054C	Industry	Other, No discharge to Puget Sound
Elliott Bay	Lafarge Corporation	WA0002232E	Industry	No discharge to Puget Sound
Elliott Bay	Seattle Cso	WA0031682B	Municipal	No discharge to Puget Sound
Elliott Bay	Shell Oil Product Seattle Terminal	WA0001791D	Industry	Stormwater discharge only
Elliott Bay	Stabbert Yacht And Ship Llc	WA0030996C	Industry	No discharge to Puget Sound
Elliott Bay	Todd Pacific Shipyard	WA0002615D	Industry	Other, No discharge to Puget Sound
Main Basin	Aaa Monroe Rock Corp	WA0030465D	Industry	Stormwater discharge only
Main Basin	American Gold Seafoods Clam Bay	WA0031526B	Industry	Net pens; no water discharge
Main Basin	American Gold Seafoods Orchard Rock	WA0031542B	Industry	Net pens; no water discharge
Main Basin	Brightwater Conveyance System Noi	WA0032051A	Industry	No discharge to Puget Sound
Main Basin	Fishing Vessel Owners	WA0031062B	Industry	No discharge to Puget Sound
Main Basin	Lake Union Drydock	WA0030074D	Industry	No discharge to Puget Sound
Main Basin	Muckleshoot Indian Tribe	WAR10A12I	Industry	Stormwater discharge only
Main Basin	Northlake Shipyard Inc	WA0030864C	Industry	Other, No discharge to Puget Sound
Main Basin	Pacific Fishermen	WA0031046B	Industry	Stormwater discharge only
Port Gardner	Bnsf Skykomish Remediation Site	WA0032123A	Industry	Infrequent Discharge
Port Gardner	Echo Glen Childrens Ctr	WA0029939B	Municipal	No discharge to Puget Sound
Port Gardner	Everett Shipyard Inc	WA0030961C	Industry	No discharge to Puget Sound
Port Gardner	Everett Shipyard Piers 1-3	WA0032000A	Industry	No discharge to Puget Sound
Port Gardner	Hansen Boat Co	WA0031909B	Industry	Other, No discharge to Puget Sound
Port Gardner	M.A.P. #2 Llc	WA0031976A	Industry	No discharge to Puget Sound
Port Gardner	Snoqualmie Ridge Phase 2	WA0032018A	Industry	No discharge to Puget Sound
Port Gardner	Wa Wsp Fire Training Acad	WA0031836A	Industry	Other, No discharge to Puget Sound

Table A-2: Facilities Excluded from the Point Source Database and Rationale.

Study Area ID	Name of Permit Holder	Permit No.	Facility Type	Rationale for Exclusoin
Port Gardner	Aspen Rural Cluster Subdivision	WAR10A96I	Industry	Hatchery
Port Gardner	NW & Alaska Fisheries Center	WA0025097	Industry	Hatchery
Port Gardner	Salmon Hatchery	WA0026000	Industry	Hatchery
Port Gardner	Salmon Rearing Ponds	WA0025241	Industry	Hatchery
San Juan Islands	American Gold Seafoods Site 1	WA0031569B	Industry	Net pens; no water discharge
San Juan Islands	American Gold Seafoods Site 2	WA0031577B	Industry	Net pens; no water discharge
San Juan Islands	American Gold Seafoods Site 3	WA0031585B	Industry	Net pens; no water discharge
San Juan Islands	American Gold Seafoods Site 4	WA0031593B	Industry	Net pens; no water discharge
San Juan Islands	Dakota Creek Industries	WA0031411B	Industry	Stormwater discharge only
San Juan Islands	NAS Whidbey IS/P-157 Direct Island	WAR10AB5F	Industry	Stormwater discharge only
San Juan Islands	NAS Whidbey IS/Victoria Homes	WAR10A59F	Industry	Stormwater discharge only
San Juan Islands	Naval Airsta Whidbey Island	WAR05A59F	Industry	Stormwater discharge only
Sinclair-Dyes Inlet	American Gold Seafoods	WA0040801C	Industry	Net pens; no water discharge
Sinclair-Dyes Inlet	American Gold Seafoods Fort Ward	WA0031534B	Industry	Net pens; no water discharge
Sinclair-Dyes Inlet	Fred Hill Materials; Poulsbo Plant	WAG503179	Industry	Groundwater discharge
South Sound (east)	Abitibi Consolidated Sales Corp.	WA0001040C	Industry	No discharge to Puget Sound
South Sound (east)	Clear Creek Hatchery	WA0025801	Industry	Hatchery
South Sound (east)	Salmon Rearing Ponds	WA0025526	Industry	Hatchery
South Sound (west)	All American Bottled Water Corp	WA0001309C	Industry	No discharge to Puget Sound
South Sound (west)	South Sound Net Pens	WA0040878B	Industry	Net pens; no water discharge
South Sound (west)	Harstene Oyster Company	WA0037320	Industry	Hatchery
Strait of Georgia	Brooks Mfg	WA0030805C	Industry	Stormwater discharge only
Strait of Georgia	Coho Rearing Ponds	WA0025852	Industry	Hatchery
Strait of Georgia	Finkbonner Shellfish	WA0026255	Industry	Hatchery
Strait of Georgia	Georgia Pacific West Bellingham	WA0001091C	Industry	No discharge to Puget Sound
Strait of Georgia	Oeser Co	WA0030813D	Industry	Stormwater discharge only
Strait of Georgia	Puglia Engineering Inc	WA0031348C	Industry	No discharge to Puget Sound
Strait of Georgia	Red Creek Hatchery	WA0025861	Industry	Hatchery
Strait of Georgia	Skookum Creek Fish Hatchery	WA0025208	Industry	Hatchery
Strait of Juan de Fuca	Crown Pacific - Port Angeles Mill	WA0042013A	Industry	No discharge to Puget Sound
Strait of Juan de Fuca	Makah Natl Fish Harchery	WA0025674	Industry	Hatchery
Whidbey Basin	Indian Ridge Corrections Center	WA0029424B	Municipal	No discharge to Puget Sound
Whidbey Basin	Salmon Farm	WA0025844	Industry	Hatchery

Appendix B

Pollutant Load Calculations for Individual Permitted Point Source Wastewater Discharge Facilities

Table B-1. Estimated Copper Loadings from Industrial Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Industrial	Admiralty Inlet	Port Townsend Paper	WA0000922B	4,380	5.00	82.9	82.9	82.9
Industrial	Commencement Bay	Birds Eye Foods Inc	WA0037419C	93.6	20.0	7.09	3.54	0.000
Industrial	Commencement Bay	Occidental Chemical Corp	WA0037265E	682	5.50	14.2	7.10	0.000
Industrial	Commencement Bay	Pacific Functional Fluids	WA0038679E	2.02	6.00	0.0460	0.0230	0.000
Industrial	Commencement Bay	Simpson Tacoma Kraft Co.	WA0000850B	10,100	8.80	336	336	336
Industrial	Commencement Bay	Sonoco - Sumner	WA0000884C	51.5	28.6	5.57	5.57	5.57
Industrial	Commencement Bay	ST Services	WA0039501C	1.96	2.00	0.0148	0.00742	0.000
Industrial	Commencement Bay	Western Wood Preserving Co	WA0040738C	37.7	11.0	1.57	1.57	1.57
Industrial	Elliott Bay	Nucor Steel Seattle Inc	WA0031305C	51.6	1.70	0.332	0.332	0.332
Industrial	Elliott Bay	Pacific Coast Coal Co	WA0030830B	unknown	3.00	Estimate was not possible.		
Industrial	Main Basin	Paramount Petroleum	WA0003239D	unknown	1.00	Estimate was not possible.		
Industrial	Main Basin	SeaTac Airport	WA0024651E	818	10.1	31.3	31.3	31.3
Industrial	Port Gardner	Kimberly-Clark Worldwide, Inc	WA0000621A	10,300	9.20	359	359	359
Industrial	San Juan Islands	Tesoro Refining And Marketing Co	WA0000761C	1,180	5.00	22.3	22.3	22.3
Industrial	Sinclair/Dyes Inlet	Puget Sound Naval Shipyard	WA0002062	2,470	6.00	56.2	56.2	56.2
Industrial	South Sound (east)	Ft Lewis Water Pollution Control	WA0021954	2,590	31.0	304	304	304
Industrial	South Sound (west)	Port of Olympia Budd Inlet	WA0040533B	5.26	0.000	0.000	0.000	0.000
Industrial	Strait of Georgia	BP Cherry Point Refinery	WA0022900B	1,640	0.70	4.35	4.35	4.35
Industrial	Strait of Georgia	ConocoPhillips Ferndale Refinery	WA0002984B	617	2.00	4.67	4.67	4.67
Industrial	Strait of Georgia	Darigold Lynden Plant	WA002470C	818	3.83	11.8	5.92	0.000
Industrial	Strait of Georgia	Intalco Ferndale	WA002950B	1,380	5.00	26.1	13.1	0.000
Industrial	Strait of Georgia	Lehigh Northwest Cement Co	WA0001198B	22.1	7.00	0.586	0.586	0.586
Industrial	Strait of Georgia	Tenaska Cogeneration Plant	WA0031291B	24.7	12.0	1.12	1.12	1.12
Industrial	Strait of Juan de Fuca	Battelle Marine Science Lab	WA0040649	20.8	10.0	0.787	0.394	0.000
Industrial	Strait of Juan de Fuca	Nippon Paper Industries USA Co.-Outfall 1	WA0002925C	3,130	2.50	29.6	29.6	29.6

The precision of the data in this table is only two significant figures.

Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge.

To the extent that individual anaytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.

(a) = See the text for an explanation of "average flow."

(b) = Non-detect results were replaced with the method detection limit or method reporting limit. If no limit was available, non-detect results were replaced with the average of the method limits for other dischargers.

(c) = In most cases, the estimated loading may be an overestimate.

(d) = In most cases, the estimated loading may be an underestimate.

mgy = Million gallons per year.

ug/L = Micrograms per liter.

kg/year = Kilograms per year.

ND = Not detected.

MDL = Method detection limit.

MRL = Method reporting limit.

Table B-2. Estimated Copper Loadings from Municipal Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Municipal	Commencement Bay	Buckley Stp	WA0023361C	222	7.39	6.21	6.21	6.21
Municipal	Commencement Bay	City of Sumner	WA0023353	0.306	15.0	0.0174	0.0174	0.0174
Municipal	Commencement Bay	Enumclaw STP	WA0020575D	618	10.7	25.0	25.0	25.0
Municipal	Commencement Bay	Orting Stp	WA0020303C	204	10.0	7.72	7.72	7.72
Municipal	Commencement Bay	Puyallup Stp	WA0037168D	1,520	8.30	47.8	47.8	47.8
Municipal	Commencement Bay	Sumner Stp	WA0023353C	690	15.0	39.2	39.2	39.2
Municipal	Commencement Bay	Tacoma Central No. 1	WA0037087B	7,190	13.1	357	357	357
Municipal	Commencement Bay	Tacoma North No. 3	WA0037214C	1,650	6.60	41.2	41.2	41.2
Municipal	Main Basin	Bainbridge Island City Wwtp	WA0020907D	196	17.0	12.6	12.6	12.6
Municipal	Main Basin	Edmonds Stp	WA0024058C	2,080	12.0	94.5	94.5	94.5
Municipal	Main Basin	Gig Harbor Stp	WA0023957B	292	6.00	6.63	3.32	0.000
Municipal	Main Basin	Lakota Stp	WA0022624D	1,680	20.0	127	127	127
Municipal	Main Basin	Metro Renton (King Co Renton)	WA0029581D	28,100	14.6	1,550	1,550	1,550
Municipal	Main Basin	Metro West Point (King Co West Point)	WA0029181E	37,400	11.0	1,560	1,560	1,560
Municipal	Main Basin	Midway Sewer District	WA0020958D	1,560	26.0	154	154	154
Municipal	Main Basin	Miller Creek Wwtp	WA0022764D	1,100	1.00	4.16	2.08	0.00
Municipal	Main Basin	North Bend Stp	WA0029351D	170	20.0	12.9	12.9	12.9
Municipal	Main Basin	Redondo Stp	WA0023451D	1,010	44.0	168	168	168
Municipal	Main Basin	Salmon Creek Wwtp	WA0022772E	874	2.00	6.62	6.62	6.62
Municipal	Main Basin	Vashon Stp (King Co-Vashon)	WA0022527E	43	6.10	1.00	1.00	1.00
Municipal	Port Gardner	Duvall Stp	WA0029513C	180	12.0	8.18	8.18	8.18
Municipal	Port Gardner	Everett Stp BA52223	WA0024490C	4,140	7.20	113	113	113
Municipal	Port Gardner	Everett Stp BA52224	WA0024490C	4,620	4.80	84.0	84.0	84.0
Municipal	Port Gardner	Lake Stevens Sewer District	WA0020893D	726	6.77	18.6	18.6	18.6
Municipal	Port Gardner	Marysville Stp	WA0022497C	1,690	2.00	12.8	12.8	12.8
Municipal	Port Gardner	Monroe Stp	WA0020486D	538	7.00	14.3	14.3	14.3
Municipal	Port Gardner	Snohomish Stp	WA0029548C	343	7.00	9.09	9.09	9.09
Municipal	San Juan Islands	Anacortes Wwtp	WA002057E	659	8.00	20.0	20.0	20.0
Municipal	San Juan Islands	Friday Harbor Stp	WA0023582D	116	31.0	13.6	13.6	13.6
Municipal	San Juan Islands	Oak Harbor Stp	WA0020567C	689	12.0	31.3	31.3	31.3
Municipal	Sinclair/Dyes Inlet	Bremerton Stp	WA0029289E	1,840	1.00	6.95	3.47	0.000
Municipal	Sinclair/Dyes Inlet	Kitsap Cnty Central Kitsap	WA0030520E	1,340	8.30	42.1	42.1	42.1
Municipal	Sinclair/Dyes Inlet	Messenger House Care Center	WA0023469D	2	39.0	0.322	0.322	0.322
Municipal	Sinclair/Dyes Inlet	Port Orchard Wwtp	WA0020346C	595	6.20	14.0	14.0	14.0
Municipal	South Sound (east)	Chambers Creek Stp	WA0039624	6,480	22.0	540	540	540
Municipal	South Sound (east)	Rainier State School	WA0037923C	43	41.0	6.67	6.67	6.67
Municipal	South Sound (east)	Shelton Stp	WA0023345C	776	0.020	0.0587	0.0294	0.000
Municipal	South Sound (east)	WA DOC McNeil Island Stp	WA0040002C	83	23.5	7.38	7.38	7.38
Municipal	South Sound (east)	Yelm Stp	WA0040762B	78	13.0	3.82	3.82	3.82

Table B-2. Estimated Copper Loadings from Municipal Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Municipal	South Sound (west)	LOTT	WA0037061	4,020	18.1	275	275	275
Municipal	South Sound (west)	Rustlewood Stp	WA0038075B	9.52	2.00	0.0721	0.0721	0.0721
Municipal	South Sound (west)	Seashore Villa Stp	WA0037273B	86.0	20.0	6.51	6.51	6.51
Municipal	Strait of Georgia	Bellingham Stp	WA0023744D	4,430	98.0	1,640	1,640	1,640
Municipal	Strait of Georgia	Birch Bay Stp	WA0029556C	291	7.00	7.71	7.71	7.71
Municipal	Strait of Georgia	Blaine Stp	WA0022641C	207	26.0	20.4	20.4	20.4
Municipal	Strait of Georgia	Everson Stp	WA0020435D	91.8	5.00	1.74	1.74	1.74
Municipal	Strait of Georgia	Ferndale Stp	WA0022454C	538	33.0	67.2	67.2	67.2
Municipal	Strait of Georgia	Lynden Stp	WA0022578D	382	5.00	7.23	7.23	7.23
Municipal	Whidbey Basin	Arlington Stp	WA0022560E	430	18.0	29.3	29.3	29.3
Municipal	Whidbey Basin	Burlington Wwtp	WA0020150C	569	5.00	10.8	10.8	10.8
Municipal	Whidbey Basin	Granite Falls Stp	WA0021130D	96.3	5.20	1.90	1.90	1.90
Municipal	Whidbey Basin	La Connor Stp	WA0022446C	90.6	20.0	6.86	3.43	0.000
Municipal	Whidbey Basin	Mt Vernon Wwtp	WA0024074D	1,310	5.00	24.8	24.8	24.8
Municipal	Whidbey Basin	Sedro Woolley Stp	WA0023752C	269	11.0	11.2	11.2	11.2

The precision of the data in this table is only two significant figures.

Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge.

To the extent that individual anaytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.

(a) = See the text for an explanation of "average flow."

(b) = Non-detect results were replaced with the method detection limit or method reporting limit. If no limit was available, non-detect results were replaced with the average of the method limits for other dischargers.

(c) = In most cases, the estimated loading may be an overestimate.

(d) = In most cases, the estimated loading may be an underestimate.

mgy = Million gallons per year.

ug/L = Micrograms per liter.

kg/year = Kilograms per year.

ND = Not detected.

MDL = Method detection limit.

MRL = Method reporting limit.

Table B-3. Estimated Lead Loadings from Industrial Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Industrial	Admiralty Inlet	Port Townsend Paper	WA0000922B	4,380	2.00	33.2	16.6	0.000
Industrial	Commencement Bay	Pacific Functional Fluids	WA0038679E	2.02	40.0	0.306	0.153	0.000
Industrial	Commencement Bay	Simpson Tacoma Kraft Co.	WA0000850B	10,100	0.700	26.8	26.8	26.8
Industrial	Commencement Bay	Sonoco - Sumner	WA0000884C	51.5	16.7	3.25	3.25	3.25
Industrial	Commencement Bay	ST Services	WA0039501C	1.96	1.00	0.00742	0.00371	0.000
Industrial	Elliott Bay	ConocoPhillips Renton	WA0001945E	unknown	3.00	Estimate was not possible.		
Industrial	Main Basin	Bp Oil Service Station #11093	WA0031437C	15.8	1.00	0.0597	0.0597	0.0597
Industrial	Main Basin	Paramount Petroleum	WA0003239D	unknown	2.00	Estimate was not possible.		
Industrial	Main Basin	Paramount Petroleum Corp Lust Site	WA0031704B	0.940	1.00	0.00356	0.00356	0.00356
Industrial	Main Basin	SeaTac Airport	WA0024651E	818	1.00	3.10	1.55	0.000
Industrial	Port Gardner	Kimberly-Clark Worldwide, Inc	WA0000621A	10,300	10.5	409	409	409
Industrial	San Juan Islands	Tesoro Refining And Marketing Co	WA0000761C	1,180	1.00	4.47	4.47	4.47
Industrial	South Sound (east)	Ft Lewis Water Pollution Control	WA0021954	2,592	1.00	9.81	9.81	9.81
Industrial	Strait of Georgia	BP Cherry Point Refinery	WA0022900B	1,640	0.500	3.10	1.55	0.000
Industrial	Strait of Georgia	ConocoPhillips Ferndale Refinery	WA0002984B	617	1.50	3.50	3.50	3.50
Industrial	Strait of Georgia	Darigold Lynden Plant	WA002470C	818	1.07	3.30	1.65	0.000
Industrial	Strait of Georgia	Intalco Ferndale	WA002950B	1,380	1.00	5.22	2.61	0.000
Industrial	Strait of Georgia	Lehigh Northwest Cement Co	WA0001198B	22.1	1.07	0.0891	0.0445	0.000
Industrial	Strait of Georgia	Tenaska Cogeneration Plant	WA0031291B	24.7	4.00	0.374	0.374	0.374
Industrial	Strait of Juan de Fuca	Battelle Marine Science Lab	WA0040649	20.8	2.00	0.157	0.0787	0.000
Industrial	Strait of Juan de Fuca	Nippon Paper Industries USA Co.-Outfall 1	WA0002925C	3,130	0.780	9.24	9.24	9.24

The precision of the data in this table is only two significant figures.

Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge.

To the extent that individual anaytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.

(a) = See the text for an explanation of "average flow."

(b) = Non-detect results were replaced with the method detection limit or method reporting limit. If no limit was available, non-detect results were replaced with the average of the method limits for other dischargers.

(c) = In most cases, the estimated loading may be an overestimate.

(d) = In most cases, the estimated loading may be an underestimate.

mgy = Million gallons per year.

ug/L = Micrograms per liter.

kg/year = Kilograms per year.

ND = Not detected.

MDL = Method detection limit.

MRL = Method reporting limit.

Table B-4. Estimated Lead Loadings from Municipal Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Municipal	Commencement Bay	Buckley Stp	WA0023361C	222	150	126	63.0	0.000
Municipal	Commencement Bay	City of Sumner	WA0023353	0.306	2.00	0.00232	0.00232	0.00232
Municipal	Commencement Bay	Enumclaw STP	WA0020575D	618	0.800	1.87	1.87	1.87
Municipal	Commencement Bay	Puyallup Stp	WA0037168D	1,520	0.550	3.16	3.16	3.16
Municipal	Commencement Bay	Sumner Stp	WA0023353C	690	2.00	5.22	5.22	5.22
Municipal	Commencement Bay	Tacoma Central No. 1	WA0037087B	7,190	1.10	29.9	29.9	29.9
Municipal	Commencement Bay	Tacoma North No. 3	WA0037214C	1,650	0.440	2.75	2.75	2.75
Municipal	Main Basin	Bainbridge Island City Wwtp	WA0020907D	196	1.00	0.742	0.371	0.000
Municipal	Main Basin	Edmonds Stp	WA0024058C	2,080	20.0	157	78.7	0.000
Municipal	Main Basin	Gig Harbor Stp	WA0023957B	292	16.2	17.9	8.96	0.000
Municipal	Main Basin	Lakota Stp	WA0022624D	1,680	10.0	63.6	31.8	0.000
Municipal	Main Basin	Metro Renton (King Co Renton)	WA0029581D	28,100	0.460	48.9	48.9	48.9
Municipal	Main Basin	Metro West Point (King Co West Point)	WA0029181E	37,400	0.720	102	102	102
Municipal	Main Basin	Midway Sewer District	WA0020958D	1,560	1.00	5.90	5.90	5.90
Municipal	Main Basin	Miller Creek Wwtp	WA0022764D	1,100	3.00	12.5	12.5	12.5
Municipal	Main Basin	North Bend Stp	WA0029351D	170	1.00	0.643	0.322	0.000
Municipal	Main Basin	Redondo Stp	WA0023451D	1,010	10.0	38.2	19.1	0.000
Municipal	Main Basin	Salmon Creek Wwtp	WA0022772E	874	2.00	6.62	6.62	6.62
Municipal	Main Basin	Vashon Stp (King Co-Vashon)	WA0022527E	43.2	0.290	0.0474	0.0474	0.0474
Municipal	Port Gardner	Everett Stp BA52223	WA0024490C	4,140	3.20	50.2	50.2	50.2
Municipal	Port Gardner	Everett Stp BA52224	WA0024490C	4,620	1.80	31.5	31.5	31.5
Municipal	Port Gardner	Lake Stevens Sewer District	WA0020893D	726	1.00	2.75	1.37	0.000
Municipal	Port Gardner	Marysville Stp	WA0022497C	1,690	20.0	128	63.9	0.000
Municipal	Port Gardner	Monroe Stp	WA0020486D	538	1.00	2.04	1.02	0.000
Municipal	Port Gardner	Snohomish Stp	WA0029548C	343	4.00	5.19	2.60	0.000
Municipal	San Juan Islands	Anacortes Wwtp	WA002057E	659	1.00	2.49	1.25	0.000
Municipal	San Juan Islands	Friday Harbor Stp	WA0023582D	116	1.00	0.439	0.220	0.000
Municipal	San Juan Islands	Oak Harbor Stp	WA0020567C	689	1.00	2.61	1.30	0.000
Municipal	Sinclair/Dyes Inlet	Bremerton Stp	WA0029289E	1,840	1.00	6.95	3.47	0.000
Municipal	Sinclair/Dyes Inlet	Kitsap Cnty Central Kitsap	WA0030520E	1,340	5.60	28.4	28.4	28.4
Municipal	Sinclair/Dyes Inlet	Messenger House Care Center	WA0023469D	2.18	4.00	0.0330	0.0165	0.000
Municipal	Sinclair/Dyes Inlet	Port Orchard Wwtp	WA0020346C	595	150	338	169	0.000
Municipal	South Sound (east)	Chambers Creek Stp	WA0039624	6,480	6.00	147	147	147
Municipal	South Sound (east)	Shelton Stp	WA0023345C	776	0.002	0.00587	0.00294	0.000
Municipal	South Sound (east)	WA DOC McNeil Island Stp	WA0040002C	83.0	1.27	0.399	0.399	0.399
Municipal	South Sound (east)	Yelm Stp	WA0040762B	77.7	1.00	0.294	0.294	0.294
Municipal	South Sound (west)	LOTT	WA0037061	4,020	0.483	7.35	7.35	7.35
Municipal	South Sound (west)	Rustlewood Stp	WA0038075B	9.52	50.0	1.80	1.80	1.80

Table B-4. Estimated Lead Loadings from Municipal Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Municipal	Strait of Georgia	Bellingham Stp	WA0023744D	4,430	5.00	83.8	83.8	83.8
Municipal	Strait of Georgia	Birch Bay Stp	WA0029556C	291	1.00	1.10	1.10	1.10
Municipal	Strait of Georgia	Blaine Stp	WA0022641C	207	16.2	12.7	6.35	0.000
Municipal	Strait of Georgia	Everson Stp	WA0020435D	91.8	1.00	0.347	0.347	0.347
Municipal	Strait of Georgia	Ferndale Stp	WA0022454C	538	9.50	19.3	19.3	19.3
Municipal	Strait of Georgia	Lynden Stp	WA0022578D	382	16.2	23.5	11.7	0.000
Municipal	Whidbey Basin	Arlington Stp	WA0022560E	430	1.00	1.63	0.814	0.000
Municipal	Whidbey Basin	Burlington Wwtp	WA0020150C	569	2.00	4.31	4.31	4.31
Municipal	Whidbey Basin	La Connor Stp	WA0022446C	90.6	1.00	0.343	0.171	0.000
Municipal	Whidbey Basin	Mt Vernon Wwtp	WA0024074D	1,310	1.00	4.96	2.48	0.000
Municipal	Whidbey Basin	Sedro Woolley Stp	WA0023752C	269	1.00	1.02	1.02	1.02

The precision of the data in this table is only two significant figures.

Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge.

To the extent that individual anaytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.

(a) = See the text for an explanation of "average flow."

(b) = Non-detect results were replaced with the method detection limit or method reporting limit. If no limit was available, non-detect results were replaced with the average of the method limits for other dischargers.

(c) = In most cases, the estimated loading may be an overestimate.

(d) = In most cases, the estimated loading may be an underestimate.

mgy = Million gallons per year.

ug/L = Micrograms per liter.

kg/year = Kilograms per year.

ND = Not detected.

MDL = Method detection limit.

MRL = Method reporting limit.

Table B-5. Estimated Mercury Loadings from Industrial Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Industrial	Admiralty Inlet	Port Townsend Paper	WA0000922B	4,380	0.00470	0.0779	0.0779	0.0779
Industrial	Commencement Bay	Graymont Western Us Inc	WA0001007D	19.2	0.331	0.0241	0.0241	0.0241
Industrial	Commencement Bay	Simpson Tacoma Kraft Co.	WA0000850B	10,100	0.0113	0.432	0.432	0.432
Industrial	Commencement Bay	Sonoco - Sumner	WA0000884C	51.5	0.0164	0.00319	0.00319	0.00319
Industrial	Commencement Bay	US Oil & Refining Co.	WA001783B	157	0.0256	0.0152	0.0152	0.0152
Industrial	Elliott Bay	Seattle Steam	WA0001503D	18.3	0.0329	0.00227	0.00227	0.00227
Industrial	Port Gardner	Kimberly-Clark Worldwide, Inc	WA0000621A	10,300	0.139	5.42	5.42	5.42
Industrial	San Juan Islands	Shell Oil Products US	WA002941B	1,450	0.00953	0.0523	0.0523	0.0523
Industrial	San Juan Islands	Tesoro Refining And Marketing Co	WA0000761C	1,180	0.139	0.621	0.621	0.621
Industrial	Strait of Georgia	BP Cherry Point Refinery	WA0022900B	1,640	0.0293	0.182	0.182	0.182
Industrial	Strait of Georgia	ConocoPhillips Ferndale Refinery	WA0002984B	617	0.0291	0.0680	0.0680	0.0680
Industrial	Strait of Georgia	Tenaska Cogeneration Plant	WA0031291B	24.7	0.00150	0.000140	0.000140	0.000140
Industrial	Strait of Juan de Fuca	K Ply Inc	WA0038059C	unknown	0.00309	Estimate was not possible.		
Industrial	Strait of Juan de Fuca	Nippon Paper Industries USA Co.-Outfall 1	WA0002925C	3,130	0.00780	0.0924	0.0924	0.0924

The precision of the data in this table is only two significant figures.

Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge.

To the extent that individual anaytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.

(a) = See the text for an explanation of "average flow."

(b) = Non-detect results were replaced with the method detection limit or method reporting limit. If no limit was available, non-detect results were replaced with the average of the method limits for other dischargers.

(c) = In most cases, the estimated loading may be an overestimate.

(d) = In most cases, the estimated loading may be an underestimate.

mgy = Million gallons per year.

ug/L = Micrograms per liter.

kg/year = Kilograms per year.

ND = Not detected.

MDL = Method detection limit.

MRL = Method reporting limit.

Table B-6. Estimated Mercury Loadings from Municipal Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Municipal	Commencement Bay	Buckley Stp	WA0023361C	222	0.00090	0.000756	0.000756	0.000756
Municipal	Commencement Bay	Enumclaw STP	WA0020575D	618	0.0198	0.0463	0.0463	0.0463
Municipal	Commencement Bay	Puyallup Stp	WA0037168D	1,520	0.00350	0.0201	0.0201	0.0201
Municipal	Commencement Bay	Sumner Stp	WA0023353C	690	0.00594	0.0155	0.0155	0.0155
Municipal	Main Basin	Alderwood Stp	WA0020826D	787	0.00618	0.0184	0.0184	0.0184
Municipal	Main Basin	Bainbridge Island City Wwtp	WA0020907D	196	0.00180	0.00134	0.00134	0.00134
Municipal	Main Basin	Edmonds Stp	WA0024058C	2,080	0.0162	0.128	0.128	0.128
Municipal	Main Basin	Gig Harbor Stp	WA0023957B	unknown	0.0255	Estimate was not possible.		
Municipal	Main Basin	Lakota Stp	WA0022624D	1,680	0.0098	0.0621	0.0621	0.0621
Municipal	Main Basin	Lynnwood Stp	WA0024031E	1,560	0.0147	0.0868	0.0868	0.0868
Municipal	Main Basin	Midway Sewer District	WA0020958D	1,560	0.0144	0.0850	0.0850	0.0850
Municipal	Main Basin	Miller Creek Wwtp	WA0022764D	1,100	0.00331	0.0138	0.0138	0.0138
Municipal	Main Basin	Redondo Stp	WA0023451D	1,010	0.0154	0.0589	0.0589	0.0589
Municipal	Main Basin	Salmon Creek Wwtp	WA0022772E	874	0.00104	0.00344	0.00344	0.00344
Municipal	Port Gardner	Lake Stevens Sewer District	WA0020893D	726	0.0125	0.0344	0.0344	0.0344
Municipal	Port Gardner	Marysville Stp	WA0022497C	unknown	0.00142	Estimate was not possible.		
Municipal	Port Gardner	Monroe Stp	WA0020486D	538	0.00319	0.0065	0.0065	0.0065
Municipal	Port Gardner	Snohomish Stp	WA0029548C	343	0.0117	0.0152	0.0152	0.0152
Municipal	San Juan Islands	Anacortes Wwtp	WA002057E	659	0.00782	0.0195	0.0195	0.0195
Municipal	Sinclair/Dyes Inlet	Kitsap Cnty Central Kitsap	WA0030520E	1,340	0.00251	0.0127	0.0127	0.0127
Municipal	South Sound (west)	LOTT	WA0037061	4,020	0.00170	0.0259	0.0259	0.0259
Municipal	Strait of Georgia	Bellingham Stp	WA0023744D	4,430	0.0107	0.179	0.179	0.179
Municipal	Strait of Georgia	Birch Bay Stp	WA0029556C	291	0.00130	0.00143	0.00143	0.00143
Municipal	Strait of Georgia	Lynden Stp	WA0022578D	382	0.00123	0.00178	0.00178	0.00178
Municipal	Strait of Juan de Fuca	Port Angeles Stp	WA0023973C	907	0.0509	0.175	0.175	0.175
Municipal	Strait of Juan de Fuca	Sequim Stp	WA0022349C	171	0.0000030	0.00000194	0.00000194	0.00000194
Municipal	Whidbey Basin	Burlington Wwtp	WA0020150C	569	0.00050	0.00108	0.00108	0.00108
Municipal	Whidbey Basin	Mt Vernon Wwtp	WA0024074D	1,310	0.00228	0.0113	0.0113	0.0113
Municipal	Whidbey Basin	Stanwood Stp	WA0020290E	174	0.00210	0.00138	0.00138	0.00138

The precision of the data in this table is only two significant figures.

Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge.

To the extent that individual anaytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.

(a) = See the text for an explanation of "average flow."

(b) = Non-detect results were replaced with the method detection limit or method reporting limit. If no limit was available, non-detect results were replaced with the average of the method limits for other dischargers.

(c) = In most cases, the estimated loading may be an overestimate.

(d) = In most cases, the estimated loading may be an underestimate.

mgy = Million gallons per year.

ug/L = Micrograms per liter.

kg/year = Kilograms per year.

ND = Not detected.

MDL = Method detection limit.

MRL = Method reporting limit.

Table B-7. Estimated Zinc Loadings from Industrial Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Industrial	Admiralty Inlet	Port Townsend Paper	WA0000922B	4,380	10.0	166	166	166
Industrial	Commencement Bay	Occidental Chemical Corp	WA0037265E	682	24.0	62.0	31.0	0.000
Industrial	Commencement Bay	Pacific Functional Fluids	WA0038679E	2.02	260	1.99	1.99	1.99
Industrial	Commencement Bay	Simpson Tacoma Kraft Co.	WA0000850B	10,100	37.0	1,410	1,410	1,410
Industrial	Commencement Bay	Sonoco - Sumner	WA0000884C	51.5	192	37.4	37.4	37.4
Industrial	Commencement Bay	Sound Refining Tacoma	WA0003204B	unknown	41.0	Estimate was not possible		
Industrial	Commencement Bay	ST Services	WA0039501C	1.96	27.0	0.200	0.200	0.200
Industrial	Elliott Bay	Pacific Coast Coal Co	WA0030830B	unknown	3.00	Estimate was not possible		
Industrial	Main Basin	Paramount Petroleum	WA0003239D	unknown	56.0	Estimate was not possible		
Industrial	Main Basin	Paramount Petroleum	WA0003239D	unknown	65.0	Estimate was not possible		
Industrial	Main Basin	SeaTac Airport	WA0024651E	818	32.0	99.1	99.1	99.1
Industrial	Port Gardner	Kimberly-Clark Worldwide, Inc	WA0000621A	10,300	50.9	1,980	1,980	1,980
Industrial	San Juan Islands	Tesoro Refining And Marketing Co	WA0000761C	1,180	50.0	223	223	223
Industrial	Sinclair/Dyes Inlet	Fleet & Industrial Supply Center	WA0002780	14.6	100	5.53	5.53	5.53
Industrial	South Sound (east)	Ft Lewis Water Pollution Control	WA0021954	2,590	60.0	589	589	589
Industrial	Strait of Georgia	BP Cherry Point Refinery	WA0022900B	1,640	21.8	135	135	135
Industrial	Strait of Georgia	ConocoPhillips Ferndale Refinery	WA0002984B	617	61.0	142	142	142
Industrial	Strait of Georgia	Darigold Lynden Plant	WA002470C	818	9.75	30.2	15.1	0.000
Industrial	Strait of Georgia	Intalco Ferndale	WA002950B	1,380	66.0	345	345	345
Industrial	Strait of Georgia	Tenaska Cogeneration Plant	WA0031291B	24.7	66.0	6.17	6.17	6.17
Industrial	Strait of Juan de Fuca	Battelle Marine Science Lab	WA0040649	20.8	10.0	0.787	0.394	0.000
Industrial	Strait of Juan de Fuca	Nippon Paper Industries USA Co.-Outfall 1	WA0002925C	3,130	17.0	201	201	201

The precision of the data in this table is only two significant figures.
Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge.
To the extent that individual anaytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.
(a) = See the text for an explanation of "average flow."
(b) = Non-detect results were replaced with the method detection limit or method reporting limit. If no limit was available, non-detect results were replaced with the average of the method limits for other dischargers.
(c) = In most cases, the estimated loading may be an overestimate.
(d) = In most cases, the estimated loading may be an underestimate.

mgy = Million gallons per year.
ug/L = Micrograms per liter.
kg/year = Kilograms per year.
ND = Not detected.
MDL = Method detection limit.
MRL = Method reporting limit.

Table B-8. Estimated Zinc Loadings from Municipal Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Municipal	Commencement Bay	Buckley Stp	WA0023361C	222	52.7	44.3	44.3	44.3
Municipal	Commencement Bay	City of Sumner	WA0023353	0.306	62.0	0.0718	0.0718	0.0718
Municipal	Commencement Bay	Enumclaw STP	WA0020575D	618	31.3	73.2	73.2	73.2
Municipal	Commencement Bay	Puyallup Stp	WA0037168D	1,520	43.3	249	249	249
Municipal	Commencement Bay	Sumner Stp	WA0023353C	690	62.0	162	162	162
Municipal	Commencement Bay	Tacoma Central No. 1	WA0037087B	7,190	49.2	1,340	1,340	1,340
Municipal	Commencement Bay	Tacoma North No. 3	WA0037214C	1,650	19.0	119	119	119
Municipal	Main Basin	Bainbridge Island City Wwtp	WA0020907D	196	11.0	8.16	8.16	8.16
Municipal	Main Basin	Edmonds Stp	WA0024058C	2,080	60.0	472	472	472
Municipal	Main Basin	Gig Harbor Stp	WA0023957B	292	52.0	57.5	57.5	57.5
Municipal	Main Basin	Lakota Stp	WA0022624D	1,680	25.0	159	159	159
Municipal	Main Basin	Metro Renton (King Co Renton)	WA0029581D	28,100	31.2	3,320	3,320	3,320
Municipal	Main Basin	Metro West Point (King Co West Point)	WA0029181E	37,400	28.3	4,010	4,010	4,010
Municipal	Main Basin	Midway Sewer District	WA0020958D	1,560	70.0	413	413	413
Municipal	Main Basin	Miller Creek Wwtp	WA0022764D	1,100	8.00	33.3	33.3	33.3
Municipal	Main Basin	North Bend Stp	WA0029351D	170	37.0	23.8	23.8	23.8
Municipal	Main Basin	Redondo Stp	WA0023451D	1,010	62.0	237	237	237
Municipal	Main Basin	Salmon Creek Wwtp	WA0022772E	874	22.0	72.8	72.8	72.8
Municipal	Main Basin	Vashon Stp (King Co-Vashon)	WA0022527E	43.2	27.7	4.53	4.53	4.53
Municipal	Port Gardner	Duvall Stp	WA0029513C	180	47.0	32.0	32.0	32.0
Municipal	Port Gardner	Everett Stp BA52223	WA0024490C	4,140	17.0	266	266	266
Municipal	Port Gardner	Everett Stp BA52224	WA0024490C	4,620	20.0	350	350	350
Municipal	Port Gardner	Lake Stevens Sewer District	WA0020893D	726	45.1	124	124	124
Municipal	Port Gardner	Marysville Stp	WA0022497C	1,690	15.0	95.8	95.8	95.8
Municipal	Port Gardner	Monroe Stp	WA0020486D	538	56.0	114	114	114
Municipal	Port Gardner	Snohomish Stp	WA0029548C	343	14.0	18.2	18.2	18.2
Municipal	San Juan Islands	Anacortes Wwtp	WA002057E	659	28.0	69.8	69.8	69.8
Municipal	San Juan Islands	Friday Harbor Stp	WA0023582D	116	56.0	24.6	24.6	24.6
Municipal	San Juan Islands	Oak Harbor Stp	WA0020567C	689	25.0	65.2	65.2	65.2
Municipal	Sinclair/Dyes Inlet	Bremerton Stp	WA0029289E	1,840	19.5	135	135	135
Municipal	Sinclair/Dyes Inlet	Kitsap Cnty Central Kitsap	WA0030520E	1,340	36.1	183	183	183
Municipal	Sinclair/Dyes Inlet	Messenger House Care Center	WA0023469D	2.18	121	1.00	1.00	1.00
Municipal	Sinclair/Dyes Inlet	Port Orchard Wwtp	WA0020346C	595	353	795	795	795
Municipal	South Sound (east)	Chambers Creek Stp	WA0039624	6,480	83.0	2,040	2,040	2,040
Municipal	South Sound (east)	Rainier State School	WA0037923C	43.0	58.0	9.44	9.44	9.44
Municipal	South Sound (east)	Shelton Stp	WA0023345C	776	0.070	0.206	0.206	0.206
Municipal	South Sound (east)	WA DOC McNeil Island Stp	WA0040002C	83.0	196	61.6	61.6	61.6
Municipal	South Sound (east)	Yelm Stp	WA0040762B	77.7	42.0	12.4	12.4	12.4
Municipal	South Sound (west)	LOTT	WA0037061	4,020	91.7	1,400	1,400	1,400
Municipal	South Sound (west)	Rustlewood Stp	WA0038075B	9.52	2.00	0.0721	0.0721	0.0721

Table B-8. Estimated Zinc Loadings from Municipal Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Municipal	Strait of Georgia	Bellingham Stp	WA0023744D	4,430	276	4,628	4,628	4,628
Municipal	Strait of Georgia	Birch Bay Stp	WA0029556C	291	38.0	41.9	41.9	41.9
Municipal	Strait of Georgia	Blaine Stp	WA0022641C	207	98.0	76.8	76.8	76.8
Municipal	Strait of Georgia	Everson Stp	WA0020435D	91.8	8.91	3.10	1.55	0.00
Municipal	Strait of Georgia	Ferndale Stp	WA0022454C	538	55.0	112	112	112
Municipal	Strait of Georgia	Lynden Stp	WA0022578D	382	47.0	68.0	68.0	68.0
Municipal	Whidbey Basin	Arlington Stp	WA0022560E	430	76.0	124	124	124
Municipal	Whidbey Basin	Burlington Wwtp	WA0020150C	569	85.0	183	183	183
Municipal	Whidbey Basin	Granite Falls Stp	WA0021130D	96.3	46.8	17.1	17.1	17.1
Municipal	Whidbey Basin	La Connor Stp	WA0022446C	90.6	48.0	16.5	16.5	16.5
Municipal	Whidbey Basin	Mt Vernon Wwtp	WA0024074D	1,310	35.0	174	174	174
Municipal	Whidbey Basin	Sedro Woolley Stp	WA0023752C	269	71.0	72.3	72.3	72.3

The precision of the data in this table is only two significant figures.

Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge.

To the extent that individual anaytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.

(a) = See the text for an explanation of "average flow."

(b) = Non-detect results were replaced with the method detection limit or method reporting limit. If no limit was available, non-detect results were replaced with the average of the method limits for other dischargers.

(c) = In most cases, the estimated loading may be an overestimate.

(d) = In most cases, the estimated loading may be an underestimate.

mgy = Million gallons per year.

ug/L = Micrograms per liter.

kg/year = Kilograms per year.

ND = Not detected.

MDL = Method detection limit.

MRL = Method reporting limit.

Table B-9. Estimated *bis* (2-Ethylhexyl)phthalate Loadings from Industrial Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Industrial	Admiralty Inlet	Port Townsend Paper	WA0000922B	4,380	10.0	166	82.9	0.000
Industrial	Commencement Bay	Pacific Functional Fluids	WA0038679E	2.02	10.0	0.0766	0.0383	0.000
Industrial	Commencement Bay	Simpson Tacoma Kraft Co.	WA0000850B	10,100	9.40	359	180	0.000
Industrial	Commencement Bay	Sonoco - Sumner	WA0000884C	51.5	6.0	1.17	1.17	1.17
Industrial	Main Basin	SeaTac Airport	WA0024651E	818	1.0	3.10	1.55	0.000
Industrial	Port Gardner	Kimberly-Clark Worldwide, Inc	WA0000621A	10,300	9.60	374	187	0.000
Industrial	San Juan Islands	Tesoro Refining And Marketing Co	WA0000761C	1,180	1.70	7.59	7.59	7.59
Industrial	Strait of Georgia	BP Cherry Point Refinery	WA0022900B	1,640	3.0	18.6	9.31	0.000
Industrial	Strait of Georgia	ConocoPhillips Ferndale Refinery	WA0002984B	617	21.0	49.0	24.5	0.000
Industrial	Strait of Georgia	Intalco Ferndale	WA002950B	1,380	140 (e)	731	731	731
Industrial	Strait of Georgia	Tenaska Cogeneration Plant	WA0031291B	24.7	5.25	0.491	0.245	0.000
Industrial	Strait of Juan de Fuca	Nippon Paper Industries USA Co.-Outfall 1	WA0002925C	3,130	5.25	62.2	31.1	0.000

The precision of the data in this table is only two significant figures.

Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge.

To the extent that individual anaytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.

(a) = See the text for an explanation of "average flow."

(b) = Non-detect results were replaced with the method detection limit or method reporting limit. If no limit was available, non-detect results were replaced with the average of the method limits for other dischargers.

(c) = In most cases, the estimated loading may be an overestimate.

(d) = In most cases, the estimated loading may be an underestimate.

(e) = Qualified value.

mgy = Million gallons per year.

kg/year = Kilograms per year.

MDL = Method detection limit.

ug/L = Micrograms per liter.

ND = Not detected.

MRL = Method reporting limit.

Table B-10. Estimated *bis* (2-Ethylhexyl)phthalate Loadings from Municipal Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Municipal	Commencement Bay	Buckley Stp	WA0023361C	222	29.7	25.0	25.0	25.0
Municipal	Commencement Bay	Puyallup Stp	WA0037168D	1,520	5.60	32.2	32.2	32.2
Municipal	Main Basin	Bainbridge Island City Wwtp	WA0020907D	196	72.0	53.4	53.4	53.4
Municipal	Main Basin	Edmonds Stp	WA0024058C	2,080	1.60	12.6	12.6	12.6
Municipal	Main Basin	Gig Harbor Stp	WA0023957B	292	10.0	11.1	5.53	0.000
Municipal	Main Basin	Metro Renton (King Co Renton)	WA0029581D	28,100	1.25	133	133	133
Municipal	Main Basin	Metro West Point (King Co West Point)	WA0029181E	37,400	1.17	166	166	166
Municipal	Main Basin	Midway Sewer District	WA0020958D	1,560	4.80	28.3	28.3	28.3
Municipal	Main Basin	Miller Creek Wwtp	WA0022764D	1,100	2.60	10.8	10.8	10.8
Municipal	Main Basin	North Bend Stp	WA0029351D	170	2.00	1.29	0.64	0.000
Municipal	Main Basin	Redondo Stp	WA0023451D	1,010	24.0	91.7	91.7	91.7
Municipal	Main Basin	Salmon Creek Wwtp	WA0022772E	874	2.00	6.62	3.31	0.000
Municipal	Main Basin	Vashon Stp (King Co-Vashon)	WA0022527E	43.2	1.51	0.247	0.247	0.247
Municipal	Port Gardner	Everett Stp BA52223	WA0024490C	4,140	6.80	107	107	107
Municipal	Port Gardner	Everett Stp BA52224	WA0024490C	4,620	2.00	35.0	35.0	35.0
Municipal	Port Gardner	Lake Stevens Sewer District	WA0020893D	726	50.0	137	68.7	0.000
Municipal	Port Gardner	Marysville Stp	WA0022497C	1,690	12.0	76.7	76.7	76.7
Municipal	Port Gardner	Monroe Stp	WA0020486D	538	2.00	4.07	2.04	0.000
Municipal	Port Gardner	Snohomish Stp	WA0029548C	343	37.0	48.0	48.0	48.0
Municipal	Port Gardner	Snoqualmie Wwtp	WA0022403C	260	1.00	0.984	0.492	0.000
Municipal	San Juan Islands	Anacortes Wwtp	WA002057E	659	1.70	4.24	4.24	4.24
Municipal	San Juan Islands	Oak Harbor Stp	WA0020567C	689	0.20	0.522	0.261	0.000
Municipal	Sinclair/Dyes Inlet	Bremerton Stp	WA0029289E	1,840	11.0	76.4	76.4	76.4
Municipal	Sinclair/Dyes Inlet	Kitsap Cnty Central Kitsap	WA0030520E	1,340	6.50	33.0	16.5	0.000
Municipal	South Sound (east)	Chambers Creek Stp	WA0039624	6,480	14.6	358	358	358
Municipal	South Sound (west)	LOTT	WA0037061	4,020	43.0	654	654	654
Municipal	Strait of Georgia	Bellingham Stp	WA0023744D	4,430	28.9	485	485	485
Municipal	Strait of Georgia	Blaine Stp	WA0022641C	207	3.40	2.66	2.66	2.66
Municipal	Strait of Georgia	Everson Stp	WA0020435D	91.8	0.10	0.0347	0.0347	0.0347
Municipal	Strait of Georgia	Ferndale Stp	WA0022454C	538	4.50	9.16	9.16	9.16
Municipal	Strait of Georgia	Lynden Stp	WA0022578D	382	4.50	6.51	6.51	6.51
Municipal	Strait of Juan de Fuca	Port Angeles Stp	WA0023973C	907	4.00	13.7	6.87	0.000
Municipal	Whidbey Basin	Arlington Stp	WA0022560E	430	2.00	3.26	1.63	0.000
Municipal	Whidbey Basin	Mt Vernon Wwtp	WA0024074D	1,310	2.10	10.4	10.4	10.4
Municipal	Whidbey Basin	Sedro Woolley Stp	WA0023752C	269	2.00	2.04	2.04	2.04

The precision of the data in this table is only two significant figures.

Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge.

To the extent that individual anaytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.

(a) = See the text for an explanation of "average flow."

(b) = Non-detect results were replaced with the method detection limit or method reporting limit. If no limit was available, non-detect results were replaced with the average of the method limits for other dischargers.

(c) = In most cases, the estimated loading may be an overestimate.

(d) = In most cases, the estimated loading may be an underestimate.

mgy = Million gallons per year.

ug/L = Micrograms per liter.

kg/year = Kilograms per year.

ND = Not detected.

MDL = Method detection limit.

MRL = Method reporting limit.

Table B-11. Estimated Chloroform Loadings from Industrial Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Industrial	Admiralty Inlet	Port Townsend Paper	WA0000922B	4,380	5.00	82.9	41.4	0.000
Industrial	Commencement Bay	Occidental Chemical Corp	WA0037265E	682	1.00	2.58	1.29	0.000
Industrial	Commencement Bay	Pacific Functional Fluids	WA0038679E	2.02	1.00	0.00766	0.00383	0.000
Industrial	Commencement Bay	Simpson Tacoma Kraft Co.	WA0000850B	10,100	5.80	222	222	222
Industrial	Commencement Bay	Sonoco - Sumner	WA0000884C	51.5	30.0	5.84	2.92	0.000
Industrial	Main Basin	SeaTac Airport	WA0024651E	818	0.20	0.619	0.310	0.000
Industrial	Port Gardner	Kimberly-Clark Worldwide, Inc	WA0000621A	10,300	10.0	390	390	390
Industrial	San Juan Islands	Tesoro Refining And Marketing Co	WA0000761C	1,180	1.80	8.04	8.04	8.04
Industrial	Strait of Georgia	BP Cherry Point Refinery	WA0022900B	1,640	2.00	12.4	6.21	0.000
Industrial	Strait of Georgia	ConocoPhillips Ferndale Refinery	WA0002984B	617	0.50	1.17	0.584	0.000
Industrial	Strait of Georgia	Intalco Ferndale	WA002950B	1,380	0.050	0.261	0.131	0.000
Industrial	Strait of Georgia	Tenaska Cogeneration Plant	WA0031291B	24.7	1.49	0.139	0.0695	0.000
Industrial	Strait of Juan de Fuca	Nippon Paper Industries USA Co.-Outfall 1	WA0002925C	3,130	1.49	17.6	8.81	0.000

The precision of the data in this table is only two significant figures.

Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge.

To the extent that individual anaytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.

(a) = See the text for an explanation of "average flow."

(b) = Non-detect results were replaced with the method detection limit or method reporting limit. If no limit was available, non-detect results were replaced with the average of the method limits for other dischargers.

(c) = In most cases, the estimated loading may be an overestimate.

(d) = In most cases, the estimated loading may be an underestimate.

mgy = Million gallons per year.

ug/L = Micrograms per liter.

kg/year = Kilograms per year.

ND = Not detected.

MDL = Method detection limit.

MRL = Method reporting limit.

Table B-12. Estimated Chloroform Loadings from Municipal Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Municipal	Commencement Bay	Buckley Stp	WA0023361C	222	3.37	2.83	2.83	2.83
Municipal	Commencement Bay	Puyallup Stp	WA0037168D	1,520	1.00	5.75	2.88	0.000
Municipal	Main Basin	Bainbridge Island City Wwtp	WA0020907D	196	1.00	0.742	0.371	0.000
Municipal	Main Basin	Edmonds Stp	WA0024058C	2,080	1.40	11.0	11.0	11.0
Municipal	Main Basin	Gig Harbor Stp	WA0023957B	292	1.00	1.11	0.553	0.000
Municipal	Main Basin	Midway Sewer District	WA0020958D	1,560	1.00	5.90	2.95	0.000
Municipal	Main Basin	Miller Creek Wwtp	WA0022764D	1,100	1.00	4.16	2.08	0.000
Municipal	Main Basin	North Bend Stp	WA0029351D	170	1.00	0.643	0.322	0.000
Municipal	Main Basin	Redondo Stp	WA0023451D	1,010	1.00	3.82	1.91	0.000
Municipal	Main Basin	Salmon Creek Wwtp	WA0022772E	874	1.00	3.31	1.65	0.000
Municipal	Main Basin	Vashon Stp (King Co-Vashon)	WA0022527E	43.2	2.00	0.327	0.164	0.000
Municipal	Port Gardner	Everett Stp BA52223	WA0024490C	4,140	1.00	15.7	7.84	0.000
Municipal	Port Gardner	Everett Stp BA52224	WA0024490C	4,620	1.00	17.5	8.75	0.000
Municipal	Port Gardner	Lake Stevens Sewer District	WA0020893D	726	1.00	2.75	1.37	0.000
Municipal	Port Gardner	Marysville Stp	WA0022497C	1,690	1.00	6.39	3.19	0.000
Municipal	Port Gardner	Monroe Stp	WA0020486D	538	1.00	2.04	1.02	0.000
Municipal	Port Gardner	Snohomish Stp	WA0029548C	343	1.00	1.30	0.649	0.000
Municipal	Port Gardner	Snoqualmie Wwtp	WA0022403C	260	1.00	0.984	0.492	0.000
Municipal	San Juan Islands	Anacortes Wwtp	WA002057E	659	2.70	6.73	6.73	6.73
Municipal	San Juan Islands	Friday Harbor Stp	WA0023582D	116	1.50	0.659	0.659	0.659
Municipal	San Juan Islands	Oak Harbor Stp	WA0020567C	689	1.00	2.61	2.61	2.61
Municipal	Sinclair/Dyes Inlet	Bremerton Stp	WA0029289E	1,840	4.50	31.3	31.3	31.3
Municipal	Sinclair/Dyes Inlet	Kitsap Cnty Central Kitsap	WA0030520E	1,340	1.50	7.61	3.80	0.000
Municipal	South Sound (east)	Chambers Creek Stp	WA0039624	6,480	1.00	24.5	12.3	0.000
Municipal	South Sound (east)	Shelton Stp	WA0023345C	776	1.30	3.82	3.82	3.82
Municipal	South Sound (east)	WA DOC McNeil Island Stp	WA0040002C	83.0	1.00	0.314	0.157	0.000
Municipal	South Sound (west)	LOTT	WA0037061	4,020	4.20	63.9	63.9	63.9
Municipal	Strait of Georgia	Bellingham Stp	WA0023744D	4,430	4.80	80.5	80.5	80.5
Municipal	Strait of Georgia	Birch Bay Stp	WA0029556C	291	1.45	1.60	0.800	0.000
Municipal	Strait of Georgia	Blaine Stp	WA0022641C	207	1.20	0.940	0.940	0.940
Municipal	Strait of Georgia	Everson Stp	WA0020435D	91.8	15.0	5.21	5.21	5.21
Municipal	Strait of Georgia	Ferndale Stp	WA0022454C	538	1.45	2.96	1.48	0.000
Municipal	Strait of Georgia	Lynden Stp	WA0022578D	382	1.45	2.10	1.05	0.000
Municipal	Strait of Juan de Fuca	Port Angeles Stp	WA0023973C	907	2.10	7.21	7.21	7.21
Municipal	Whidbey Basin	Arlington Stp	WA0022560E	430	1.00	1.63	0.814	0.000
Municipal	Whidbey Basin	Mt Vernon Wwtp	WA0024074D	1,310	1.10	5.45	5.45	5.45
Municipal	Whidbey Basin	Sedro Woolley Stp	WA0023752C	269	0.40	0.407	0.204	0.000

The precision of the data in this table is only two significant figures.
Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge.
To the extent that individual anaytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.

(a) = See the text for an explanation of "average flow."
(b) = Non-detect results were replaced with the method detection limit or method reporting limit. If no limit was available, non-detect results were replaced with the average of the method limits for other dischargers.
(c) = In most cases, the estimated loading may be an overestimate.
(d) = In most cases, the estimated loading may be an underestimate.

mgy = Million gallons per year.
ug/L = Micrograms per liter.
kg/year = Kilograms per year.
ND = Not detected.
MDL = Method detection limit.
MRL = Method reporting limit.

Table B-13. Estimated Total Phenolics Loadings from Industrial Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Industrial	Admiralty Inlet	Port Townsend Paper	WA0000922B	4,380	150	2,490	2,490	2,490
Industrial	Commencement Bay	Simpson Tacoma Kraft Co.	WA0000850B	10,100	30.0	1,150	1,150	1,150
Industrial	Commencement Bay	Sonoco - Sumner	WA0000884C	51.5	17.0	3.31	3.31	3.31
Industrial	Main Basin	Paramount Petroleum	WA0003239D	unknown	0.010	Estimate was not possible.		
Industrial	San Juan Islands	Shell Oil Products US	WA002941B	1,450	0.56	3.07	3.07	3.07
Industrial	San Juan Islands	Tesoro Refining And Marketing Co	WA0000761C	1,180	0.05	0.223	0.112	0.000
Industrial	Strait of Georgia	BP Cherry Point Refinery	WA0022900B	1,640	35.0	217	217	217
Industrial	Strait of Georgia	ConocoPhillips Ferndale Refinery	WA0002984B	617	2.0	4.67	2.34	0.000
Industrial	Strait of Georgia	Intalco Ferndale	WA002950B	1,380	5.0	26.1	13.1	0.000
Industrial	Strait of Georgia	Tenaska Cogeneration Plant	WA0031291B	24.7	5.02	0.469	0.235	0.000
Industrial	Strait of Juan de Fuca	Nippon Paper Industries USA Co.-Outfall 1	WA0002925C	3,130	10.0	118	118	118

The precision of the data in this table is only two significant figures.

Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge.

To the extent that individual anaytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.

(a) = See the text for an explanation of "average flow."

(b) = Non-detect results were replaced with the method detection limit or method reporting limit. If no limit was available, non-detect results were replaced with the average of the method limits for other dischargers.

(c) = In most cases, the estimated loading may be an overestimate.

(d) = In most cases, the estimated loading may be an underestimate.

mgy = Million gallons per year.

ug/L = Micrograms per liter.

kg/year = Kilograms per year.

ND = Not detected.

MDL = Method detection limit.

MRL = Method reporting limit.

Table B-14. Estimated Total Phenolics Loadings from Municipal Dischargers with Pollutant Concentration and Flow Data.

Source Type	Study Area	Permitted Discharger	Permit Number	Average Flow (a) (mgy)	Concentration (b) (µg/L)	Estimated Average Loading (kg/year)		
						ND = MDL or MRL (c)	ND = 1/2 (MDL or MRL)	ND = 0 (d)
Municipal	Commencement Bay	Buckley Stp	WA0023361C	222	5.0	4.20	2.10	0.000
Municipal	Commencement Bay	Tacoma Central No. 1	WA0037087B	7,190	50.0	1,361	680	0.000
Municipal	Commencement Bay	Tacoma North No. 3	WA0037214C	1,650	50.0	312	156	0.000
Municipal	Main Basin	Bainbridge Island City Wwtp	WA0020907D	196	5.0	3.71	1.85	0.000
Municipal	Main Basin	Edmonds Stp	WA0024058C	2,080	40.0	315	157	0.000
Municipal	Main Basin	Gig Harbor Stp	WA0023957B	292	10.0	11.1	11.1	11.1
Municipal	Main Basin	Midway Sewer District	WA0020958D	1,560	15.0	88.6	88.6	88.6
Municipal	Main Basin	Miller Creek Wwtp	WA0022764D	1,100	5.0	20.8	10.4	0.000
Municipal	Main Basin	North Bend Stp	WA0029351D	170	5.0	3.22	1.61	0.000
Municipal	Main Basin	Salmon Creek Wwtp	WA0022772E	874	7.0	23.2	23.2	23.2
Municipal	Main Basin	Vashon Stp (King Co-Vashon)	WA0022527E	43.2	5.0	0.818	0.409	0.000
Municipal	Port Gardner	Everett Stp BA52223	WA0024490C	4,140	40.0	627	313	0.000
Municipal	Port Gardner	Everett Stp BA52224	WA0024490C	4,620	40.0	700	350	0.000
Municipal	Port Gardner	Lake Stevens Sewer District	WA0020893D	726	20.0	55.0	27.5	0.000
Municipal	Port Gardner	Marysville Stp	WA0022497C	1,690	40.0	256	128	0.000
Municipal	Port Gardner	Monroe Stp	WA0020486D	538	5.0	10.2	5.09	0.000
Municipal	Port Gardner	Snoqualmie Wwtp	WA0022403C	260	40.0	39.4	19.7	0.000
Municipal	San Juan Islands	Oak Harbor Stp	WA0020567C	689	26.9	70.2	35.1	0.000
Municipal	Sinclair/Dyes Inlet	Bremerton Stp	WA0029289E	1,840	5.0	34.7	17.4	0.000
Municipal	Sinclair/Dyes Inlet	Kitsap Cnty Central Kitsap	WA0030520E	1,340	6.0	30.4	15.2	0.000
Municipal	South Sound (east)	Chambers Creek Stp	WA0039624	6,480	5.0	123	61.3	0.000
Municipal	South Sound (east)	Shelton Stp	WA0023345C	776	0.10	0.29	0.147	0.000
Municipal	Strait of Georgia	Bellingham Stp	WA0023744D	4,430	0.60	10.1	10.1	10.1
Municipal	Strait of Georgia	Birch Bay Stp	WA0029556C	291	50.0	55.1	27.5	0.000
Municipal	Strait of Georgia	Blaine Stp	WA0022641C	207	60.0	47.0	47.0	47.0
Municipal	Strait of Georgia	Everson Stp	WA0020435D	91.8	50.0	17.4	8.69	0.000
Municipal	Strait of Georgia	Ferndale Stp	WA0022454C	538	50.0	102	50.9	0.000
Municipal	Strait of Georgia	Lynden Stp	WA0022578D	382	50.0	72.3	36.1	0.000
Municipal	Whidbey Basin	Arlington Stp	WA0022560E	430	5.0	8.14	4.07	0.000

The precision of the data in this table is only two significant figures.

Since the concentrations of toxic chemicals in wastewater are often highly variable, a single set of values may not accurately represent the character of a particular discharge.

To the extent that individual anaytical results were not representative of typical concentrations, the loading estimates for individual facilities probably differed from the actual average loadings.

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mgy = Million gallons per year.

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