DEVELOPMENT OF FRESHWATER SEDIMENT QUALITY VALUES FOR USE IN WASHINGTON STATE

Phase II Report:
Development and Recommendation of SQVs for Freshwater Sediments in Washington State

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LIST OF ACRONYMS

2LAET – second lowest Apparent Effects Threshold
AET – Apparent Effects Threshold
ASTM – American Society for Testing and Materials
C – control
CF – control final
CI – control initial
CSL – Cleanup Screening Level
DDD – dichlorodiphenyldichloroethane
DDE – dichlorodiphenyldichloroethylene
DDT – dichlorodiphenyltrichloroethane
DMEF – Dredged Material Evaluation Framework
DMMP – Dredged Material Management Programs
EPA – Environmental Protection Agency
ERL – Effects Range Low
HPAH – high molecular weight polynuclear aromatic hydrocarbon
LAET – lowest Apparent Effects Threshold
LPAH – low molecular weight polynuclear aromatic hydrocarbon
MCUL – Minimum Cleanup Level
ML – Maximum Level
NOAA – National Oceanic and Atmospheric Administration
PAET – Probable Apparent Effects Threshold
PAH – polynuclear aromatic hydrocarbon
PCB – polychlorinated biphenyl
PSDDA – Puget Sound Dredged Disposal Analysis
PSEP – Puget Sound Estuary Program
QA – quality assurance
QA/QC – quality assurance/quality control
R – reference
RF – reference final
SAIC – Science Applications International Corporation
SEDQUAL – Sediment Quality Information System
SQS – Sediment Quality Standard
SQV – sediment quality value
T – test
TBT – tributyltin
TEL – Threshold Effects Level
TEQ – toxic equivalent
TOC – total organic carbon

EXECUTIVE SUMMARY

In early 2002, the Washington State Department of Ecology (Ecology) embarked on a project to identify, update, and ultimately select freshwater sediment quality values (SQVs) for use in Ecology's sediment management programs. The first phase of this effort was completed in December 2002 (SAIC and Avocet, 2002), and included compilation of existing freshwater SQVs in North America, and an assessment of their reliability in predicting effects in Washington State. The results of this work indicated that additional Phase II work was needed to update existing freshwater Apparent Effects Thresholds (AETs) and calculate more reliable SQVs for Washington State, as none of the existing guidelines were adequately predictive of toxicity in the Washington State data set.

The goals of the Phase II work described in this report are:

- Update Ecology's freshwater AETs (Ecology 1997), including additional tests and endpoints if possible
- Investigate additional methods of calculating SQVs, including the optimal percentile and floating percentile approaches described in Section 2.0
- Conduct reliability testing to identify which SQVs are most predictive of toxicity in the Washington State data set, and make recommendations regarding their use in accordance with the Sediment Management Standards.

As part of the process of deriving SQVs, additional development work was completed that will be beneficial to Ecology's programs:

- The freshwater sediment database was substantially updated and both the chemistry and bioassay data were subjected to detailed review to ensure accuracy and quality
- Interpretation guidelines for freshwater biological tests were developed
- The SEDQUAL freshwater bioassay interpretation tool, including statistical analysis and comparison of bioassay data to interpretation guidelines, was completed and thoroughly tested

Results of the Phase II SQV development work include the following:

- The freshwater data set is considerably stronger than it was in 1997, and has been improved from a quality assurance standpoint. The current database allows for the calculation of two additional AETs, for a total of four acute and subchronic endpoints. The 2003 AETs are more consistent with one another, and encompass a broader range of analytes than the 1997 AETs. Unfortunately, no benthic or chronic freshwater tests have enough data to allow calculation of AETs.

- There is still a lack of data for a variety of pesticides, herbicides and biocides, among other chemicals. These chemicals may be important in areas of the state that have not been widely sampled, particularly in central and eastern Washington. At sites or locations in which these chemicals are likely to be present, the AETs and other SQVs derived in this report may not provide adequate protectiveness, and bioassay testing should be undertaken on a site-specific basis. In addition, it is possible that lack of these analytes in the existing data set reduced the sensitivity of the AETs as well as the other SQVs calculated, if they contributed to observed toxicity in the bioassays.

- The freshwater AETs are not as sensitive as the marine AETs are in Puget Sound, most likely due to variations in metals bioavailability from one area to the next. The two mortality bioassays exhibit the lowest sensitivity and reliability. Because these AETs are less protective than the marine AETs, they may not meet the narrative goals of the SQS and the CSL in the Sediment Management Standards.

- Use of lower percentiles of the no-hit distribution improves sensitivity, and shows a reasonable balance between protectiveness and efficiency - in the 75-80% sensitivity range, with a corresponding efficiency of 60-80%. This approach is similar to the Probable Apparent Effects Threshold proposed in Ecology (1997), but has been modified to allow any optimal percentile to be chosen, rather than only the 95^{th} percentile.

- Use of the floating percentile method (described in Section 2.0) further improves the sensitivity and efficiency, resulting in SQVs with a sensitivity of 85% and efficiency of 75%, and an overall reliability of better than 80%. Other choices of sensitivity and efficiency are possible, and a range of potential guideline values was calculated to illustrate the trade-offs involved.

- Metals, certain phthalates, PCBs, and PAHs acting in an additive manner are most closely associated with toxicity in the data set. There is a significant degree of covariance among many of the metals and among the PAHs, which complicates calculation of the SQVs.

The following recommendations to Ecology are provided, based on the conclusions above and supporting analyses:

- AETs, calculated in the standard way, are not recommended for setting freshwater SQS and CSL values at this time, because of their relatively low sensitivity. The freshwater AETs are nevertheless useful for other purposes within the sediment management programs, because they are highly efficient. Above these levels, it is nearly certain that adverse effects will be observed. Therefore, they would be appropriate as MLs in the dredging programs, and as hotspot and early action levels in the cleanup programs.

- As an alternative to AETs, the Floating Percentile method is recommended over the optimal percentile approach, because it is more reliable and provides SQVs that better predict toxicity in the Washington State data set. Using this method, it is possible to develop an optimized SQV set for any choice of false negative rate and any definition of adverse effects determined to be appropriate to a given program. The method is also capable of providing customized SQVs for a given region of the state, should it be considered appropriate to stratify the freshwater data set into ecoregions, watersheds, or political boundaries.

- Within the range of adverse effects levels evaluated in this report, it is recommended that Ecology retain use of the biological SQS and CSL levels, as defined in the Phase I report (subject to agency and peer review), rather than using a statistical significance only comparison. The SQS and CSL biological effects levels are more consistent with the existing rules and marine programs.

- Based on the evaluations conducted for the Phase I report, it is recommended that Ecology use a comparison to control rather than a comparison to reference for calculating SQVs. Once freshwater reference areas have been identified and their performance validated over time, the decision of whether to use reference or control comparisons can be made on a programmatic basis. However, the Phase I reliability analysis indicated that if a decision is made to use reference comparisons, they must be used consistently on all projects and not mixed with comparisons to control, or the reliability of the decision process will substantially decline.

- It is recommended that PCB criteria be set only for total PCBs, rather than individual Aroclors, based on the sensitivity analysis. The manner in which total PCBs should be calculated when congener data are available was outside the scope of this study (since congener data were not present in the data set); however, this will be important to address in the future.

- It is also recommended that LPAH and HPAH measures not be used, based on the sensitivity analysis. For PAHs, two alternative approaches could be used, which seem to provide roughly the same sensitivity and reliability. A single SQV can be set using a molar sum of PAHs, consistent with narcosis theory. Alternatively, SQVs for individual PAHs can be set using the freshwater AETs.

- It is recommended that areas of the state susceptible to contamination by pesticides, herbicides, and other chemicals not well-represented in the existing data set be further sampled, using synoptic chemistry and bioassay testing. This will allow additional SQVs to be calculated that will provide greater protection in these areas.

1.0 INTRODUCTION

In 1997, the Washington State Department of Ecology (Ecology) released its first set of freshwater AETs for Washington State (Ecology 1997), based on data that had been collected through 1994. At that time, there were enough data to calculate AETs for two endpoints – the 10-day *Hyalella azteca* mortality bioassay, and the Microtox® luminescence bioassay. A relatively small database existed, and some of the data were collected prior to standardization of freshwater bioassay protocols. Because of these factors, these AETs were not intended for regulatory use. Since then, quite a bit of additional data have been collected, new tests have been introduced, protocols have been standardized, and interest in having updated regional freshwater sediment quality values (SQVs) has grown. Recent data are now available from the Duwamish River, the Spokane River, the Columbia River, the Willamette River, and various large lakes on both the east and west side of the Cascades.

Consequently, in early 2002, Ecology embarked on a project to identify, update, and recalculate freshwater SQVs for use in Washington State sediment management programs. Ideally, two levels of SQVs would be developed, to correspond to the narrative Sediment Quality Standard (SQS) and Cleanup Screening Level/Minimum Cleanup Level (CSL/MCUL). Phase I of the project was completed in December 2002 (SAIC and Avocet 2002), and included:

- A compilation of existing freshwater SQV sets in North America
- An evaluation of the appropriateness of these guidelines for Ecology's programs, using narrative criteria, resulting in the selection of eight SQV sets for further evaluation
- An update of the regional freshwater sediment database, including gathering additional synoptic data sets, and conducting quality assurance reviews of both new and old data sets
- Adding new freshwater bioassay evaluation tools to the SEDQUAL information system, allowing the development of custom bioassay hit/no-hit definitions and comparison of bioassay data to these definitions to identify stations with hits
- A reliability analysis of the eight chosen SQV sets against the newly updated freshwater data set, to evaluate their ability to correctly predict biological hits and no-hits
- An evaluation of the use of marine AETs as freshwater dredged material disposal guidelines, and recommended updates to the Columbia River DMEF manual (DMEF 1998).

The results of these analyses indicated that the existing freshwater SQV sets were not able to correctly predict both hits and no-hits with an acceptable degree of reliability, and further work was therefore needed in Phase II to update the 1997 freshwater AETs and/or calculate new freshwater guidelines.

This report provides the results of Phase II, and includes the following:

- Calculation of updated freshwater AETs for four bioassay endpoints
- Calculation of alternative freshwater SQVs, including use of a lower no-hit percentile for the AETs and entirely new SQVs based on iterative error rate minimization techniques

- A reliability analysis of the AETs and alternative SQVs based on the updated regional freshwater data set
- Recommendations for how these values could be used in Ecology's programs.

Section 2 of this report describes the methods used to finalize the data set, calculate the SQVs, and conduct the reliability assessment. Section 3 presents the updated freshwater AETs and alternative SQVs and the associated reliability analyses, and Section 4 provides additional discussion of technical and policy issues. Section 5 summarizes conclusions and recommendations, and Section 6 provides the references for the report.

It should be emphasized that this report provides initial recommendations to Ecology, which will make the final decision on how any SQVs presented in this report, or any modifications to the SQVs presented here, will actually be used in Ecology's sediment management programs. Among the results presented here are a wide variety of options for setting final SQS and CSL-equivalent values. Additionally, the SQVs presented in this report were guided and based on initial policy and technical decisions made by Ecology, described in Section 2. Any potential future modifications to these underlying choices and conditions could significantly change the associated values.

2.0 METHODS

2.1 Data Preparation

Data Collection. Most of the data collection and data entry was conducted under Phase I; the Phase I report provides details of the data sets obtained and the process that was used to screen them. One additional data set for Lake Sammamish was added which came in at the very end of Phase I. The final Phase II data file used for the development of SQVs (a subset of the publicly available SEDQUAL data set) is available from Ecology by request.

Data Screening. Two early data sets for McCormick & Baxter Creosoting Company (MBCREOS1 and MBCREOS2) were deleted when it was determined that the logistic regression models using the *Hyalella azteca* results for these data sets were significantly different from the rest of the *H. azteca* data sets. These studies were conducted in the 1990-1991 timeframe, and unlike more recent studies, the *H. azteca* organisms were collected locally and may have had a different sensitivity to contaminants. Although for some time there has been a general sense that the early McCormick & Baxter results were unusual, this was recently confirmed in a more rigorous manner by both NOAA (Field et al. 2003) and the Oregon Department of Environmental Quality (Brunelle et al., 2003).

In addition, some surveys and individual stations were screened out because of a low number of replicates in bioassays, below what is considered a minimum standard in modern freshwater protocols (ASTM 2000). Surveys or stations with less than five replicates were screened out, including:

- **LAKROO92 (all 18 stations) –** 7-day Hyalella, 3 replicates.
- **LSAMM99 (all 16 stations)** – Microtox®, 2 replicates
- **MARCO90 (1 station) –** 10-day Hyalella, 3 replicates.
- **QUEBAX2 (all 4 stations) –** 14-day Hyalella, 4 replicates.
- **SIMILK00 (all 4 stations) –** 10-day Hyalella, 4 replicates.
- **TRISTAR (all 3 stations)** – Microtox®, 3 replicates.
- **UNIMAR2 (all 9 stations)** – 14-day Hyalella, 3 replicates.

Although conducting a power analysis was discussed, it was decided against at this time. The purpose of a power analysis is to determine the minimum difference between two samples that can be detected with a given confidence (alpha level), or conversely whether or not there is sufficient power to detect a specified minimum detectable difference. Conducting a power analysis requires identification of a minimum detectable difference and/or a confidence level that is considered appropriate, and these variables have not been defined or selected by Ecology. The Phase II analysis uses statistical difference from control only, rather than a specified threshold that could serve as a target for a minimum detectable difference.

The freshwater ASTM protocols recommend 8 replicates and require a minimum of 4 replicates in order to provide appropriate power under most circumstances. The minimum of 4 is mainly considered appropriate for less rigorous applications, such as trend analysis between years, and is fewer than the PSDDA marine bioassay standard of 5 replicates. The data sets remaining in the database after the above screening meet or exceed both of these minimum guidelines.

Surveys and stations were also screened out if they had an insufficient analyte list. Although it would be ideal for all stations to have the same analyte list when developing SQVs, that is not possible when using historical data sets. A minimum of PAHs and metals was selected as a general guideline for including a survey or station, consistent with other national criteria development efforts. Metals and PAHs both contribute significantly to toxicity in most contaminated sediment data sets, and if these minimum analytes were not available, toxicity would frequently occur in samples without adequate chemistry to explain it. This would lead to an unrealistically high number of false negatives in the reliability analysis, based solely on the analyte list and not on the accuracy of the SQVs.

For some surveys, different stations had varying analyte lists. In these surveys, only those stations with adequate analyte lists were retained. The surveys and stations deleted included:

- **COLALU94 (all 6 stations) –** Only conventionals.
- **LKROOS92 (2, 8, 10, 11, 15, 17, 19, 61, 71) –** 6 metals and TOC.
- **LKROOS01 (all 10 stations) –** 6 metals plus conventionals.
- **SIMILK00 (all 4 stations) –** metals and conventionals, no organics.
- **STEILLK2 (all 4 stations) –** metals and conventionals, no organics.
- **QUEBAX2 (all 4 stations) –** PAHs and conventionals, no metals.

Finally, individual chemical data were screened out based on qualifiers assigned during the quality assurance process by the original authors. Data qualified as H, N, Q, X, or R (defined in Table 2-1 below) were not included in the analysis. Undetected data were also not included, as these data do not provide useful information for the purposes of developing SQVs.

Table 2-1. Qualifier Definitions for Screened-Out Data

Qualifier	Definition
H	Holding time exceeded (conventionals)
N	Estimate based on presumptive evidence analyte is present in sample
Q	Questionable value
X	Less than 10% recovery
R	Rejected – failure to meet QA guidelines

For AET recalculations only, outliers were also removed using the 3x rule (if the highest no-hit value is more than three times the next-highest value, the highest value is considered an outlier). Statistical outlier approaches such as Rosner's test and Dixon's test are also available; however, there is some evidence that these statistical approaches do not work well with distributions that are patchy in their upper ranges, such as the freshwater data set (Gilbert 1987, Sokal and Rohlf 1981). They are also not consistent with the approach approved by the EPA Science Advisory Board. Therefore, the standard 3x rule was used for Phase II update of freshwater AETs.

Selection of Bioassay Tests and Endpoints. In Phase I it was determined that there is currently insufficient data to calculate SQVs for the chronic tests. Four tests have sufficient data to calculate SQVs: *Hyalella azteca* 10-day mortality, *Chironomus* 10-day mortality, *Chironomus* 10-day growth, and Microtox® 15-minute luminescence bioassays. These endpoints were used for Phase II update of the AETs and development of alternative SQVs.

The Microtox® protocol has recently undergone revision and finalization. In particular, the handling of "overluminescence," or values greater than 100% of the initial control luminescence, was finalized during this project. Phase II interpretation guidelines were revised in accordance with the final 2003 protocol, as follows:

- A certain amount of luminescence greater than 100% is considered normal variation and within the acceptable range. A 10% threshold was set, to be consistent with the level below which mortality and reduction in luminescence is not considered significant. Therefore, mean values of the normalized control, reference, or test sample between 100% and 110% are considered normal. Mean values greater than 110% will be considered a QA failure in the case of a control or reference sample, and uninterpretable in the case of a test sample.

- Similarly, values of Test/Reference (T/R) or Test/Control (T/C) between 100% and 110% will be treated as a no-hit result. Values of T/R or T/C greater than 110% will be considered uninterpretable. Enhancement in luminescence greater than 110% could theoretically be considered a hit or adverse effect, but no consensus has yet been reached on this issue.

The revisions to the Microtox® interpretation and quality assurance guidelines had not yet been programmed into the SEDQUAL bioassay statistical analysis tool at the time Phase II was being conducted, so these interpretations were performed by inspecting the results for each sample and making necessary corrections to the hit/no-hit interpretations in an Excel spreadsheet.

Comparison to Control vs. Reference. Based on the results of Phase I, there appears to be no reliability advantage to using a comparison to reference rather than a comparison to control, for this freshwater data set. Freshwater reference areas have not yet been standardized, and the variability of reference stations in the historical data set appears to overwhelm any theoretical advantage they may provide. In addition, many test stations do not have valid reference stations and would have to be excluded from the analysis if comparison to reference were used. Consequently, a comparison to control provides a much larger and more consistent data set to work with in calculating SQVs. Finally, all of the other national SQV sets that have been developed for freshwater have used a comparison to control. Therefore, it was decided to use comparison to control for Phase II derivation of SQVs.

This decision does not limit how individual regulatory programs may choose to interpret and use their bioassay data. It is expected that freshwater reference areas may be developed over time and standardized, and once this process is completed it may be possible to use a comparison to reference for future updates of the SQVs. However, it is likely that the process may be more difficult than in the marine environment because of the more heterogeneous nature of freshwater environments, and that there may not be valid reference areas for all freshwater sites.

Selection of Hit/No-Hit Criteria. For development of AETs, a sample was considered to be a hit if it was statistically different from the control. One minor exception to this interpretation guideline was introduced for mortality and luminescence bioassays, because many of these bioassays have become relatively well-controlled and show only minor variance in the control replicates. Thus, even very small differences can be statistically significant. For these bioassays, an observed effect was required to be both statistically significant and at least a 10% different from the control to be considered a hit. “Statistically significant” means a statistical difference from a control sample at an alpha level of 0.05. Data transformations, selection of null hypotheses, and statistical testing procedures are identical to those currently in use by Ecology and DMMP programs for marine sediment data (Michelsen and Shaw 1996, Fox et al. 1998).

The alternative approaches for calculating SQVs (optimal percentiles and floating percentiles) used the same three levels of effects evaluated in Phase I – statistical significance only (including the above modification), a level equivalent to the SQS, and a level equivalent to the CSL. For a detailed discussion of the derivation of these hit/no-hit interpretation guidelines, please see the Phase I report (SAIC and Avocet, 2002). Changes were made to the Microtox QA/QC interpretation guidelines, as described above and shown in Table 2-2 below. As noted above, when using the SEDQUAL Bioassay Statistical Analysis tool, the reference for all stations was set to the control.

Table 2-2. SQS and CSL Endpoints for Biological Tests

Test	QA Control	QA Reference	SQS	CSL
Hyalella azteca 10-day mortality	C ≤ 20%	R ≤ 25%	T – R > 10%	T – R > 25%
Chironomus tentans 10-day mortality	C ≤ 30%	R ≤ 30%	T – R > 10%	T – R > 25%
Chironomus tentans 10-day growth	CF ≥ 0.48 mg/ind	RF/CF ≥ 0.8	T/R < 0.8	T/R < 0.7
Microtox® decrease in luminescence	CF/CI ≥ 0.72, CF/CI ≤ 1.1	RF/CF ≥ 0.8, RF/CF ≤ 1.1	T/R < 0.85	T/R < 0.75

C = Control, CI = Control Initial, CF = Control Final
R = Reference, RF = Reference Final
T = Test Sample

AETs are developed for individual bioassays, and the lowest and second-lowest AETs can be used to set lower and upper regulatory levels. The alternative approaches work in a somewhat different manner, starting directly with the biological definitions of these various regulatory levels. This requires all bioassays at a station to be assessed in a combined, or “pooled,” approach at each of the effects levels for which SQVs need to be derived. The SQS and CSL effects levels defined in Phase I were applied to the individual bioassay results for a station, and if any one bioassay at a station showed an observed effect, the station as a whole was considered to be a hit.

Selection of Final Analyte List. In Phase I, any detected chemical that was on one of the SQV lists was included in the reliability analysis. However, for development of SQVs, a minimum number of data points is required. To be as inclusive as possible, a minimum of 30 detected values was chosen as the lower limit for inclusion on the analyte list. For AETs, the list of chemicals with 30 detected values varies, because some test endpoints have more data than others. For calculation of alternative endpoints, chemicals were included if there was enough data for at least three of the four bioassays.

Analytes were also screened out for other reasons. Some analytes, such as iron, aluminum, and magnesium, were screened out because they are crustal elements and are naturally present in high concentrations. Certain conventional analytes, such as grain size parameters and acid-volatile sulfides, were screened out because they likewise are not considered contaminants. Others were derived quantities, such as dioxin TEQs. Finally, several chemicals and conventional parameters were screened out because the hit and no-hit distributions were statistically indistinguishable and the highest no-hit value was higher than the highest hit value (known as a "greater than" value in AET terminology). These included TOC, ammonia, sulfides, and phosphorus, as well as some chemicals that had not enough data for some bioassays and "greater than" values for others, such as beryllium, mono- and dibutyltin, DDE and DDD, di-n-butyl phthalate, benzoic acid, and carbazole.

Chemicals with not enough detected data to calculate SQVs include DDT and derivatives, along with essentially all other pesticides, herbicides, and biocides except TBT, PCB Aroclors other than 1254 and 1260, PCB congeners, dioxins/furans, and chlorinated phenols and benzenes. The lack of data for these chemicals is likely a combination of factors, including the possibility that many of these chemicals are simply not widespread in the areas surveyed so far, the lack of surveys in agricultural areas of the state, and a limited list of analytes in many older surveys. For areas of the state where these chemicals are important, their absence in this data set could result in a lack of sensitivity of the derived AETs and alternative SQVs, and site-specific bioassay testing is recommended.

The final list of chemicals for which a full set of SQVs were derived includes:

- **Metals:** Antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, zinc, and tributyltin

- **PAHs:** 2-Methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(ghi)perylene, chrysene, dibenz(ah)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene, total benzofluoranthenes, LPAHs, HPAHs, and the molar sum of PAHs

- **Other Organic Chemicals:** Aroclor 1254, Aroclor 1260, total PCBs, bis(2-ethylhexyl) phthalate, butylbenzyl phthalate, dimethyl phthalate, di-n-octyl phthalate, and dibenzofuran

AETs were calculated for additional chemicals for some bioassay endpoints with sufficient data, including DDT and derivatives, 4-methylphenol, benzoic acid, beryllium, carbazole, monobutyltin, dibutyltin, di-n-butyl phthalate, phosphorus, retene, TOC, and sulfides. These chemicals were not retained for other SQVs because there were only enough data for some bioassays, and because some of these chemicals had "greater than" AETs and did not appear to be associated with toxicity in the data set.

Normalization and Summing. To date, evaluations of the reliability of dry weight-normalized SQVs vs. organic carbon-normalized SQVs has shown that the dry weight values have equal or better reliability than the organic carbon-normalized values (PSEP 1988, Ecology 1997). In addition, organic carbon normalization has created some confusion and difficulty in implementation that would be eliminated if dry weight SQVs were used. Therefore, it was decided to calculate Phase II SQVs on a dry weight normalized basis.

In the past, marine AETs have been available both for individual PAHs and for summed dry weight values such as LPAHs and HPAHs. In recent years, there has been a trend toward using summed values of PAHs in the development of SQVs, as this may better reflect their mode of action and additive toxicity (Swartz et al., 1995; EPA 2000). However, dry weight sums are not necessarily appropriate, as narcosis-based toxicity is additive on a molar basis. Dividing the dry weight concentrations by the molecular weight provides molar concentrations that can be summed to predict narcosis-based toxicity (Hermens et al., 1984; Hermens et al., 1985a,b; Deneer et al., 1988). Based on the potential for this approach to better reflect PAH toxicity, it was decided to calculated two sets of SQVs for each method, one using the existing approach of individual PAHs plus dry weight sums, and one using only the molar sum of PAHs. In the SQV set that used the molar sum of PAHs, the individual Aroclors were also summed into a single Total PCBs value.

2.2 Sediment Quality Value Calculations

Apparent Effects Thresholds. The derivation of AETs is described in detail in PSEP (1988), and the same general steps were followed in Phase II for each of the four bioassay endpoints, as described below and shown in Figure 2-1.

1. **Data Query.** The project database was queried to retrieve all the chemistry and bioassay data for stations at which that bioassay was conducted.

2. **Bioassay Statistical Analysis.** Using SEDQUAL's bioassay statistical analysis tool, the bioassay results for each station were compared to the quality assurance and hit/no-hit criteria listed above, and each station was designated as a hit, no-hit, or failed quality assurance. Those stations that failed quality assurance criteria were removed from the data set. In the case of the Microtox® bioassay, some quality assurance evaluations were conducted by hand subsequent to the BSA analysis, as discussed above.

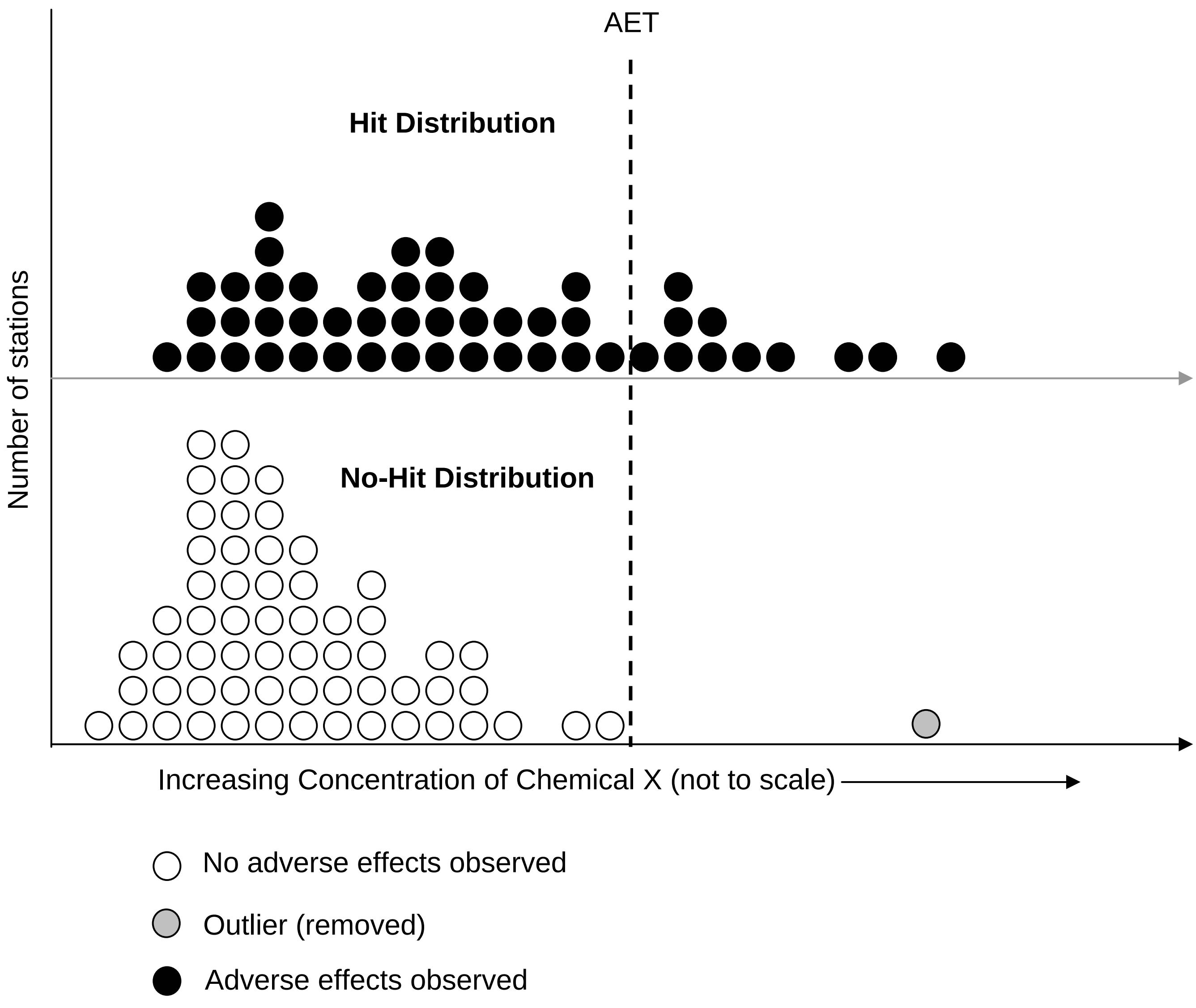
3. **Chemical Screening.** Analytes with less than 30 data points were screened out.

4. **Creation of Hit and No-Hit Distributions.** The chemistry data for each remaining analyte were then divided into hit and no-hit distributions, and ranked in order of increasing concentration for each of the distributions.

5. **Removal of Outliers.** The highest no-hit concentration was compared with the second highest no-hit concentration, and if it was more than three times higher, it was designated as an outlier and removed from the no-hit distribution. This could be done more than once; however, only in a few cases were two data points removed through this process, and never more than two.

6. **Identification of AET.** The highest remaining no-hit concentration was designated as the AET. If the highest remaining no-hit concentration for an analyte was higher than the highest hit concentration, then a greater than sign (>) was placed before the AET value to indicate that the actual AET may be higher than that value, or an AET may not exist for that chemical.

Figure 2-1. Calculation of Apparent Effects Thresholds (AETs)



Optimal Percentiles. In Ecology (1997), an alternative AET called the Probable Apparent Effects Threshold (PAET) was proposed, which was the 95th percentile of the no-hit distribution, without outliers removed. This approach was suggested as a possible alternative to removal of outliers. As part of Phase II, this idea was further explored by evaluating all possible percentiles of the hit and no-hit distribution, to see which ones provided the best reliability with this data set. The procedure used was as follows:

- **Creation of Hit and No-Hit Distributions.** Hit and no-hit distributions were created for each analyte following the same procedures outlined above. Outliers were not removed from the distributions.

- **Calculation of Percentiles.** Percentiles of the hit and the no-hit distributions were calculated for each analyte in an Excel spreadsheet, ranging from one to one hundred, in increments of one. The results were arranged with analytes in columns and percentiles in rows. This resulted in 200 possible percentiles and associated chemical concentrations that could be selected as candidate SQV sets.

- **Reliability Analysis.** Each percentile row was then treated as if it were a set of SQVs, and all six reliability parameters were calculated for each row, as described in Section 2.3.

- **Identification of Optimal Percentiles.** An Excel macro was used to search the reliability results for the best-performing percentiles, corresponding to various false negative rates that the agency might choose. Target false negative rates were chosen from 5% to 25%, in increments of 5%. For each target false negative rate, the macro searched the percentile rows for the one that had a false negative rate closest to the target and the lowest false positive rate, giving the greatest overall reliability. Using this method, Ecology can select any target false negative rate, and find the percentile choice that provides the most efficient set of SQVs that meet that target. Selecting multiple false negative rates and comparing the results allows examination of the trade-offs in efficiency and overall reliability that occur as the false negative rate is varied.

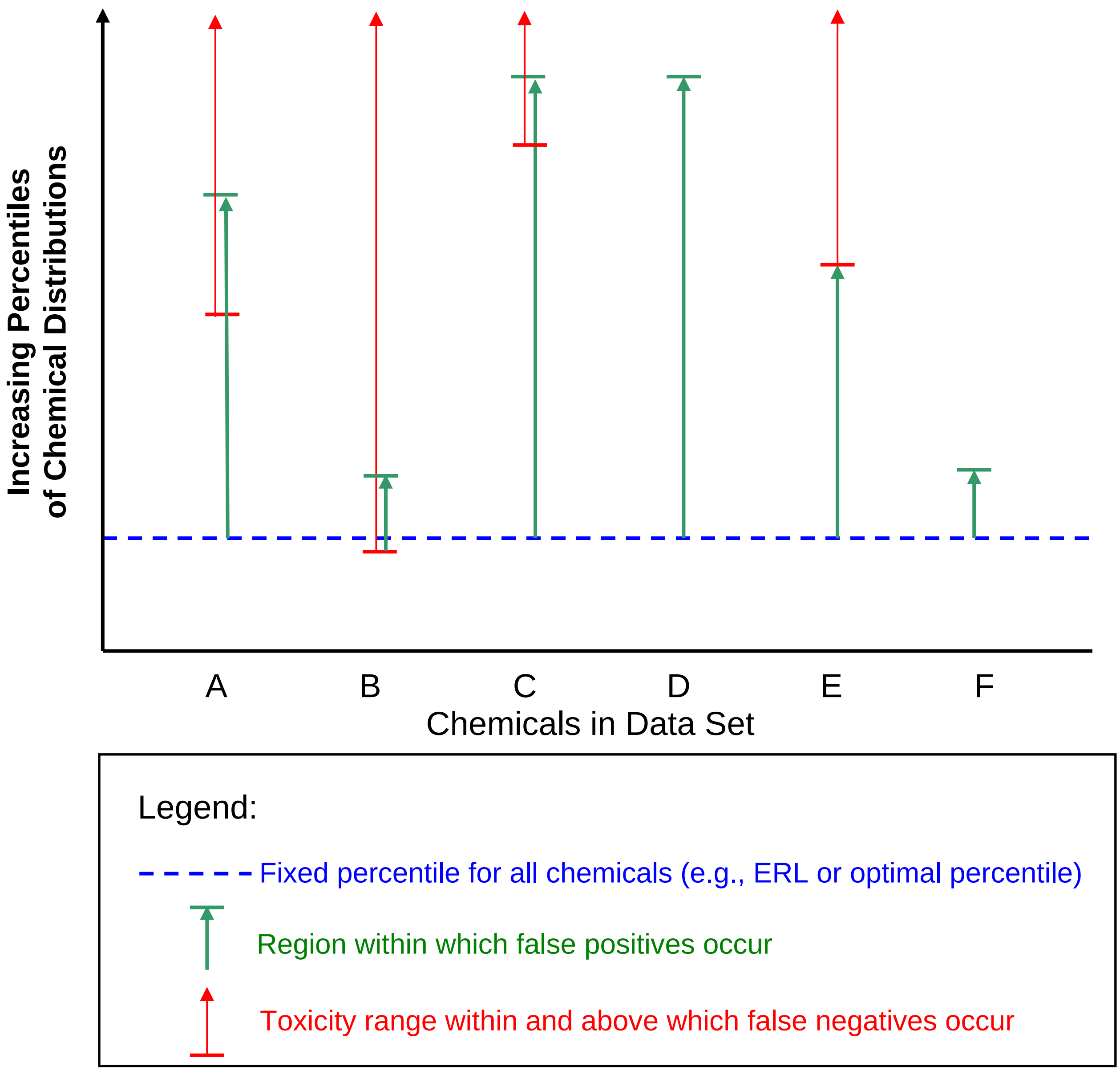
This approach allows for the possibility that percentiles of either the hit or the no-hit distribution may have the best combination of error rates, and does not distinguish between the two on theoretical grounds. However, for this data set, percentiles of the no-hit distribution were as good or better than the hit distribution (within a percentage or two). Use of the no-hit distribution is more consistent with how AETs have been developed, as well as previous alternatives to AETs suggested by Ecology (1997), such as PAETs. Therefore, only the no-hit distribution was used in the final analysis.

Error Rate Minimization Techniques. A significant percentage of the error in the methods described above and in currently available SQV sets is related to the use of a single percentile of the distribution to set the criterion for all chemicals (Michelsen 1999). Because all chemicals do not contribute equally to toxicity in a data set, this oversimplification results in substantial mathematical error.

To improve on these approaches, a new method of calculating SQVs was developed that does not require the SQVs to be based on the same percentile of the hit or no-hit distribution for all chemicals. This method, known as the Floating Percentile method, substantially improves false negative and false positive error rates for the freshwater data set over existing approaches, and results in guidelines that are reasonably protective without being over-conservative.

The basic concept behind the Floating Percentile method (Figure 2-2) is to select an optimal percentile of the data set that provides a low false negative rate (as described above), then adjust individual chemical concentrations upward until false positive rates are decreased to their lowest possible level while retaining the same false negative rate. The Y axis in Figure 2-2 is the percentile of each chemical's overall distribution and is not linearly related to toxicity. The green bar shows the concentration range within which toxicity does not occur, and the red bar shows the range within which toxicity occurs. These ranges may overlap due to site-specific or sample-specific variations in bioavailability or toxicity.

Figure 2-2. Floating Percentile Method



First, a constant percentile of the distribution that results in a low false negative rate (similar to an ERL) is initially selected for all chemicals, represented by the blue dashed line. The difference between this constant percentile and the lower end of the toxicity range for each chemical is the area between the blue line and the red bar, and this is the source of most of the false positive errors.

The second step is to determine which chemicals are associated with false positive errors in the data set and adjust those SQVs upward until the lower end of their toxicity ranges are reached (red bar). Above this point, false negatives will begin to increase. Above the red bar, both false negatives and false positives may occur, as is shown for Chemicals A, B, and C. This region is the range of concentrations over which site-specific bioavailability plays an important role in toxicity, and therefore hit and no-hit samples are mixed together, causing both types of errors.

In Figure 2-2, Chemical B's concentration cannot be raised at all, because it is already within its toxic concentration range. In any data set, a few chemicals will already be at a toxic level, giving rise to the low percentage of false negatives that the blue line represents. Some chemicals may show a sharper toxicity threshold, such as Chemical E. Others may not appear to be related to toxicity in the data set at all, as shown by Chemicals D and F. These chemical concentrations can be raised to their maximum percentile without any observed increase in toxicity. However, it may be safer in practice to raise them only to the point where false positives no longer occur (represented by the green bar) or to a similar endpoint such as AETs.

Once each chemical has been individually adjusted upward to the lower end of its toxicity range, the false positives will have been significantly reduced while retaining the same low false negative rate. Most chemicals should be at or near their actual toxicity range, rather than a level arbitrarily assigned by a fixed percentile. In this manner, optimized criteria sets can be developed for a number of different target false negative rates, allowing the trade-offs between false negatives and false positive to be evaluated and a final set of SQVs to be selected.

In summary, the steps required to calculate SQVs using this approach include:

- Select toxicity tests and endpoints
- Compile synoptic chemistry/bioassay data
- Assign hit/no-hit status
- Screen data and develop chemical distributions
- Select a range of target false negative rates and identify associated optimal percentile values
- Adjust percentiles for individual chemicals upward to reduce false positives

Optimization of chemical concentrations occurs in two steps, an iterative automated step using Excel macros, and a hand-optimization step to address covariance and other issues that cannot be satisfactorily resolved by the macros alone. The Excel macro uses the following approach to conduct the initial optimization:

1. An appropriate incremental increase for testing is calculated for each analyte based on that analyte's complete concentration range (e.g., 1/10 of the difference between the highest and lowest concentration).

2. The number of false positives contributed by each individual analyte is calculated, and the chemical contributing the most false positives is selected to begin the optimization procedure.

3. The concentration for that analyte is increased by the chosen increment.

4. After each incremental increase, false negative and false positive rates are recalculated for the entire SQV set.

5. If the false negative rate increases, the chemical concentration is adjusted back down to its previous level and that chemical is "locked in" at that level.

6. If the false positive rate is reduced to zero, the chemical concentration is locked in at that level.

7. If either of the above two conditions is met, that chemical is completed and the macro moves on to the chemical with the next highest number of false positives. If neither criterion is met, the macro raises the concentration by another increment and repeats steps 4-7.

8. Incremental increases and recalculations continue until every chemical has reached its toxicity threshold or a level at which it has no more false positives.

Through this process, it is possible to identify those analytes having the greatest influence on toxicity in the data set (those whose concentrations cannot be increased without increasing false negatives), and those chemicals having little or no influence on toxicity in the data set (those that can be increased to their highest concentrations with no effect on error rates).

Inspection of the results of the automated process, particularly when various starting percentiles are chosen, also indicates analytes (often metals) with a high covariance in the data set. It may also become apparent that other chemicals, such as PAHs, have relatively little effect individually, but may act in an additive manner to cause toxicity. Because the automated process treats each chemical as acting independently in the data set, this can cause variation in the results depending on the starting values that are chosen, if covariance or additive effects are pronounced in the data set, as was true for this freshwater data set. This effect must be addressed through a final optimization step, requiring judgment on the part of the SQV developer to select the most appropriate values.

The spreadsheets used to develop the SQVs provide a test area, where candidate SQV sets may be adjusted and finalized, and the results of each change tested with respect to all the reliability parameters (this area also allows the operator to enter any criteria set of their choice and test its reliability against the regional data set). The following guidelines were followed in finalizing the criteria sets:

- The resulting SQV sets should be internally consistent within the same hit/no-hit definition. Specifically, chemical concentrations should increase or stay the same as the false negative rate increases and the false positive rate decreases. Developing candidate SQV sets for multiple increasing false negative rates (e.g., 5-25%, in increments of 5%) allows this criterion to be used most effectively.

- The resulting SQV sets should be consistent across different hit/no-hit definitions. Specifically, chemical concentrations should increase as the adverse effects level increases. Using more than two hit/no-hit definitions allows this criterion to be used most effectively.

- The resulting SQV sets should be consistent with toxicological information. For example, metals concentrations should be within the range shown to be toxic in national literature. PAH values should be consistent with narcosis theory. Relative concentrations within chemical classes should be similar to those observed in other data sets and in toxicological literature. Concentrations should not be below regional background concentrations.

- The resulting SQV sets should have equal or better reliability than those produced by the automated macros and all other available methods.

Following each of these guidelines ensures that any anomalies produced by covariance or other interactions between chemicals in the data set are removed and addressed in a scientifically defensible manner.

2.3 Reliability Analysis

Reliability analysis was conducted following the derivation of the AETs, to evaluate their predictive accuracy when used with the regional data set. In addition, reliability analysis was used to select optimal percentiles that could be used as an alternative to AETs, and is an integral part of the iterative process used to calculate the Floating Percentile SQVs. In all three cases, the same measures of reliability were used, listed below. These same measures were used in Phase I to evaluate the reliability of existing SQV sets in North America (SAIC and Avocet, 2002).

- **False Negatives:** hits predicted as no-hits/total number of hits
- **False Positives:** no-hits predicted as hits/total number of no-hits
- **Sensitivity:** hits correctly predicted/total number of hits (100% - % false negatives)
- **2002 Efficiency:** no-hits correctly predicted/total number of no-hits (100% - % false positives)
- **1988 Efficiency:** correctly predicted hits/total predicted hits
- **Reliability:** correct predictions/total stations

False positives and false negatives are the primary measure of predictive errors in the reliability assessment. Each of the other reliability values is related to them in some way. Most of these values can be compared across data sets and SQV types. However, because the denominator of the 1988 efficiency measure varies by SQV set and is not constant with respect to the data set, this measure cannot be compared across SQV sets, or against the results of 1997 freshwater AETs.

2.4 Sensitivity Analysis

The processes described above, especially the automated and hand-optimized iterative processes, provide a great deal of insight into the sensitivity of the results to variations in approaches, initial assumptions and starting conditions, and relationships between analytes in the data set. Additional sensitivity analysis was conducted by comparing side-by-side spreadsheets for individual PAHs and Aroclors vs. summed PAHs and Aroclors, to evaluate the effect of summing certain chemical classes on reliability. In addition, the relative importance of each individual analyte was assessed by dropping out that analyte and noting any changes to reliability of the SQV set. This allows an evaluation of which analytes are critical to include in the SQV set, which are of lesser importance, and which may not be needed at all.

3.0 RESULTS

3.1 Final Data Set

The number and types of bioassay endpoints in the final data set is shown in Table 3-1, comprising 901 distinct sample/test combinations. Tables 3-1 and 3-2 do not include samples that failed quality assurance requirements.

Table 3-1. Bioassays and Endpoints in Final Data Set

Test	No. of Samples
Hyalella azteca 10-day mortality	381
Chironomus tentans 10-day mortality	238
Chironomus tentans 10-day growth	179
Microtox® decrease in luminescence	103

These samples are associated with 319 stations having various combinations of bioassays at each station. Table 3-2 shows the number and percentage of stations associated with biological hits for each effects level.

Table 3-2. Biological Hits at Each Effects Level

Effects Level	Biological Hits Number (Percent)
Statistical significance Comparison to control	204 (64%)
SQS[a] Comparison to control	192 (60%)
CSL[a] Comparison to control	129 (40%)

[a]See Table 2-2 for SQS and CSL definitions

From Table 3-2, it can be seen that there is not a great deal of difference between the statistical significance-only and the SQS comparison. This may be because the SQS levels were chosen based on power analyses reported in ASTM (2000), and are close to the minimum detectable differences that would be expected in these bioassays. Also, there is a good balance between hits and no-hits, so that the data set and reliability measures are not skewed or dominated by one or the other. When developing SQVs, it is helpful to have a balanced data set between toxic and non-toxic samples, so that the distributions are more likely to contain the actual toxicity thresholds and the thresholds are less likely to be located within the tails of the distributions.

3.2 2003 Apparent Effects Thresholds

2003 Apparent Effects Thresholds for four bioassay endpoints are listed in Table 3-3, along with a comparison to the 1997 AETs. Lowest AETs (LAETs) and second-lowest AETs (2LAETs) are also shown, since in the marine program, these have been used as the SQS and CSL standards, respectively. The chemical distributions used in calculating the 2003 AETs are provided in Appendix B.

Table 3-3. 2003 Apparent Effects Thresholds

Analyte	Hyalella Mortality	Chironomus Growth	Chironomus Mortality	Microtox® Lumin.	2003 LAET	2003 2LAET	1997 AET Microtox®	1997 AET Hyalella
Antimony	**4.4**	0.6	1.9	> 5.1	0.6	1.9	3	64
Arsenic	200	**31.4**	**50.9**	**123**	31.4	50.9	40	150
Beryllium	> 2	--	0.46	--	0.46	--	--	--
Cadmium	9.1	> 5.6	**2.39**	**2.9**	2.39	2.9	7.6	12
Chromium	> 348	133	133	**95**	95	133	--	280
Copper	2010	**829**	**619**	1460	619	829	--	840
Lead	> 1310	1160	**335**	**431**	335	431	260	720
Mercury	3.74	3.04	**0.8**	3.04	0.8	3.04	0.56	2.7
Nickel	113	113	113	**53.1**	53.1	113	46	--
Silver	3.5	> 3.3	> 3.3	**0.545**	0.545	3.5	--	4.5
Zinc	> 4150	**1080**	**683**	**1130**	683	1080	520	3200
Monobutyltin	> 4850	--	**98**	**459**	98	459	--	--
Dibutyltin	> 1930	--	**96**	--	96	--	--	--
Tributyltin	> 15700	6650	**260**	--	260	6650	--	--
2-Methylnaphthalene	**710**	1770	**555**	**469**	469	555	--	--
Acenaphthene	**7420**	**1320**	**6290**	**1060**	1060	1320	4100	100000
Acenaphthylene	**1020**	1260	**470**	**640**	470	640	2200	2600
Anthracene	**16200**	**1580**	**1900**	**1230**	1230	1580	2800	41000
Benz(a)anthracene	**44000**	**11000**	**5800**	**4260**	4260	5800	7700	33000
Benzo(a)pyrene	**55000**	**14000**	**3300**	4810	3300	4810	11000	25000
Benzo(bk)fluoranthenes	**79000**	**19900**	**13800**	11000	11000	13800	16000	34000
Benzo(ghi)perylene	**12100**	**11000**	**5200**	4020	4020	5200	1400	21000
Chrysene	**46000**	**11000**	**6400**	5940	5940	6400	11000	39000
Dibenz(ah)anthracene	**3070**	2600	**800**	839	800	839	230	3500
Fluoranthene	**46100**	**15000**	**16700**	**11100**	11100	15000	21000	130000
Fluorene	**6970**	**3850**	**3890**	**1070**	1070	3850	4200	96000
Indeno(123-cd)pyrene	**18000**	**18000**	**5300**	4120	4120	5300	760	15000
Naphthalene	**5630**	4970	**529**	**1310**	529	1310	46000	140000
Phenanthrene	**41100**	**7570**	**8950**	**6100**	6100	7570	15000	210000
Pyrene	**68000**	**16000**	**18000**	**8790**	8790	16000	23000	85000
LPAHs	**78300**	41970	**6590**	**9200**	6590	9200	74000	440000
HPAHs	**471000**	**120500**	**31640**	**54800**	31640	54800	91000	310000
4-Methylphenol	2360	--	**760**	--	760	2360	--	--
Benzoic Acid	3790	--	**2910**	--	2910	3790	--	--
Bis(2-ethylhexyl)phthalate	22300	**6380**	**7590**	**2520**	2520	6380	750	--

Analyte	Hyalella Mortality	Chironomus Growth	Chironomus Mortality	Microtox® Lumin.	2003 LAET	2003 2LAET	1997 AET Microtox®	1997 AET Hyalella
Butylbenzyl phthalate	> 1520	366	980	**260**	260	366	--	--
Dimethyl phthalate	436	> 576	**311**	436	311	436	--	--
Di-n-butyl phthalate	> 1740	> 1740	**103**	> 1740	103	--	--	43
Di-n-octyl phthalate	**201**	399	256	11	11	201	--	--
Carbazole	**923**	--	--	--	923	--	140	1800
Dibenzofuran	**660**	**1010**	**443**	**399**	399	443	--	32000
Retene	**6020**	--	--	--	6020	--	--	--
4,4-DDD	96	--	> 96	--	96	--	--	--
4,4-DDE	21	--	> 20	--	21	--	--	--
4,4-DDT	**19**	--	--	--	19	--	--	--
Aroclor 1254	> 1060	294	340	**230**	230	294	7.3	350
Aroclor 1260	500	**138**	**184**	140	138	140	--	--
Total PCBs	2090	394	**354**	62	62	354	21	820
Phosphorus	> 3290	--	> 3290	--	--	--	--	--
Sulfides	941	--	702	--	702	941	130	920
Total Organic Carbon	> 25	> 21.3	**9.82**	> 21.3	9.82	--	14	25

Units: Metals and nutrients in mg/kg, organics in µg/kg, butyltins in µg/kg ion, TOC in percent
Bold: High-confidence AETs
Non-Bold: Lower-confidence AETs

One thing to note is that not all AETs have the same degree of confidence. An AET was considered a lower-confidence AET if any of the conditions below apply:

- The AET is a “greater than” value
- The AET has only one or two hit values above it
- The AET was developed from a no-hit distribution of less than three values

In the table above, PAHs have an average of three high-confidence AETs, the highest percentage of any chemical class. Metals averaged two high-confidence AETs and two lower-confidence AETs. Organic chemicals other than PAHs tended to have fewer AETs overall and closer to 75% low-confidence AETs. The number of AETs is an indication of how often that chemical was analyzed for and/or detected in the surveys, while the percentage of high-confidence AETs tends to be a measure of natural variability in the data with respect to bioavailability, as well as the possible lack of toxicity thresholds for some chemicals within their concentration distributions.

The 2003 AETs as a whole are a clear improvement over the 1997 AETs in several ways. First, two additional endpoints have been added for *Chironomus.* These AETs are generally between the *Hyalella* and Microtox® AETs in sensitivity, providing a more complete distribution of bioassay sensitivities. Also, the *Hyalella* and Microtox® AETs have been strengthened by removal of the anomalous MBCREOS1 and MBCREOS2 surveys, as well as a number of other older data sets with very few replicates and out-of-date protocols. The addition of many newer surveys to these biological data sets has allowed calculation of more robust AET values. It is interesting to note that the result in most cases is to decrease many of the *Hyalella* AETs and increase some of the Microtox® AETs, which together with the *Chironomus* AETs, creates a more consistent set of AETs for each chemical.

The reliability of the 2003 AETs is shown in Table 3-4. The reliability of each of the bioassay-specific AETs was assessed only against that bioassay's data set, while the reliability of the LAET was assessed against the pooled data set at the SQS effects level, and the reliability of the 2LAET was assessed against the pooled data set at the CSL effects level. In each case, the reliability of the AETs was assessed as a complete set of AETs, rather than by individual chemical.

Table 3-4. Reliability of 2003 Apparent Effects Thresholds

Measure of Reliability (%)	Hyalella Mortality	Chironomus Growth	Chironomus Mortality	Microtox® Lumin.	2003 LAET	2003 2LAET
False Negatives	78	33	60	19	35	57
False Positives	2	4	2	14	11	6
Sensitivity	22	67	40	81	65	43
2003 Efficiency	98	96	98	86	89	94
1988 Efficiency	88	83	93	94	93	87
Overall Reliability	67	91	75	83	73	69

The first four columns represent the reliability of each set of AETs in representing the bioassay data from which they were derived. In other words, how well do the chemical criteria actually do in predicting hits within their own data set? Here it can be seen that the AETs for the two mortality tests are the least accurate at predicting hits and the least sensitive, while the error rates for the subchronic endpoints are lower and more sensitive. The Microtox® AETs are the best at predicting hits in the data set from which they were derived, and have both low false negative and low false positive rates. This could be because variations in bioavailability are relatively well controlled in the Microtox® test – the pH, oxygenation, alkalinity, and salinity of the water in which the test is conducted is carefully controlled. This could tend to buffer natural variations in bioavailability, especially in metals, much as is the case in marine water and sediments. As can be seen from a close inspection of the Microtox® data, the variability among replicates for this test is far lower than for any of the other bioassays.

The relatively poor performance of the AETs for mortality endpoints is difficult to explain, unless it is related to the fact that these are older tests, and the existing historical database may contain surveys run under varying conditions, with organisms from varying sources. The variation among replicates in these tests is typically not very high, especially compared to a growth test, and there are typically no significant quality assurance problems with these tests. Therefore, the relative inability of the highest no-hit value to accurately predict hits within the mortality data sets must be related either to greater susceptibility of this endpoint to natural variations in bioavailability, or to laboratory variations within the historical data set.

The LAET has a reasonably low error rate compared to the individual bioassay AETs or the 2LAET. AETs are meant to be used in a pooled manner, with the LAET as a regulatory threshold, so these reliability values are more relevant than those for the individual bioassays. However, SQS is narratively defined as a level below which adverse effects are not observed, and the false negative error rates associated with the LAET (35%) may not meet that narrative goal. In addition, the errors tend to be weighted toward more false negatives than false positives, which may not be appropriate for a lower screening level.

Similarly, the 2LAET may have more false negatives than would be desirable at that level. The CSL is intended as a level below which only minor adverse effects would occur, and above which more significant adverse effects are expected. Keeping in mind that the reliability calculations for the 2LAET were conducted against a biological CSL definition, the 2LAET failed to identify 57% of the hit stations even at this higher level of adverse effects. On the other hand, the 2LAET has very high efficiency, and above this level, one could be nearly certain that adverse effects would occur and there would be little value in conducting biological testing. Therefore, it could be useful as an ML in the dredging program, or a hot spot or early action level in the cleanup program.

The sensitivities of the LAET and the 2LAET are surprisingly low, considering the proven success and protectiveness of these levels when used as the SQS and CSL in marine sediment programs. This is very likely due to the greater heterogeneity of freshwater environments, and the variation in bioavailability of metals (in particular) in these environments. In marine systems, water and sediments are fairly well buffered, and one would expect metals toxicity thresholds to be roughly the same in most areas. However, toxicity thresholds for metals may vary greatly in freshwater, resulting in some no-hit values that are higher than toxicity thresholds for the same metal in other areas. It is possible that this approach would have more success if the freshwater data set were stratified by ecoregion or geochemical environment, and AETs calculated for each region.

For state-wide SQVs, the highest no-hit value may not be protective of all areas of the state, whereas the same would not be expected in the marine environment. This conclusion is supported by the Floating Percentile calculations (see Section 3.4), which indicate that the AETs for PAHs are appropriate, but the AETs for many metals are too high. Lowering certain metals' SQVs improves the sensitivity without a loss of efficiency.

3.3 Optimal Percentiles

As an alternative to AETs, the hit and no-hit distributions were evaluated to identify percentiles with a higher sensitivity, with efficiency also as high as possible. False negative rates of 5, 10, 15, 20, and 25% (sensitivity of 75-95%) were chosen as the target levels. Tables 3-5, 3-6, and 3-7 show the optimal percentiles and their associated reliability for each of these target levels, and for each of the adverse effects definitions being evaluated (statistical significance only, SQS, and CSL).

Although percentiles of the hit distribution were evaluated, in each case they were equal to or less reliable than percentiles of the no-hit distribution, within ± one percent. Therefore, in each case, the optimal percentile is that percentile of the no-hit distribution that comes closest to (without exceeding) the target false negative rate, and has the lowest false positive rate of the percentiles that meet the target false negative rate. Appendix C provides tables of the chemical concentrations associated with the 15 sets of optimal percentiles.

In the tables below, the first number in each pair is from the spreadsheets in which individual PAHs and Aroclors were retained, and the second number is from the spreadsheets in which individual PAHs and Aroclors were summed.

Table 3-5. Optimal Percentiles for Statistical Significance Only Effects Level

Measure of Reliability (%)	95% Sensitivity	90% Sensitivity	85% Sensitivity	80% Sensitivity	75% Sensitivity
Optimal Percentile	51st / 51st	66th / 66th	77th / 71st	83rd / 81st	90th / 88th
False Negatives	5 / 5	10 / 10	15 / 14	19 / 19	25 / 25
False Positives	70 / 68	54 / 50	42 / 43	37 / 34	26 / 22
Sensitivity	95 / 95	90 / 90	85 / 86	81 / 81	75 / 75
2003 Efficiency	30 / 32	46 / 50	58 / 57	63 / 66	74 / 78
1988 Efficiency	78 / 79	82 / 83	84 / 84	85 / 86	89 / 90
Overall Reliability	77 / 78	78 / 79	78 / 78	76 / 77	75 / 76

Table 3-6. Optimal Percentiles for the SQS Effects Level

Measure of Reliability (%)	95% Sensitivity	90% Sensitivity	85% Sensitivity	80% Sensitivity	75% Sensitivity
Optimal Percentile	52nd / 52nd	67th / 66th	78th / 71st	83rd / 81st	91st / 88th
False Negatives	5 / 5	10 / 10	15 / 15	20 / 20	24 / 25
False Positives	69 / 68	51 / 51	42 / 44	35 / 32	24 / 24
Sensitivity	95 / 95	90 / 90	85 / 85	80 / 80	76 / 75
2003 Efficiency	31 / 32	49 / 49	58 / 56	65 / 68	76 / 76
1988 Efficiency	76 / 76	80 / 80	82 / 82	84 / 85	88 / 88
Overall Reliability	76 / 76	78 / 78	77 / 77	76 / 76	76 / 75

Table 3-7. Optimal Percentiles for the CSL Effects Level

Measure of Reliability (%)	95% Sensitivity	90% Sensitivity	85% Sensitivity	80% Sensitivity	75% Sensitivity
Optimal Percentile	63rd / 63rd	65th / 65th	72nd /72nd	77th / 76th	82nd / 80th
False Negatives	5 / 5	9 / 10	13 / 15	20 / 19	25 / 25
False Positives	59 / 57	57 / 54	50 / 48	43 / 43	37 / 38
Sensitivity	95 / 95	91 / 90	87 / 85	80 / 81	75 / 25
2003 Efficiency	41 / 43	43 / 46	50 / 52	57 / 57	63 / 62
1988 Efficiency	62 / 62	62 / 62	63 / 64	65 / 65	67 / 66
Overall Reliability	68 / 69	67 / 68	68 / 69	68 / 69	69 / 69

It is important to keep in mind when reviewing these numbers that the hit and no-hit distributions are not the same for each effects level. Each hit and no-hit distribution is created by applying a different level of biological effects to the overall data set. Nevertheless, the results for the statistical significance only and the SQS adverse effects levels are quite similar, as are the distributions created by these two biological effects definitions, for the reasons discussed in Section 3.2.

From these tables, it can be seen that the optimal percentiles for reasonably sensitive SQVs would be somewhere in the range of the 50th to the 90th percentile of the no-hit distribution, or for the CSL level, a somewhat smaller range of the 60th to the 80th percentile. The individual and summed versions perform almost identically, suggesting that the summed distributions are reasonably representative and could be used in place of the individual distributions for PAHs and PCBs.

False positive error rates are still quite high until the 80% and 75% sensitivity levels are reached, at which point there begins to be more balance. Ideally, a set of SQVs could be developed in the higher sensitivity ranges with lower false positive rates. To develop such SQVs, these optimal percentiles were used as starting points for the Floating Percentile optimization process, discussed in Section 3.4 below.

3.4 Floating Percentile SQVs

Using the process described in Section 2.2, SQV sets were derived with optimized sensitivity and efficiency, shown in Tables 3-8 through 3-10 below. As in the previous section, these tables show results for five different choices of false negative rates, at three different effects levels – statistical difference from control, an effects level equivalent to the SQS, and an effects level equivalent to the CSL (see Table 2-2 for details of these biological effects levels).

In the tables below, the first number of each pair provides results for the SQV sets with individual PAHs and Aroclors, and the second number shows results for the SQV sets with summed PAHs and Aroclors.

Table 3-8. Floating Percentile Results for Statistical Significance Only Effects Level

Measure of Reliability (%)	95% Sensitivity	90% Sensitivity	85% Sensitivity	80% Sensitivity	75% Sensitivity
False Negatives	4 / 5	10 / 10	15 / 15	20 / 20	25 / 25
False Positives	55 / 57	39 / 42	26 / 33	20 / 28	16 / 24
Sensitivity	96 / 95	90 / 90	85 / 85	80 / 80	75 / 75
2003 Efficiency	45 / 43	61 / 58	74 / 67	80 / 72	84 / 76
1988 Efficiency	82 / 82	86 / 85	89 / 85	92 / 89	93 / 89
Overall Reliability	82 / 81	82 / 81	82 / 81	81 / 78	78 / 75

Table 3-9. Floating Percentile Results for the SQS Effects Level

Measure of Reliability (%)	95% Sensitivity	90% Sensitivity	85% Sensitivity	80% Sensitivity	75% Sensitivity
False Negatives	5 / 5	10 / 10	15 / 15	20 / 20	25 / 25
False Positives	57 / 55	44 / 45	26 / 33	20 / 26	15 / 23
Sensitivity	95 / 95	90 / 90	85 / 85	80 / 80	75 / 75
2003 Efficiency	43 / 45	56 / 55	74 / 67	80 / 74	85 / 77
1988 Efficiency	79 / 80	82 / 82	88 / 85	90 / 87	92 / 88
Overall Reliability	80 / 80	80 / 80	82 / 80	80 / 78	78 / 76

Table 3-10. Floating Percentile Results for the CSL Effects Level

Measure of Reliability (%)	95% Sensitivity	90% Sensitivity	85% Sensitivity	80% Sensitivity	75% Sensitivity
False Negatives	5 / 5	10 / 10	15 / 15	20 / 20	25 / 25
False Positives	50 / 50	37 / 44	26 / 24	23 / 17	21 / 16
Sensitivity	95 / 95	90 / 90	85 / 85	80 / 80	75 / 75
2003 Efficiency	50 / 50	63 / 56	74 / 76	77 / 83	79 / 84
1988 Efficiency	66 / 65	71 / 67	76 / 78	77 / 82	78 / 83
Overall Reliability	73 / 72	77 / 73	80 / 81	79 / 82	78 / 80

This process results in an overall lowering of the false positive rates associated with each level of sensitivity, which in turn allows selection of SQVs with higher sensitivity, in the 90-80% range (for example). Comparison of the unsummed values with the summed values indicates that summing the PAHs and Aroclors gives mixed results. At lower effects levels, this approach tends to result in slightly less reliable SQVs, while at higher effects levels the balance shifts toward slightly greater reliability in the 85% to 75% sensitivity range.

This approach provides a range of options for Ecology to choose among in setting SQS and CSL-equivalent levels for use in Ecology's sediment management programs, depending on the level of protectiveness desired, the level of errors that are considered acceptable, and whether or not a summing approach is utilized. Tables showing chemical concentrations associated with each of the 30 options explored above are included in Appendix D. One example of a set of SQS and CSL guidelines that could be selected is shown in Table 3-11 below, using SQS and CSL effects levels, the mid-point of the sensitivity options above (85%), and individual PAHs. This example is associated with 15% false negatives, approximately 25% false positives, and better than 80% overall accuracy. ***This example is provided for discussion purposes only – final SQVs will be selected by Ecology and may differ from the values shown.***

Table 3-11. Example SQS and CLS Values Based on Floating Percentile Approach

Analyte	SQS	CSL
Antimony	0.4	0.6
Arsenic	20	51
Cadmium	0.6	1.0
Chromium	95	100
Copper	80	830
Lead	335	430
Mercury	0.50	0.75
Nickel	60	70
Silver	2.0	2.5
Zinc	140	160
Tributyltin	75	75
2-Methylnaphthalene	470	560
Acenaphthene	1060	1320
Acenaphthylene	470	640

Analyte	SQS	CSL
Anthracene	1200	1580
Benz(a)anthracene	4260	5800
Benzo(a)pyrene	3300	4810
Benzo(bk)fluoranthenes	11000	14000
Benzo(ghi)perylene	4020	5200
Chrysene	5940	6400
Dibenz(ah)anthracene	800	840
Fluoranthene	11000	15000
Fluorene	1000	3000
Indeno(123-cd)pyrene	4120	5300
Naphthalene	500	1310
Phenanthrene	6100	7600
Pyrene	8800	16000
LPAHs	6600	9200
HPAHs	31000	54800
Bis(2-ethylhexyl)phthalate	230	320
Butylbenzyl phthalate	260	370
Dimethyl phthalate	46	440
Di-n-octyl phthalate	26	45
Dibenzofuran	400	440
Total PCBs	60	120

Units: Metals in mg/kg, organics in µg/kg, butyltins in µg/kg ion

One immediately apparent attribute of this set of SQVs is that the metals are relatively low, while the PAHs are relatively high. Some of the metals concentrations fall as low as those of other North American SQV sets, such as TELs, while most of the PAH concentrations are much higher, similar to AETs in concentration. For the most part, the metals values shown here could not be raised at all without increases (in some cases dramatic) in the false negative rates, indicating that metals are toxic at these low levels in freshwater environments, at least in some forms and environments where they are more bioavailable. There may also be sites where metals are not toxic at these levels, indicating natural variability in substrate and environment, as well as variability in the form of the metal (e.g., grit particles vs. more soluble forms).

The individual PAH values did not affect toxicity in this data set to any great degree, and each one could be raised to its highest concentration (or eliminated from the data set altogether) without any impact on any of the reliability measures. This is a result of the PAHs all covarying to a strong degree. In order to address this issue and provide a measure of safety, PAH and other organic chemicals' SQVs were not allowed to rise above the LAET for SQS values or the 2LAET for CSL values.

3.5 Sensitivity Analysis

Once all of the above steps had been completed, individual chemicals (and groups of chemicals) were dropped out of the spreadsheets to identify those that had a strong influence on toxicity and error rates in the data set, and those that do not appear to affect the predictiveness of the SQVs. Chemicals were classified as follows:

- **Strong Influence:** In every version of the SQVs, these chemicals affected the reliability of the SQVs if removed from the data set: Antimony, zinc, bis(2-ethylhexyl) phthalate, total PCBs, individual PAHs (when removed as a group), and the molar sum of PAHs.

- **Lesser Influence:** In some SQV sets but not others, removal of these chemicals affected the reliability of the SQVs: Arsenic, cadmium, copper, mercury, tributyltin, and di-n-octyl phthalate.

- **Little or No Influence:** In no case did removal of these chemicals or chemical groups affect the reliability of the SQVs: Chromium, lead, nickel, silver, individual PAHs (removed one at a time), LPAH, HPAH, dibenzofuran, individual Aroclors (removed singly or as a group), butyl benzyl phthalate, and dimethyl phthalate.

These results may reflect one or both of the following phenomena. First, the list may indicate decreasing contributions to toxicity in the data set from the top to the bottom categories. Second, covariance may play a strong role for some chemicals. Chemicals in the “Strong Influence” list are almost certainly associated with adverse effects and act largely independently of other chemicals – or act as a good surrogate for other chemicals that are important to toxicity. Chemicals in the “Lesser Influence” list also have some toxicity, and most likely have strong covariances with other chemicals on the list, so that at times their influence is obscured. Chemicals in the “Little or No Influence” list either are not very toxic at the concentrations in the data set, or covary so strongly with other chemicals that their individual influence cannot be observed. Some, such as the metals, may be somewhat toxic on their own, but nearly always occur with more toxic or higher-concentration metals.

Other chemical groups, such as the PAHs and PCBs, may exert their toxicity primarily in an additive manner. The results of the sensitivity analysis showed that the LPAH and HPAH measures are not particularly useful as additive measures of PAH toxicity. When the individual PAHs were removed, these two measures by themselves were not able to produce good reliability. Use of either SQVs for individual PAHs capped at the AETs (without LPAH and HPAH) or a summed molar PAH concentration was more reliable. The sensitivity analysis also showed that only the total PCB measure affected the reliability of the SQVs; it is not necessary to have additional guidelines for individual Aroclors.

It should be noted that these SQVs are optimized to this data set and were derived from it. Future data sets may have different combinations of chemicals that could vary the results above somewhat. While it is not likely that “strong influence” chemicals would become “no influence” chemicals or vice versa, it may not be appropriate to immediately drop all chemicals in the “no influence” list from the SQVs. A more protective approach would be to set the SQVs for these chemicals at their AET or the level above which no false positives occur, to ensure that there are some minimal criteria for these chemicals in case they are unusually important at certain sites.

4.0 CONCLUSIONS AND RECOMMENDATIONS

In summary, the following observations and conclusions can be drawn:

- The freshwater data set is considerably stronger than it was in 1994, and has been improved from a quality assurance standpoint. The current database allows for the calculation of two additional AETs, for a total of four acute and subchronic endpoints. Unfortunately, no benthic or chronic freshwater tests have enough data to allow calculation of AETs.

- There is still a lack of data for a variety of pesticides, herbicides and biocides, among other chemicals. These chemicals may be important in areas of the state that have not been widely sampled, particularly in central and eastern Washington. At sites or locations in which these chemicals are likely to be present, the AETs and other SQVs derived in this report may not provide adequate protectiveness, and bioassay testing should be undertaken on a site-specific basis. In addition, it is possible that lack of these analytes in the existing data set reduced the sensitivity of the AETs as well as the other SQVs calculated, if they contributed to observed toxicity in the bioassays.

- The 2003 AETs are more consistent with one another, and encompass a broader range of analytes. Due to the removal of older data not meeting current protocols, the four AETs fall within a narrower range for most chemicals than did the two previously calculated 1997 AETs. In general, the *Hyalella azteca* AETs were the least sensitive, the two *Chironomus* AETs were in the middle, and the Microtox® AET was the most sensitive.

- The freshwater AETs are not as sensitive as the marine AETs are in Puget Sound, most likely due to variations in metals bioavailability from one area to the next. Pooled sensitivity ranges from 45-65%, while efficiency is much higher, ranging from 87-93%. Overall reliability is about 70%. The two mortality bioassays exhibit the lowest sensitivity and reliability.

- Use of optimal percentiles of the no-hit distribution improves sensitivity, and shows a reasonable balance - in the 75-80% sensitivity range, with a corresponding efficiency of 60-80%.

- Use of the floating percentile method further improves the sensitivity and efficiency, resulting in SQVs with a sensitivity of 85% and efficiency of 75%, and an overall reliability of better than 80%. Other choices of sensitivity and efficiency are possible, and a range of potential guideline values was calculated to illustrate the trade-offs involved.

- Metals, certain phthalates, PCBs, and PAHs acting in an additive manner are most closely associated with toxicity in the data set. There is a significant degree of covariance among many of the metals and among the PAHs, which complicates calculation of the SQVs.

The following recommendations are provided, based on the conclusions above and supporting analyses:

- Standard AETs are not recommended for setting freshwater SQS and CSL values at this time, because of their relatively low sensitivity. The freshwater AETs are nevertheless useful for other purposes within the sediment management programs, because they are highly efficient. Above these levels, it is nearly certain that adverse effects will be observed. Therefore, they would be appropriate as MLs in the dredging programs, and as hotspot and early action levels in the cleanup programs. In addition, for those chemicals that covary sufficiently that individual toxicity thresholds cannot be identified using iterative methods, the AETs serve as an appropriate method for setting SQVs, providing an upper limit and a measure of safety against future data sets that may not covary in the same ways.

- As an alternative to AETs, the Floating Percentile method is recommended over the optimal percentile approach, because it allows SQVs to be developed that improve both sensitivity and efficiency over fixed-percentile methods. Using this method, it is possible to develop an optimized SQV set for any choice of false negative rate and any definition of adverse effects determined to be appropriate to a given program. The method is also capable of providing customized SQVs for a given region, should it be considered appropriate to stratify the freshwater data set into ecoregions, watersheds, or political boundaries.

- Within the range of adverse effects levels evaluated in this report, it is recommended that Ecology retain use of the biological SQS and CSL levels, as defined in the Phase I report (subject to agency and peer review), rather than using a statistical significance only comparison. The SQS and CSL biological effects levels are more consistent with the existing rules and marine programs. The results of this analysis indicate that the statistical significance only level is not very different from the SQS level in any case, most likely because the SQS thresholds were selected based on minimum detectable differences observed in recent round robin studies.

- Based on the evaluations conducted for the Phase I report, it is recommended that Ecology use a comparison to control rather than a comparison to reference for calculating SQVs. Once freshwater reference areas have been identified and their performance validated over time, the decision of whether to use reference or control comparisons can be made on a programmatic basis. However, the Phase I reliability analysis indicated that if a decision is made to use reference comparisons, they must be used consistently on all projects and not mixed with comparisons to control, or the reliability of the decision process will substantially decline.

- Within the range of false negative rates for which example SQV sets were developed (5-25%), it is recommended that a level be chosen that balances false negative and false positive rates, but with more weight given to reducing false negative errors. For both the SQS and CSL effects definitions, this level is around 15% false negatives, corresponding to 25% false positives and an overall 80+% reliability. However, other choices may also be appropriate depending on programmatic needs.

It is important to keep in mind when considering this factor that the error rate is not the same as the degree of protectiveness, although there is a relationship. In other words, a 5% false negative rate is not equivalent to protecting 95% of the species, or a 5% effects level. The adverse effects level and hence the protectiveness of the SQVs is set by the hit/no-hit definition; the error rate shows how accurately the chemical SQVs predict the chosen biological effects level for the existing data set.

- It is recommended that PCB criteria be set only for total PCBs, rather than individual Aroclors, based on the sensitivity analysis. The manner in which total PCBs should be calculated when congener data are available was outside the scope of this study (since congener data were not present in the data set); however, this will be important to address in the future.

- It is also recommended that LPAH and HPAH measures not be used, based on the sensitivity analysis. For PAHs, two alternative approaches could be used, which seem to provide roughly the same sensitivity and reliability. A single SQV can be set using a molar sum of PAHs, consistent with narcosis theory. Alternatively, SQVs for individual PAHs can be set using the freshwater AETs.

- It is recommended that areas of the state susceptible to contamination by pesticides, herbicides, and other chemicals not well-represented in the existing data set be further sampled, using synoptic chemistry and bioassay testing. This will allow additional SQVs to be calculated that will provide greater protection in these areas.

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Appendix A

APPENDIX A. LIST OF SURVEYS

Survey	*Chironomus*	*Hyalella*	Microtox®	Description
BOISECAS	0	4	0	Class II Inspection of the Boise Cascade Pulp and Paper Mill Wallula Washington, WA Dept. of Ecology EILS, 1993
CARGIL01	3	3	0	Cargill Irving Elevator Terminal, Cargill Irving, 2001
CBSLOUGH	0	20	0	Columbia Slough Sediment Analyses and Remediation Project, Phase 1 Report, Dames & Moore for City of Portland, 1991
CEDARIV	0	5	5	Sediment Sampling and Analysis Report Cedar River Delta Sediments, Golder Assts. for City of Renton, 1992
LCBWRS93	0	15	0	Lower Columbia River Backwater Reconnaissance Survey, TetraTech for Lower Columbia River Bi-State Program, 1994
LKUNDRDK	0	4	0	Sediment Monitoring Program Results Lake Union Drydock Company, Hart Crowser, 1992
LKUNION	0	9	0	Survey of Contaminants in Lake Union and Adjoining Waters, WA Dept. of Ecology EILS, 1989
LKWA00	28	28	27	Lake Washington Baseline Sediment Study, King County, 2000
LSAMM99	16	16	0	Lake Sammamish Baseline Sediment Study, King County, 1999
LUUCSO00	6	6	6	Lake Union University Regulator CSO Post Separation Study, King County, 2000
MBCREOS3	43	43	0	McCormick & Baxter RD Phase I Sediment Survey, Oregon DEQ, 2002
MBCREOS4	18	18	0	McCormick & Baxter RD Phase II Sediment Survey, Oregon DEQ, 2002
PPTLDT24	4	4	0	Sediment Characterization Study, Marine Terminal 2 Berths 203-206 and Marine Terminal 4 Berth 416, Hart Crowser for Port of Portland, 1999
PSYD&M97	0	3	0	Portland Shipyard Environmental Audit, Dames & Moore for Cascade General, 1998
PSYSEA98	55	55	55	Portland Shipyard Sediment Investigation Data Report, Striplin Env. Assts. for Port of Portland, 1998
QUEBAX1	0	4	0	Distribution and Significance of Polycyclic Aromatic Hydrocarbons in Lake Washington Sediments Adjacent to Quendall Terminals, WA Dept. of Ecology EILS, 1991
QUEBAX3	0	3	0	Results of Sediment Sampling in the JH Baxter Cove Lake Washington, WA Dept. of Ecology EILS, 1992
ROSSIS99	11	11	0	Ross Island Facility Site Investigation, Hart Crowser for Port of Portland, 2000
SALIII97	22	22	22	Salmon Bay Results of Phase III Sampling, WA Dept of Ecology EAP, 2000
SEACOM94	0	3	3	Sediment Sampling Report Seattle Commons Parcel C Seattle, Washington, 1994
SPOK2000	0	0	8	Chemical Analysis and Toxicity Testing of Spokane River Sediments Collected in October 2000, WA Dept. of Ecology EAP, 2001
SPOKNR94	0	3	3	Spokane River PCB Study, WA Dept of Ecology EILS, 1994
TOSCO99	2	2	0	TOSCO Portland Terminal, 1999 Sediment Sampling Results, Portland District Corps of Engineers, 1999
TRI-STAR	0	3	0	Tri-Star Marine NPDES Sediment Monitoring, Beak Consultants, 1997
VALCOA93	0	4	0	Aluminum Company of America; Vancouver Works Baseline Sediment Characterization, ENSR for WA Dept. of Ecology, 1994
WEYLONG	0	3	0	Class II Inspection of Weyerhaeuser Longview Pulp and Paper Mill, WA Dept. of Ecology EILS, 1991
WILREF02	3	3	0	Willamette Reference Survey, Hart Crowser for the Portland District Corps of Engineers, 2002
WLRPT498	18	18	0	Terminal 4 Slip 3 Sediment Investigation, Hart Crowser for Port of Portland, 1998
WRD&M98	0	2	0	Portland Shipyard Environmental Audit, Dames & Moore for Cascade General, 1998
TOTAL	**229**	**314**	**129**	

Notes:
1. *Chironomus* column includes both mortality and growth endpoints
2. Totals may not match text, as some samples failed quality assurance review during the analysis

Appendix B

APPENDIX B. 2003 APPARENT EFFECTS THRESHOLDS CHEMICAL DISTRIBUTIONS

Chemical distributions for the AETs reported in Section 3 are presented in this appendix. Each chemical has a no-hit (no adverse effects observed) distribution and a hit (adverse effects observed) distribution. Prior to identifying AETs, outliers are removed from the no-hit distribution, and any such outliers that have been removed are shaded in yellow. The AET is set at the highest remaining no-hit concentration. AETs are shaded dark blue if they are high confidence and light blue if they are lower confidence. The next highest concentration in the hit distribution above the AET is shaded green. The concentration gap between the blue AET and the green next highest concentration shows the magnitude of the uncertainty in the AET.

HYALELLA MORTALITY									
2-Methylnaphthalene	**2-Methylnaphthalene**	**4,4'-DDD**	**4,4'-DDD**	**4,4'-DDE**	**4,4'-DDE**	**4,4'-DDT**	**4,4'-DDT**	**4-Methylphenol**	**4-Methylphenol**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
0.7	0.95	0.6	0.8	0.5	0.8	0.73	2	7.3	36
0.76	1.5	0.7	5	0.76	2	1.4	3	11	41
1.1	1.9	0.7	7	0.8	4	3	3	16	48
1.2	2.2	0.77	8	0.8	5	3	5	16	50
1.3	11	0.9	8	0.9	5	5	6.1	24	63
1.6	12	0.99	8.9	1.2	6	5.2	7	24	117
1.7	13	1	11	2	6.5	10	7.9	50	198
2.2	13	1.3	14	2	6.7	13	10	77	215
2.7	13	1.6	20	2	6.8	13	10	130	382
3.2	14	2	22	3	8	19	12	150	699
4.2	15	3	27	3	8	100	19	150	710
5.1	15	3	30	3	8		23	159	760
10	16	3.4	49	3.2	8.6		24	180	1560
11.7	18	4.7	59	3.8	11		26	188	1730
12	20	5.6	310	4.6	11		39	239	2030
15	24	6.5		6.9	20		140	476	3590
16	28	7		7.3	22		140	512	6310
18	28	7.5		7.4	44			551	
35	30	8.3		7.8				599	
62	35	9.2		8.3				1210	
141	36	12		8.9				2360	
160	52	16		9					
170	54	22		9.6					
180	56	24		11					
180	64	33		14			AET - low confidence		
214	65	45		18			AET - high confidence		
353	87	50		19			next highest hit value		
469	94	52		20			outlier		
555	120	70		20					
710	143	96		21					
3470	188								
	189								
	443								
	877								
	982								
	1720								
	1770								
	2300								
	2310								
	4700								
	40000								
	42000								
	110000								
	460000								
	1600000								

HYALELLA MORTALITY											
Acenaphthene	**Acenaphthene**		**Acenaphthylene**	**Acenaphthylene**	**Anthracene**	**Anthracene**		**Antimony**	**Antimony**	**Aroclor 1254**	**Aroclor 1254**
No-Hit	**Hit**	**Hit (Cont.)**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**Hit (Cont.)**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
0.72	1.3	2940	1	1.7	1.2	1.9	1130	0.05	0.1	7.3	11
1.2	2.2	5700	1.1	2.2	1.2	2.7	1400	0.06	0.1	11	16
1.3	3	6290	1.2	9.93	1.9	3.2	1520	0.1	0.1	12	18
1.6	11	7390	1.3	11	2.1	4.9	1580	0.1	0.2	17	24
1.7	11	20000	2.5	12	2.3	10	1700	0.13	0.2	25	37
1.7	12	20800	2.5	12	2.6	11	1900	0.14	0.2	35	47
1.8	12	25000	3.2	12	3.1	11.7	1900	0.2	0.2	57	51
2.7	14	26000	3.3	13	4.9	12	2860	0.2	0.2	70	52
3.4	14	29600	3.5	14	5	14	2920	0.3	0.2	71	54
4.1	14.2	31000	4.5	14	5.6	18	3640	0.47	0.2	74	54
6.1	15	86200	5.4	15	12	20	5700	0.6	0.2	81	54
10	17	980000	8.5	17	12	21.5	6140	2.7	0.3	90	54
10	17.3	3900000	11	18.8	12	22	6600	2.9	0.3	95	57
11	18		13	20	12	22	6900	3.5	0.3	110	58
12	18		13	25	13	23	7900	4.4	0.4	120	62
14	20		14	34	13	25	13000	64	0.4	120	70
18	23		15.7	34	14	26	16600		0.4	140	70
18	23		16	62	15	27	35000		0.41	140	78
19	25.3		19	72	16	28	36000		0.45	150	78
20	32		20.8	88	16	28	680000		0.5	160	81
23	33		23	96	17	29	890000		0.5	180	97
23	37		23	110	20.5	32			0.5	200	100
24	37		30	120	22	37			0.5	230	140
36	37		35.8	140	23	40.9			0.54	350	156
39	45		36.8	200	25	41			0.6	960	160
43	52		42	209	27	42			0.61	1060	163
51	53		44	233	29	48.1			0.61	> 1060	168
56	59		71	296	38.6	52			0.62		170
73	60		94	362	40	53			0.66		170
82	65		110	460	40.1	57			0.72		170
88	72		136	470	46	63			0.8		189
91.9	75		140	480	46	65			1		202
99	77		148	594	53	67			1.1		209
107	90		171	640	72.5	70			1.6		227
120	92		200	642	75.1	74			1.8		230
130	100		265	697	95	85			1.9		256
148	110		265	730	101	99			4		290
156	112		279	840	124	110			31.3		294
162	130		314	1260	126	115			62.3		297
170	134		990	3500	155	150			311		340
170	177		1020	3600	220	170					520
203	210			6100	233	177					770
209	220			11000	250	177					870
230	260			11000	280	210					
240	272				320	220					
252	280				320	220					
260	310				343	260					
310	400				350	355					
316	410				353	356					
332	470				370	362					
360	560				373	370					
520	560				465	380					
523	630				510	406					
920	792				552	410					
940	830				600	420					
990	1060				630	429					
2350	1100				660	510					
2700	1250				717	560					
2790	1320				1190	580					
6100	2460				1230	690					
7420	2460				1500	774					
					1700	814					
					1700	915					
					2000	965					
					5900	980					
					16200	1110					

HYALELLA MORTALITY									
Aroclor 1260	**Aroclor 1260**	**Arsenic**		**Arsenic**		**Benzo(a)anthracene**		**Benzo(a)anthracene**	
No-Hit	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**
18	15	0.48	5	1.7	8	4.8	167	5.6	3190
24	15	0.58	5	2.1	8	5.3	170	10	3200
26	20	1.23	5	2.4	8	8.1	186	12	3300
27	24	1.4	5.02	2.5	8	8.7	190	13	3340
38	29	1.8	5.1	2.6	8.18	9	190	16	3500
40	37	1.9	5.22	2.6	8.7	9.1	199	17	3750
43	37	2	5.3	2.7	9	11	235	18.7	4000
57	38	2	5.43	2.8	9	11	240	19	5430
74	40	2.1	5.57	3	9	11	259	20	5800
130	42	2.1	5.6	3	9.14	13	271	20	7930
130	42	2.3	5.7	3.1	9.32	13	280	22	8600
460	46	2.7	5.7	3.5	9.7	14	280	24	9000
460	46	2.7	5.81	3.5	10.7	14	310	29	13000
500	48	2.9	5.9	3.68	11.1	15	350	30	19000
	53	3	6	3.8	11.7	15	354	30	37000
	57	3	6	3.9	12.2	16	470	32	43000
	57	3	6.1	3.9	12.7	16.9	523	32	49000
	62	3	6.16	3.97	12.8	17	598	37	58000
	64	3	6.2	4	13	17	600	38	63000
	64	3	6.26	4	13	18	700	41	77000
	69	3.2	6.58	4	13.1	18	724	41	280000
	70.1	3.3	6.75	4	13.7	18	740	41.4	890000
	77	3.3	6.92	4	14.7	19	917	43	
	83	3.3	7	4	15	19	1060	49	
	85	3.3	7	4	15	20	1180	67	
	98	3.4	7	4.2	17	20	1200	78	
	98	3.5	7.08	4.2	17	20	1220	79	
	116	3.55	7.08	4.3	17.2	20	1270	89	
	122	3.6	7.11	4.36	18	22	1330	93	
	138	3.6	7.38	4.4	26.6	23	1470	93	
	140	3.7	7.7	4.4	31.4	24.4	1500	93	
	150	3.7	7.8	4.5	32	25	1580	94	
	180	3.75	8	4.54	38.7	26	1800	102	
	184	3.8	8.03	4.6	49	27	2300	103	
	280	3.9	8.1	4.7	61	27	2700	105	
	310	3.9	8.6	4.7	63	28	4260	105	
	310	3.94	8.62	4.8	71.1	29	6200	106	
	330	4	8.64	4.9	103	29	10000	112	
	340	4	8.88	5	111	29	11000	112	
	2500	4	8.89	5	147	30	11000	113	
		4	9	5	175	31	12000	115	
		4	9	5	639	32	25600	130	
		4	9.46	5	1150	32	44000	136	
		4	9.7	5		33		150	
		4	10.6	5		35		154	
		4	11	5		35		168	
		4	11	5		36		170	
		4	11.7	5		37		179	
		4	13	5		37		181	
		4	13.1	5.17		38		188	
		4	13.6	5.23		39		220	
		4	14.3	5.36		40		240	
		4.09	15	5.59		50		268	
		4.1	16.5	5.6		51		288	
		4.2	17.8	5.8		52		321	
		4.24	19	6		52.7		342	
		4.3	19	6		55		350	
		4.3	19	6		56		353	
		4.3	20	6		59		373	
		4.3	20	6		62		411	
		4.3	21.7	6		64		441	
		4.3	23	6		68		470	
		4.33	23.9	6		70		516	
		4.4	26.8	6		71		530	
		4.5	28	6		71		539	
		4.5	30.6	6		73		561	
		4.6	31.3	6		73		570	
		4.6	44.9	6.1		75		590	
		4.7	49.3	6.24		77.8		740	
		4.7	50.7	6.43		78		750	
		4.7	50.9	7		79		760	
		4.7	122	7		82		870	
		4.74	123	7		95		958	
		4.85	149	7		97		1080	
		4.9	152	7.18		99		1100	
		5	200	7.69		100		1100	
		5				109		1100	
		5				110		1100	
		5				116		1300	
						120		1300	
						130		1480	
						140		1600	
						140		1700	
						148		1720	
						150		2380	
						162		2620	
						163		2640	

HYALELLA MORTALITY						
Benzo(a)pyrene		**Benzo(a)pyrene**		**Benzo(g,h,i)perylene**		**Benzo(g,h,i)perylene**
No-Hit	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**No-Hit (Cont.)**	**Hit**
4.2	298	8.8	2960	8.4	490	11
4.8	310	12	3100	9.6	497	14
8.6	310	14	3340	11	510	14
8.8	360	15	4000	11	580	16
8.8	360	16	4600	11	613	17
9.3	430	19	4900	11	680	18
10	454	19	9600	12	791	18
11	490	21	11000	13	821	18
11	570	21	11000	13	965	18.6
12	615	23.1	13000	13.5	1150	19
12	690	26	15000	14	1200	22
13	750	26	39000	14	1410	22
13	783	29	51000	15	1520	22
13	880	32	62000	15	1900	29
14	890	34	63000	16	2500	30
15	910	35	86000	16.8	2500	31
16	915	36	100000	17	4020	32
16	990	38	140000	17	5400	33
16	1080	38	250000	17	8900	35
16	1420	40		17	9400	36
18	1620	43		18	11000	46
18	1650	44.4		18	12000	56
18.6	1800	48		19	12100	56
19	1890	60		19	38000	65
19	2700	68		19		69
19	2800	73		20		70
20	3300	85		20		70
21	4810	87		20.9		77
23	6700	92.8		21		77.2
24	12000	93		21		78
25	13000	114		22		82
25	13000	116		22		87
25	14000	117		22		94
27	24300	120		23		99
27	55000	120		23		99
27.4		120		23.2		103
28		124		29		104
28		131		30		108
29		133		30		110
31		135		30		114
32		160		32		127
32		176		32		133
33		176		36		134
34		176		40		146
35.9		189		41		149
36		195		42		155
37		195		43		164
40		213		44		170
40		216		45		181
43		223		48		186
45		226		50		216
49		240		51		219
51		256		51		220
56		270		57		221
58		280		65		223
61		333		67		231
66		334		68		240
67		343		71		270
76		351		73.3		280
80		358		73.4		308
81		382		77		320
85		387		77		330
88		390		84		400
91		451		85		430
92		660		90		570
100		710		100		670
102		720		102		700
128		740		110		827
128		820		115		840
130		840		121		840
131		1000		140		854
145		1070		150		1100
150		1100		150		1200
153		1100		175		1330
153		1110		187		1350
170		1180		190		1350
171		1400		200		1500
180		1500		200		1500
195		1530		210		1660
206		1630		210		1700
210		1840		216		1720
210		2100		220		2510
230		2100		246		2800
231		2210		280		3300
248		2220		310		5200
256		2500		350		7100
280		2750		424		7600
						11000
						22000
						27000
						48000
						49000
						55000
						93000
						170000
						310000

HYALELLA MORTALITY							
Benzoic acid	**Benzoic acid**	**Beryllium**	**Beryllium**	**Bis(2-ethylhexyl) phthalate**	**Bis(2-ethylhexyl) phthalate**	**Butyl benzyl phthalate**	**Butyl benzyl phthalate**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
35	140	0.071	0.147	18	17	10	11
50	170	0.0883	0.16	18	18	21	18
64	250	0.102	0.162	18	23	24	18
73	270	0.135	0.19	25	23	25	18.8
82	300	0.147	0.42	30	24	25	23.1
110	300	0.151	0.427	32	26	31	24
110	330	0.153	0.477	32	30	32	24
250	800	0.154	0.62	40	78	34	25
250	1300	0.162	0.82	49	140	36	28
360	1500	0.188	0.9	50	220	37	32
650	1540	0.2	0.91	50	230	41	35
660	2020	0.202	2	51	250	42	40
720	2170	0.214	2	55	307	48	43
740	2430	0.249	2	62	310	50	47
813	2640	0.252		62	370	52	47
880	2840	0.256		70	370	53	50
900	4110	0.261		100	370	55	53
1650	4200	0.262		110	418	56	55
2070		0.286		110	420	56	57
2380		0.308		110	440	63	57
2910		0.317		120	452	110	62
3790		0.325		120	460	131	64
		0.327		120	460	160	64
		0.348		160	470	163	66
		0.358		160	490	165	66.4
		0.361		170	501	182	69.6
		0.385		170	510	222	70
		0.387		170	519	274	73
		0.417		170	520	470	86
		0.444		180	546	870	90
		0.463		190	547	1100	105
		0.49		200	575	1520	119
		0.5		220	713	> 1520	121
		0.5		230	727		122
		0.64		240	772		138
		0.66		260	774		140
		0.68		275	779		145
		0.7		285	867		170
		0.76		290	900		180
		0.8		300	913		184
		0.8		320	1020		198
		0.8		322	1050		230
		0.84		330	1110		258
		0.87		330	1370		260
		0.96		337	1380		280
		1.1		350	1390		366
		1.2		350	1400		407
		2		350	1440		409
		> 2		360	1600		430
				360	1600		540
				390	1680		763
				420	1740		980
				420	1800		
				444	1800		
				450	1810		
				480	1900		
				500	1900		
				540	1900		
				550	1920		
				577	1930		
				580	2000		
				660	2000		
				660	2140		
				720	2200		
				778	2220		
				800	2400		
				940	2400		
				1000	2400		
				1090	2800		
				1100	2800		
				1200	3000		
				1400	3100		
				1700	3400		
				1970	3420		
				2000	3510		
				2140	3970		
				2520	4100		
				2900	5120		
				3010	5700		
				4330	6360		
				4970	7590		
				6380	33300		
				10000			
				10500			
				18000			
				22300			

HYALELLA MORTALITY												
Cadmium		**Cadmium**		**Carbazole**	**Carbazole**	**Chromium**		**Chromium**	**Chrysene**		**Chrysene**	
No-Hit	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**
0.052	1.2	0.04	1.6	62.27758007	24	7	44.9	9.4	5.1	161	9.1	3430
0.053	1.23	0.04	1.8	67	85	9.58	45.4	10.5	6.5	170	17	3620
0.07	1.3	0.04	1.9	71	130	10.1	46.2	12	8.1	170	19	3700
0.074	1.3	0.05	1.9	94	230	10.1	46.3	13	9.5	179	22	3800
0.093	1.3	0.07	2	117	234	10.8	46.5	13.6	11	180	24	3800
0.1	1.3	0.07	2.2	124	238	11.1	47	14.8	12	187	24	4800
0.1	1.3	0.1	2.3	130	240	12	48.5	15	13	193	25	5730
0.1	1.39	0.1	2.3	172	274	12.2	49.6	17	13	210	27	5880
0.1	1.4	0.1	2.5	194	389	14.3	50.2	17.4	13	221	28	6400
0.11	1.4	0.1	2.6	229	420	15.1	50.7	18.6	13	230	28.6	7240
0.12	1.44	0.12	2.6	374	437	15.2	50.9	21.5	14	249	29	7800
0.13	1.6	0.2	3.01	923	460	15.7	52.1	22	15	260	30	8900
0.13	1.69	0.2	3.2	2920	825	16.5	52.3	23	15	281	32	11000
0.14	1.7	0.2	3.2		850	16.7	52.8	23.1	15	290	34	18000
0.159	1.7	0.2	39.6		1000	16.8	53.9	23.1	17	314	36	38000
0.16	1.8	0.2			450000	17.6	54.6	23.6	17	320	48	49000
0.161	1.9	0.2			480000	18.3	55.6	23.8	17.9	320	50	60000
0.17	1.9	0.2				18.4	57.3	24	19	340	51	75000
0.17	2	0.2				18.5	58	24	19	390	51	96000
0.173	2	0.2				18.6	58.2	24.1	21	393	51	110000
0.18	2.07	0.2				18.9	60.8	24.6	22	400	55	300000
0.18	2.1	0.22				19.1	61	25	23	430	59	950000
0.186	2.15	0.27				19.3	62	25.4	23	490	60.8	
0.187	2.39	0.3				20	63.1	26	24	498	61	
0.19	2.5	0.3				20.1	63.4	26	24	570	70	
0.2	2.7	0.3				20.1	66.7	26	24.6	601	73	
0.2	2.9	0.3				20.2	79	26	25	657	104	
0.2	3.67	0.3				20.3	80.1	26.2	25	690	110	
0.2	3.91	0.3				20.5	89	26.2	26	730	110	
0.2	5	0.31				20.6	95	27	26	755	117	
0.2	5.6	0.4				20.8	96.2	27	27	816	126	
0.2	9.07	0.4				21.1	102	28.4	28	819	128	
0.2		0.4				21.5	133	28.7	28	930	129	
0.2		0.4				21.8	348	28.9	28.1	1260	140	
0.2		0.4				22	> 348	29	30	1440	144	
0.2		0.472				22.1		29.2	31	1500	157	
0.2		0.5				23		29.3	32	1500	160	
0.2		0.5				23.3		29.4	33	1540	161	
0.2		0.5				24		29.8	33	1560	172	
0.2		0.5				25		30	34	1670	177	
0.21		0.5				25.1		31	35	1710	180	
0.24		0.55				25.4		31	35	2170	190	
0.26		0.6				25.8		31	35.9	2200	202	
0.267		0.6				26		31	36	2320	209	
0.29		0.6				26		31.5	36	3000	211	
0.292		0.6				26.1		31.8	36.6	3700	220	
0.3		0.61				26.2		32	38	5940	263	
0.3		0.651				26.4		32	39	7000	266	
0.3		0.7				27		32	39	10000	280	
0.3		0.7				27		32.1	40	11000	318	
0.3		0.7				27.3		33	43	11000	385	
0.357		0.7				28		34	43	11000	390	
0.361		0.75				28		35	45	28100	412	
0.377		0.75				29		36	46	46000	425	
0.391		0.78				29		36	47		430	
0.4		0.8				29		36.3	50		482	
0.45		0.8				29		36.5	50		489	
0.49		0.875				29		36.7	52		507	
0.506		0.9				29.4		37	55		508	
0.52		0.963				29.8		37	57		510	
0.6		0.968				31		37.7	57.3		541	
0.6		0.98				31		38	58		562	
0.607		1				31.1		38.2	59		620	
0.63		1				31.2		39	61		670	
0.69		1				31.9		39	70		707	
0.7		1				31.9		39.7	70.4		850	
0.791		1				32		40	71		1000	
0.8		1.08				33.4		40	73		1100	
0.811		1.1				33.7		40.5	76		1130	
0.82		1.1				34		41	78		1140	
0.834		1.15				34.2		42	91		1200	
0.9		1.16				34.9		42.1	93		1200	
0.913		1.17				36.4		43	95		1300	
0.973		1.2				36.5		43	95		1300	
1		1.26				37.8		43.9	98		1300	
1		1.3				38.2		45	100		1400	
1		1.3				38.8		45.3	100		1500	
1		1.3				39		45.5	105		1600	
1.1		1.3				39		46	110		1800	
1.1		1.3				40		48	110		1800	
1.1		1.36				40.5		53.9	111		2100	
1.1		1.4				40.5		55.9	126		2140	
1.1		1.5				41		61.3	130		2210	
1.13		1.51				42.8		67	130		2460	
1.2		1.53				43.3		68.3	140		3000	
1.2		1.55				43.5		69.2	147		3200	
1.2		1.58				44.3		75.6	152		3370	
								76				
								77.1				
								79.9				
								80.7				
								80.7				
								81.9				
								84.4				
								99.5				
								112				
								208				

HYALELLA MORTALITY									
Copper		**Copper**		**Dibenz(a,h)anthracene**	**Dibenz(a,h)anthracene**	**Dibenzofuran**	**Dibenzofuran**	**Dibutyltin**	**Dibutyltin**
No-Hit	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
3.8	45.6	7.4	213	1.5	2.5	0.81	1.1	3.5	43
4.69	48.1	11	229	2.8	4.9	0.86	1.5	5.5	53
5.15	49.9	11	267	3.7	10	1.3	1.9	6.9	70
8.5	50.9	14.8	314	3.7	10.9	1.5	10	7.6	77
8.5	50.9	16	315	4.8	12	1.7	10	9.2	79.2
9.5	51.4	16	327	7.9	12	3.7	12	9.2	92
9.7	54.5	16	338	8.5	13	4.3	12	12	96
10.7	57.6	17	371	13	14	4.9	13	12	107
10.7	59.3	17	382	14	14	9.2	13	16	131
10.9	61	17	397	14	14	9.4	14	17	155
11	61.8	18	399	17	16	12	14	19	233
15.2	62	18.3	461	18	16	14	15	20	259
15.4	62.9	18.4	461	19.3	18	16	16	25	277
15.6	64	19	508	21	18	30	18	26	
16	65	20.3	622	26	18	31	19	85	
16.5	65.2	20.4	635	34.1	22	52	24	130	
16.7	66	23.4	651	50	24	90	26	140	
16.8	66.9	23.6	655	55.9	28	98	26	265	
17.2	70.4	24.7	2090	58	28.5	116	33	288	
18	71.2	24.8		82	29	138	38	321	
18.1	84.5	25.9		97	30	160	41	333	
19.3	94.4	28.6		116	31	168	46	492	
20	101	30.1		120	34	170	62	509	
20.2	113	31.7		132	36	180	64	661	
20.2	136	32		214	37	200	68	1930	
20.4	142	32.4		216	37.3	234	75	17000	
20.7	146	32.9		251	38	244	83	> 1930	
20.9	187	33.8		280	43	372	94		
21.1	363	35		292	45	384	110		
21.4	420	35.9		294	45.3	443	140		
21.7	526	36		320	49	660	160		
22.5	571	36.2		332	56	3810	160		
22.6	619	38.5		350	66		166		
22.9	627	41		540	72		170		
23.6	651	41.4		780	91		194		
24.2	829	43.1		839	99		204		
24.3	1460	43.4		1200	125		310		
24.4	2010	44		1700	176		399		
24.4	10800	44.1		2200	200		460		
25.3		44.6		2600	217		928		
25.5		46		3070	230		1010		
26		46.9		11000	240		1750		
26		47.7			260		2260		
26.5		48.6			300		7800		
26.6		50			327		7900		
26.7		50.4			342		8300		
26.8		52.2			390		10000		
27.9		53.2			424		19000		
28		53.4			437		580000		
28.2		54			490		2200000		
28.3		57.3			630				
28.7		62			720				
29.5		62.7			730				
30		63.8			800				
30		68			800				
30.7		69.4			1200				
30.9		71.1			1700				
31		71.1			3000				
31.2		74.5			4700				
31.6		76.7			33000				
32.2		77			39000				
32.5		77.9			710000				
33		81.2							
33.8		82.3							
34		86							
34		90.1							
34.1		90.9							
34.2		94.3							
35		96.6							
35		96.7							
35.4		100							
35.5		106							
36.5		109							
36.5		119							
36.8		119							
38		122							
38.3		125							
39.1		130							
40.1		140							
40.6		146							
40.7		154							
41		158							
41.9		163							
42.7		188							
42.9		209							
43.7		210							
43.8		212							

HYALELLA MORTALITY					
Dimethyl phthalate	**Dimethyl phthalate**	**Di-n-butyl phthalate**	**Di-n-butyl phthalate**	**Di-n-octyl phthalate**	**Di-n-octyl phthalate**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
5.4	11	6.5	11	12	10
31	11	8.1	11	13	11
46	12	9	14	17	12
54	13	10	15	25	13
108	13	11	15	32	13
147	14	12	16	34	15
156	15	12	17	46	17
158	16	13	17	47	18
172	16	15	19	48	21
311	19	17	20	49	21
314	21	19	22	52	22
436	37	21	24	54	23
	42	21	26	55	26
	54	23	26	58	26
	58	24	26.3	66	27
	71	30	27	100	30
	93	37	31	201	30
	110	158	34		34
	112	306	37		34
	160	690	40		37
	171	805	41		39
	190	841	41		40
	270	1180	41		44
	362	1740	41.7		45
	576	> 1740	44		54
			47		67
			61		74
			67		90
			68		110
			71		115
			90		256
			99.9		399
			101		413
			103		1420
			108		1520
			116		3400
			136		4290
			254		
			350		
			350		
			481		
			893		

HYALELLA MORTALITY							
Fluoranthene		**Fluoranthene**		**Fluorene**	**Fluorene**	**High Molecular Weight PAH**	**High Molecular Weight PAH**
No-Hit	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
5.6	160	13	4950	0.85	0.78	47.3	75
8.1	170	18	6100	0.86	1.8	54	100
8.5	190	28	7400	1.5	2.5	55	118
14	192	30	7710	1.5	2.7	56	144
15	200	32	7730	2.2	12	86.9	270
15	210	36	7900	2.2	13	88.1	300
16	210	38.6	15000	3	14	89	337
16	230	39	15000	4.7	15	96.6	510
16	230	41	16100	5.9	15.3	99	799
16	240	43	16700	6	17	107.1	1004
17	240	47	18000	9.2	17	116	1600
18	240	54	19200	11	18	131.2	2080
19	268	58	20100	12	18.3	134	2251
19	270	67.6	24200	13	19	136	3290
21	276	68	26000	13	19	157	3600
22	310	70	35000	18	23	193.7	4850
23	319	80	37000	19	23	223.6	6740
23	320	81.5	43000	22	24	255.8	6800
23	363	96	47700	22.3	28.2	290	10270
23.5	380	97	86000	25	30	309	13690
24	383	116	100000	29	33	412.4	15600
26.9	428	120	120000	30	37	441	16460
27	452	123	120000	33	39	470	18000
27.2	455	124	1600000	36	43	524.5	19800
28	460	130	5200000	36.2	44	612	21970
34	460	130		38.1	47	629	27820
35	500	143		42	50	711	31170
36	520	157		49	60	1376	35390
36	580	158		57	73	2068	38030
38	646	206		62	79	2522	44500
39	690	206		67.4	88	2629	57000
39	710	280		75	104	3370	62900
40	731	280		85	107	3457	95330
40.9	770	288		91	120	4280	111800
41	940	291		100	124	4660	134300
43	1100	291		120	140	6270	161500
44	1220	300		124	160	7370	427700
44	1260	301		126	171	8440	511000
44.7	1400	324		140	174	9000	627000
45	1500	334		160	180	10410	765000
46	1620	342		167	190	11020	852500
53	1640	344		181	200	13290	3556000
54	1690	356		185	201	13480	12858000
55	1780	359		220	230	15080	
58	2000	380		251	250	16780	
61	2000	390		270	274	17410	
63	2300	410		390	285	19960	
64	2660	419		400	310	25180	
65	3100	437		420	330	28550	
65	3140	445		465	465	31640	
66	3210	450		498	470	54800	
67	3360	453		590	490	72000	
69	3370	455		666	570	120500	
70	3450	502		730	620	120900	
70.2	4040	540		2080	660	121500	
70.7	5000	674		2350	670	122700	
71	6500	695		2500	932	250500	
71	6600	699		6970	1070	471000	
71.5	9340	720			1200		
72	9800	740			1540		
75	11100	766			1720		
76	15000	798			1900		
76	15000	833			3240		
77	21000	939			3400		
77	46100	950			3850		
79	180000	1100			3890		
87		1300			6740		
91		1300			14000		
91		1400			14000		
93		1500			15800		
93		1600			17000		
97		1900			18300		
110		2000			34000		
110		2140			56400		
110		2340			930000		
112		2450			3200000		
116		2600					
129		2600					
130		2800					
130		3190					
130		3200					
138		3300					
144		3600					
150		4200					
153		4500					
160		4700					
160		4780					

HYALELLA MORTALITY								
Indeno(1,2,3-c,d)pyrene		**Indeno(1,2,3-c,d)pyrene**	**Lead**		**Lead**		**Low Molecular Weight PAH**	**Low Molecular Weight PAH**
No-Hit	**No-Hit (Cont.)**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**Hit**
8	643	9	0.62	56.2	5.6	154	8.9	9.5
8.1	763	10	0.77	58.7	6.19	177	10	18
8.2	770	13	2.28	58.8	6.3	180	10	18
10	773	14	3.02	64	6.8	185	10.4	24
11	800	16	4.27	65	7	203	10.8	25
11	1150	16	4.7	68.4	7.6	210	17.1	29.4
12	1160	17	5.01	73.5	7.8	223	18	31
12	1340	17.8	5.24	79.7	9.9	232	21.1	59
12	1350	18	5.99	79.9	10.7	234	23.3	71
13	1700	21	6.69	80.7	11	246	24.7	160
14	2300	22	7.1	81	11.8	258	28.6	247
14	3400	23	7.17	82.9	11.9	272	32.2	247
14	4120	24	7.24	89.6	12.2	283	40	422
15	4600	27	7.3	91	12.5	284	51	553
15	10000	28	7.3	95.2	12.7	294	52	651
16	11000	30	9.21	99.4	13.3	295	53	850
16	13900	30	10.2	102	13.4	299	71.1	1000
17	14000	30	10.5	105	13.8	323	95	1310
17.7	17000	33	11.1	115	14	436	103.8	1470
18	18000	35	11.1	122	14.8	470	147	2010
19	60000	36	11.2	133	15.1	495	181	2108
20		36	11.4	152	15.2	542	233	2760
20		44	11.6	171	15.2	678	351	2890
20		44	11.8	172	15.7	719	358	3000
22		59	12	184	15.9	739	363	3110
22		61	12	189	16	1180	420	4672
22		64.2	12.2	194	16.1		750	8130
22.8		73	12.6	204	16.2		1225	8980
24		76	12.7	210	16.9		1763	9130
24		80	12.7	211	17.6		1800	9200
25		81	12.7	230	17.9		1900	10270
27		83	12.7	249	18.1		2088	14070
27		88	12.9	293	19.8		2186	16870
28		88	13.1	322	20.2		2240	18700
29		93.9	13.2	335	20.8		2498	28500
29		97	13.2	357	21		2700	29010
30		100	13.3	371	21.1		3040	49000
31		100	13.4	431	25.6		3140	128580
34		106	13.5	461	25.9		3200	154100
40		120	13.7	510	26		4380	171000
41		124	14.4	525	26.6		4720	175180
43		130	14.4	715	27.3		6259	3453500
43		130	14.6	1160	27.4		6590	19801000
43		133	14.7	1310	27.4		8255	
45		134	14.7	> 1310	27.5		8800	
45		144	14.9		29		9380	
52		155	15		30.2		9520	
53		170	15.2		31		12990	
53		178	15.3		33.6		41971	
59		198	15.5		36		78300	
60		207	15.6		36.2			
65.6		208	15.7		38			
67		210	15.9		38.9			
68		222	15.9		39			
68		244	16.4		41.5			
69		255	16.5		41.9			
70		260	16.6		44.8			
74		260	17.3		47.6			
81		269	17.3		48.8			
82		294	17.4		49.9			
90		330	17.9		50			
95		330	18.6		50.2			
97.2		330	18.8		52.2			
101		342	18.9		53.5			
110		450	21		54.4			
110		460	22.4		56			
116		580	23.5		60.8			
120		720	23.6		62.5			
134		730	23.6		64.3			
141		740	26.1		68.1			
150		810	26.3		78.5			
160		889	30.1		79.1			
160		920	31		80.8			
180		960	32.4		87.6			
199		1180	35		89			
200		1200	36		93			
210		1220	37.8		94.6			
220		1450	39		96.6			
270		1500	39.2		111			
280		1600	42.3		114			
283		1600	45.9		118			
310		1750	47.7		124			
340		1800	48.2		125			
363		2000	48.3		125			
370		2340	51.1		131			
470		5100	51.7		150			
518		5300	54		150			
		6000						
		6500						
		10000						
		13000						
		19000						
		29000						
		41000						
		43000						
		43000						
		46000						
		84000						
		88000						
		110000						

HYALELLA MORTALITY													
Mercury		**Mercury**	**Monobutyltin**	**Monobutyltin**	**Naphthalene**	**Naphthalene**	**Nickel**		**Nickel**	**Phenanthrene**		**Phenanthrene**	
No-Hit	**No-Hit (Cont.)**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**
0.006	0.433	0.01	1	3.2	1	1.3	5.3	35.7	9.1	4.3	384	5.6	1100
0.0083	0.435	0.01	1.3	4.19	1.3	2.2	7.79	36	12.7	6.6	388	14	1200
0.01	0.445	0.01	1.7	11.3	1.5	3.6	8	38.9	13	6.7	420	14	1300
0.013	0.461	0.024	3.97	12.4	1.9	3.9	8.4	39	14	6.8	569	14	1340
0.02	0.478	0.033	4.2	21.5	2.2	6.81	8.7	39.4	14.7	8.8	587	16	1500
0.03	0.48	0.033	4.3	26.9	2.5	6.83	10	39.9	15.3	10	617	18	1700
0.038	0.53	0.036	4.4	37	2.8	11	10	40.7	16	10	719	18	1720
0.039	0.54	0.04	4.8	38	3.1	12.1	10.9	41	16	11	730	19	1800
0.04	0.545	0.044	5	40	3.3	13	11.2	41.4	16	11	750	19	1900
0.04	0.552	0.05	5.2	50	4.9	13	11.6	43.5	16.5	12	778	21	2600
0.04	0.558	0.05	5.3	54	6.1	14	12.9	43.7	17	13	1000	22	2900
0.04	0.659	0.05	6.4	56	7.8	14.4	14.5	44.2	17.4	14	1130	22	3620
0.04	0.796	0.053	6.91	59	8.1	15	14.6	45	18	14	1200	24	3990
0.042	0.8	0.056	7.1	64	9.7	15	14.6	45	18.4	14	1200	25	4370
0.05	0.9	0.06	7.13	76	9.8	15	14.7	45.2	20.8	16	1300	26	4440
0.05	0.993	0.06	9.3	97.7	10	16	14.7	45.6	21	17	1400	33	4700
0.05	2.01	0.06	9.5	166	10	19	15	46.8	21	17	1480	33	4700
0.05	2.07	0.06	10	221	10	19	15.4	47	21	17	1500	38	4900
0.05	3.04	0.06	11	267	13	19	15.5	47.3	22	19	1600	41	6100
0.05	3.74	0.07	11	312	18	22	15.8	48.1	22	19	1730	42.9	6190
0.05	43	0.07	11.2	396	18	24	15.8	48.7	22	19	1730	44	6400
0.052		0.07	12.1		20	27	16	48.9	22	19	1900	49	7570
0.057		0.08	13.6		20	27	16	49.4	22.6	19.3	1990	54	8420
0.0583		0.08	15		20	27	17	51	22.7	20	2080	59	8950
0.06		0.08	17		22.2	30	17.4	53.9	23	21	2660	60	14200
0.06		0.08	18.8		23.4	31	17.6	54.9	23	22	4230	71	15000
0.06		0.08	19		24	32	17.9	55.3	23	23	4700	80	21700
0.06		0.0853	20.3		26.6	33	18.2	57.6	23	23	5300	86	36200
0.06		0.0885	21		30	33.6	18.3	58.2	23	25	5470	86	39200
0.06		0.09	22		30	34	18.5	59.6	23	26	5700	96	44000
0.06		0.09	22		31.5	37	18.5	60	23.6	26	5700	102	49000
0.06		0.09	24		33	48	18.8	61.5	23.9	26	6100	109	50000
0.06		0.09	24.9		35.6	55	19.2	62.4	24	28	8240	110	52000
0.06		0.09	26		40	61	19.3	63.9	24	29	26000	128	67000
0.07		0.096	26		42	64	19.4	113	25	31.2	41100	129	100000
0.07		0.1	26		49	65	19.7	355	25	32		133	120000
0.07		0.1	27		54	100	19.9		25	33		136	260000
0.07		0.1	29		58	100	20.1		25	34		142	9500000
0.0776		0.1	30		64	110	20.3		25	35		143	
0.08		0.12	38		70	120	20.3		25.7	35		160	
0.08		0.13	38		86	126	20.8		26	36		160	
0.08		0.13	40		92	148	21		26	36		161	
0.08		0.13	41		100	161	21		27	37		180	
0.08		0.13	43		100	165	21		27	39		186	
0.08		0.13	46		110	225	21.2		27	43		190	
0.08		0.13	60		160	235	22		27	45		196	
0.0838		0.131	98		250	350	22		27	52		234	
0.0844		0.14	154		291	380	22		27.8	53		234	
0.0877		0.14	194		424	400	22		28	54		240	
0.088		0.15	212		466	440	22		28	55		282	
0.0998		0.15	379		471	450	22		28	56.7		290	
0.1		0.16	380		501	510	22		28	60		333	
0.1		0.16	459		650	529	22		28	60		354	
0.104		0.16	459		913	540	23		28	62		384	
0.11		0.17	508		1030	627	23		28	63		393	
0.11		0.18	2560		1300	1270	23		28.9	65		394	
0.11		0.18	4850		1400	1310	23		29	65		440	
0.114		0.186	>4850		1600	1360	23.7		29	65		469	
0.119		0.2			3220	2200	24		29.5	71		472	
0.12		0.2			5630	2280	24		29.6	73		566	
0.13		0.21				3630	24		29.7	80		570	
0.13		0.21				4870	24.1		29.8	81		620	
0.13		0.215				4890	24.8		30	87		629	
0.14		0.23				4970	26		30	93		680	
0.14		0.25				12000	26		30	93		848	
0.141		0.251				21000	26		30.6	93		880	
0.149		0.253				40600	26		30.6	93		1000	
0.15		0.259				67000	26.8		30.8	93.1		1000	
0.157		0.26				92000	27		31	95		1000	
0.16		0.27				600000	27		31	95		1040	
0.16		0.27				2300000	27		31	97		1070	
0.165		0.286					27.2		32	110			
0.17		0.343					27.3		33.7	120			
0.18		0.36					28		36	130			
0.19		0.46					28.2		37	150			
0.206		0.52					28.7		37.9	150			
0.21		0.546					28.8		38.8	160			
0.21		0.56					29		39.1	180			
0.232		0.604					29.1		39.2	190			
0.28		0.62					29.3		39.3	190			
0.284		0.662					30.4		39.6	210			
0.284		0.673					31		43.4	231			
0.297		0.69					32.9		45.1	240			
0.335		0.711					33.6		46	244			
0.359		0.749					34.2		48.4	260			
0.37		0.8					34.3		52.3	278			
0.389		0.844					34.4		53.1	332			
		1.25							54				
		1.3							56				
		1.41							56.8				
		1.5							58.4				
		1.72							61.9				
		2							63				
		2.22							64				
		2.7							70.6				
		2.7							77.4				
		2.9							88				
		2.93							105				
		3.3							133				
		9.5							594				

HYALELLA MORTALITY									
Phosphorus	**Phosphorus**	**Pyrene**		**Pyrene**		**Retene**	**Retene**	**Silver**	**Silver**
No-Hit	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
128	459	7	160	14	4400	75	94	0.06	0.094
282	475	8.7	160	20	4700	77.1	202	0.08	0.094
306	563	10	162	24	5120	128	1050	0.094	0.098
349	625	13	200	29	5300	201	1900	0.1	0.1
352	657	14	210	30	7000	289	4230	0.1	0.1
393	1310	14	210	34	7150	352	6020	0.1	0.1
402	2770	17	240	36	7500	553	8700	0.1	0.1
410		17	240	37	7540	564	11200	0.1	0.11
425		17	250	45.5	8100	782	16000	0.1	0.12
428		17	250	46	9130	1170	19200	0.1	0.14
486		18	254	47	11200	1300	27000	0.1	0.16
503		18	261	53	13300	1470	35000	0.1	0.199
507		19	270	54	13600	2170	66400	0.1	0.2
516		19	280	66	15900	5400	360000	0.1	0.2
531		20	280	71	18000	6020		0.11	0.2
538		21	289	71.2	20000	54500		0.11	0.2
590		21.1	319	74	21000	810000		0.12	0.2
615		22	350	82	25000			0.14	0.2
624		24	361	85.7	32200			0.14	0.2
691		25	375	88.1	40000			0.144	0.2
694		27	379	92	65000			0.15	0.217
710		27	380	96	68000			0.16	0.23
725		30	387	97	98000			0.17	0.3
741		31	430	110	100000			0.19	0.3
824		32.2	450	110	110000			0.2	0.3
880		33	523	118	130000			0.2	0.3
908		33	560	120	1100000			0.2	0.3
1040		37	560	124	3900000			0.2	0.3
1150		37	580	130				0.2	0.3
1160		38	581	133				0.2	0.3
1180		39	626	144				0.2	0.322
1540		39	679	175				0.2	0.36
1590		41	830	183				0.2	0.39
2060		42	927	260				0.2	0.4
2660		43	950	300				0.2	0.4
2790		45	970	304				0.2	0.4
3290		46	987	308				0.2	0.4
> 3290		48	1100	320				0.2	0.444
		48.5	1250	320				0.2	0.5
		50	1320	332				0.2	0.5
		51.6	1350	332				0.219	0.5
		54	1500	333				0.22	0.5
		55	1590	352				0.23	0.5
		55	1630	356				0.25	0.53
		56	1900	359				0.26	0.545
		57	2000	370				0.26	0.58
		63	2100	380				0.27	0.6
		64	2340	404				0.28	0.6
		65.6	2700	410				0.3	0.6
		66	2710	429				0.3	0.63
		67	2870	431				0.3	0.7
		67	2960	452				0.3	0.72
		67	3460	455				0.3	0.8
		68	3500	465				0.3	0.8
		68	3540	477				0.35	0.8
		70	4410	488				0.359	0.8
		72.4	5000	510				0.38	0.86
		73	5700	536				0.4	1
		74	6800	626				0.4	1.1
		74	8790	634				0.4	1.1
		75	10000	685				0.43	1.2
		77	16000	700				0.43	1.32
		80	21000	715				0.45	2.8
		82	22000	730				0.45	2.9
		83	26000	750				0.53	3.3
		89	55600	770				0.7	4.5
		90	68000	829				0.77	
		91		1200				0.8	
		92		1320				0.9	
		92		1400				1.1	
		93		1500				1.4	
		99		1600				1.6	
		100		1710				1.8	
		107		1820				1.9	
		108		2190				1.9	
		110		2200				2	
		117		2300				2.2	
		120		2300				3.1	
		120		2500				3.5	
		121		2530					
		130		3000					
		140		3200					
		140		3650					
		140		4100					
		150		4200					
		150		4280					
		158		4300					

HYALELLA MORTALITY			
Total benzofluoranthenes (b+k (+j))		**Total benzofluoranthenes (b+k (+j))**	
No-Hit	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**
11.7	350	16	5400
12	414	16	5530
13	480	23	5600
15	496	27	6590
15	501	29	7000
15.1	560	29	7110
15.4	600	41	8900
17	630	41	13500
19.2	630	42	13800
20	630	44	14600
20	770	48	22100
21	799	49	25000
21	890	50	47000
22	906	54	85000
25	1040	62	101000
25	1100	67	144000
26	1151	70	163000
26	1280	76	200000
26	1340	77	280000
27	1370	82	560000
32	1380	83	
36	1780	91	
36.9	1923	91	
38	1960	102	
39	2020	103	
39	2100	117	
41	2450	119	
41	2800	120	
43	2830	143	
43	3170	148	
44	3400	175	
44	3620	178	
45	4800	198	
46.4	5300	234	
50	11000	245	
50	12000	290	
50	17900	293	
52	18400	300	
53	19900	311	
53	20100	312	
54	41800	313	
55	79000	316	
57		320	
59		335	
59		348	
60		363	
63		379	
66.9		412	
68		421	
69		445	
72		541	
76		552	
76.6		579	
79		617	
83		643	
87		657	
93		680	
102		686	
110		774	
110		823	
116		853	
118		855	
120		881	
124		890	
127		1028	
140		1200	
141		1390	
142		1410	
149		1410	
150		1600	
176		1700	
180		1850	
186		1860	
187		2000	
188		2100	
190		2270	
191		2320	
220		2620	
248		2750	
248		3200	
255		3200	
283		3400	
297		3700	
310		3810	
338		4300	
339		4440	
339		5180	

HYALELLA MORTALITY					
Total organic carbon		**Total organic carbon**		**Total Polychlorinated Biphenyls**	**Total Polychlorinated Biphenyls**
No-Hit	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**Hit**
0.05	2.51	0.05	3.8	11	11
0.08	2.52	0.1	3.95	12	16
0.13	2.54	0.22	4.13	17	29
0.14	2.57	0.25	4.19	43	40
0.14	2.6	0.25	4.25	43	53
0.21	2.61	0.4	4.49	48	57
0.22	2.69	0.4	4.56	73	62
0.23	2.71	0.4	4.6	108	69
0.23	2.74	0.56	4.9	130	70.1
0.26	2.8	0.6	5.1	217	82
0.35	2.87	0.67	5.6	304	88
0.38	3.1	0.76	5.7	460	108
0.38	3.12	0.8	5.81	1460	112
0.4	3.3	0.82	5.9	2090	116
0.42	3.31	0.83	6.27		116
0.6	3.4	0.89	7.07		116
0.61	3.42	0.9	7.35		116
0.65	3.48	0.91	7.4		129
0.67	3.6	0.95	7.7		130
0.69	3.6	0.97	7.9		168
0.72	3.61	1.01	8.3		209
0.72	3.71	1.1	8.9		251
0.74	3.89	1.12	9		253
0.78	4.01	1.19	9.7		257
0.81	4.01	1.2	9.82		284
0.88	4.05	1.3	10		300
0.9	4.14	1.45	10.6		310
0.94	4.31	1.46	12		310
0.97	4.65	1.46	12.1		330
0.996	4.74	1.48	13		340
1.03	4.74	1.52	18		354
1.16	4.9	1.56	19		379
1.2	4.92	1.61	21.3		388
1.24	5	1.62			394
1.26	5.02	1.65			1050
1.27	5.13	1.67			1050
1.28	5.2	1.73			2500
1.28	5.7	1.75			
1.3	6.3	1.77			
1.3	6.4	1.8			
1.3	6.4	1.83			
1.3	6.8	1.83			
1.32	7.35	1.89			
1.37	12	1.9			
1.39	12	1.96			
1.4	12.2	1.97			
1.42	15.8	1.97			
1.44	25	1.98			
1.44	> 25	2.01			
1.5		2.03			
1.5		2.1			
1.5		2.11			
1.52		2.11			
1.57		2.13			
1.59		2.14			
1.6		2.15			
1.68		2.16			
1.72		2.18			
1.77		2.21			
1.8		2.25			
1.8		2.25			
1.82		2.26			
1.83		2.27			
1.85		2.3			
1.87		2.34			
1.87		2.35			
1.91		2.41			
1.93		2.44			
1.96		2.46			
1.98		2.47			
2.06		2.5			
2.07		2.61			
2.09		2.66			
2.1		2.7			
2.13		2.74			
2.15		2.74			
2.16		3			
2.17		3			
2.18		3.03			
2.21		3.13			
2.27		3.48			
2.3		3.52			
2.31		3.58			
2.35		3.6			
2.42		3.68			
2.45		3.69			
2.48		3.7			

HYALELLA MORTALITY						
Total Sulfides No-Hit	**Total Sulfides Hit**	**Tributyltin No-Hit**	**Tributyltin Hit**	**Zinc No-Hit**	**No-Hit (Cont.)**	**Zinc Hit**
0.17	0.21	0.503	1.28	13.6	152	40
0.9	0.21	0.87	1.95	14.8	158	45
2.3	0.31	1	2	17.2	161	45.4
2.69	1.8	1.16	2.27	17.7	167	49
2.9	2.9	2	52	18.6	173	54
3.3	6	2.4	60	24.4	188	55
3.4	6.6	2.51	110	30.7	193	55
3.8	9.9	2.88	113	34.8	203	58
5.8	17.4	3.6	160	47.5	211	60
6.2	17.5	4.3	198	48	215	60.6
6.2	20	4.3	250	49.7	243	61.5
7	20.8	4.4	260	51.3	249	62.2
7.8	21	4.7	370	55	377	68.3
9	21	5.7	590	55.9	391	73.7
9.2	21.7	6.4	598	58.1	397	75
10	22	7.6	697	58.2	399	77
10.8	23	8.5	810	61.3	406	79.8
11.4	24	9	824	65	435	84.3
12.6	31	9.3	936	65.6	520	85
13.4	42.4	9.5	965.2	65.6	527	86
15.8	44.2	11	1700	66	550	87
16	44.6	12	1700	69.9	567	90
18.4	48	13	1959	70.3	623	93.2
18.4	48.1	13	2200	70.8	684	96
19.3	62	18	2490	70.8	754	97.6
22.6	65.8	19	2750	71.1	849	98.8
24.7	80.1	22		71.6	904	101
34	96.3	25		72.7	1020	101
35.6	130	27		72.7	1080	110
47.4	133.9	30		73	1180	111
60.6	149	32		73.5	2010	115
64	150	35		74	4150	120
65.5	161	37		76	> 4150	120
74.1	181	40		76.4		122
83.8	202	62		76.8		130
87	223	78		76.9		130
92.4	230	100		77.3		133
97.3	249	200		79.3		136
110	341	210		79.3		137
146	450	220		81.5		144
231	590	247		82		145
247	703	300		83		155
321	920	723		83		164
360	2330	1210		84		169
493	7700	1410		84		190
514		1710		84		193
702		1860		84.4		210
900		2220		85		210
941		2530		85.3		212
		6650		85.7		220
		15700		85.9		225
		64600		86		227
		> 15700		87		238
				87		242
				89.3		254
				89.4		262
				89.6		264
				90		269
				90.5		270
				91.8		271
				94.4		279
				95.9		281
				96.8		284
				97.3		286
				98		296
				101		306
				104		314
				106		333
				106		337
				107		354
				113		359
				114		368
				117		369
				119		370
				119		374
				122		375
				124		377
				124		385
				126		397
				128		407
				131		423
				136		435
				139		443
				142		450
				145		457
				148		470
						494
						562
						582
						593
						661
						673
						675
						683
						689
						1070
						1090
						1770
						2980
						4050

CHIRONOMUS GROWTH							
2-Methylnaphthalene	**2-Methylnaphthalene**	**Acenaphthene**	**Acenaphthene**	**Acenaphthylene**	**Acenaphthylene**	**Anthracene**	**Anthracene**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
11	13	10	20	3.2	4.5	5	13
12	13	10	23	3.5	12	10	52
13	52	11	59	11	13	11	53
14	54	11	60	11	17	12	74
15	62	11	88	12	23	12	110
15	64	12	92	12	35.8	12	126
15	180	12	162	13	44	12	155
16	188	12	177	14	94	13	170
16	189	14	203	14	110	14	233
20	443	14	260	14	110	14	370
24	877	15	272	15	200	15	373
28	2310	17	310	15.7	209	16	406
28	3470	18	410	19	362	16	560
30		18	560	20.8	460	17	774
36		18	630	23	480	18	814
141		18	940	25	640	20	1130
160		19	990	30	642	22	1190
170		23	1060	34	1020	22	1400
180		23	1100	36.8	3600	23	1520
214		24	2350	42		25	1700
353		32	2460	71		25	1700
469		33	2460	88		27	1700
555		36	2790	120		27	1900
982		37	2940	136		28	2860
1720		37	5700	140		28	2920
1770		39	7420	148		29	5700
		43	20800	171		29	6140
	AET - low confidence	45	29600	265		32	6600
	AET - high confidence	52		265		37	16200
	next highest hit value	72		279		38.6	
	outlier	73		314		40	
		75		594		40.1	
		82		697		41	
		90		1260		42	
		91.9				46	
		99				53	
		107				65	
		112				67	
		120				70	
		130				72.5	
		148				85	
		156				95	
		209				99	
		240				101	
		252				115	
		260				124	
		310				177	
		316				220	
		332				320	
		360				343	
		520				350	
		523				356	
		792				429	
		920				465	
		1250				510	
		1320				552	
		6100				600	
		6290				630	
						660	
						717	
						915	
						965	
						1110	
						1230	
						1500	
						1580	
						5900	

CHIRONOMUS GROWTH											
Antimony	**Antimony**	**Aroclor 1254**	**Aroclor 1254**	**Aroclor 1260**	**Aroclor 1260**	**Arsenic**		**Arsenic**	**Benzo(a)anthracene**		**Benzo(a)anthracene**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**
0.05	0.06	11	52	15	42	1.4	5.17	3.5	4.8	99	8.1
0.1	0.1	11	70	15	53	1.9	5.3	3.9	11	103	28
0.1	0.1	12	156	18	57	2	5.6	4	11	105	162
0.1	0.2	16	170	20	57	2	5.6	4.3	13	105	179
0.13	0.2	17	227	24	77	2.7	5.7	4.3	13	106	220
0.14	0.3	18	960	26	184	2.9	5.7	4.4	14	109	235
0.2	0.3	24	1060	27	460	3	5.81	4.7	14	110	240
0.2	0.4	25		29	500	3	5.9	5	15	112	288
0.2	0.4	37		37		3	6	5	15	112	373
0.2	0.5	47		38		3	6	5	16	113	411
0.2	0.6	51		40		3	6	5	16.9	115	516
0.2	0.8	54		42		3	6	6	17	130	600
0.2	1.1	54		43		3	6	6	17	140	724
0.2		58		46		3.2	6	6	18	148	917
0.3		62		46		3.3	6	6	18	150	958
0.3		70		48		3.3	6	6	18	154	1080
0.47		78		62		3.4	6.1	7	19	163	1330
0.5		81		64		3.5	6.92	7.7	19	167	2620
0.6		140		74		3.5	7	7.8	19	170	2640
4.4		189		85		3.7	7	8	20	181	2700
		202		98		3.9	7	9	20	186	3340
		209		116		4	7	13.7	20	188	3750
		230		138		4	7	15	22	199	4000
		256		2500		4	8	17	22	259	5430
		294				4	8	17.2	24	271	8600
						4	8	20	24.4	321	9000
						4	8.1	111	25	342	11000
						4	9	152	26	353	12000
						4	9	175	29	441	13000
						4	9	200	29	523	25600
						4	9		29	539	37000
						4	11		30	561	77000
						4	11		30	598	
						4	11.7		31	1060	
						4	12.7		32	1100	
						4	12.8		32	1180	
						4	13		32	1220	
						4	13.1		32	1270	
						4	14.3		33	1480	
						4	16.5		35	1500	
						4	17		35	1580	
						4.09	20		35	1720	
						4.1	21.7		36	2300	
						4.2	30.6		37	2380	
						4.3	31.3		38	3200	
						4.3	31.4		41	4260	
						4.6	123		41	6200	
						4.6			43	11000	
						4.7			49	44000	
						4.7			51		
						4.7			52		
						4.8			56		
						4.9			62		
						5			64		
						5			67		
						5			70		
						5			71		
						5			73		
						5			73		
						5			77.8		
						5			79		
						5			79		
						5			82		
						5			89		
						5			93		
						5			93		
						5			94		

CHIRONOMUS GROWTH							
Benzo(a)pyrene		Benzo(a)pyrene	Benzo(g,h,i)perylene		Benzo(g,h,i)perylene	Bis(2-ethylhexyl) phthalate	Bis(2-ethylhexyl) phthalate
No-Hit	No-Hit (Cont.)	Hit	No-Hit	No-Hit (Cont.)	Hit	No-Hit	Hit
10	102	8.8	11	73.3	9.6	50	120
12	114	11	11	73.4	18	62	300
12	116	20	11	77	84	62	310
13	117	153	11	77	99	110	370
13	120	160	12	78	102	110	420
13	120	176	13	82	104	120	450
14	120	195	13.5	87	121	140	460
14	124	213	14	94	127	160	501
15	128	216	14	99	134	180	540
15	128	223	14	108	164	200	727
16	133	298	15	110	170	240	1930
16	135	334	16	114	231	250	2140
16	145	358	16	115	308	260	2140
18	150	387	16.8	133	424	275	2800
18	170	570	17	146	821	290	3010
18.6	171	615	17	149	1330	307	3420
19	176	1080	17	150	1350	320	3510
19	176	1110	17	175	1720	330	7590
19	180	1530	17	186	2500	330	10500
21	189	2750	18	187	2510	337	33300
21	195	2960	18	216	3300	350	
21	206	3300	18	220	7100	350	
23	226	3340	19	221	7600	350	
24	231	4900	19	223	8900	360	
25	248	9600	19	270	9400	360	
25	256	11000	19	497	11000	370	
26	256	13000	20	613	12100	370	
27	270	13000	20	791	27000	390	
27	333	15000	20.9	827	55000	418	
27.4	351	24300	21	854		420	
28	382	39000	22	1150		420	
28	451	86000	22	1200		440	
29	783		22	1350		444	
31	890		22	1410		452	
32	915		22	1520		460	
32	1070		23	1660		470	
32	1420		29	1900		480	
33	1620		29	2800		500	
34	1630		30	4020		510	
34	1800		30	5400		519	
36	1840		30	11000		520	
36	1890		31	38000		546	
37	2220		32			547	
38	2700		32			550	
40	4000		33			575	
40	4810		35			660	
43	6700		36			774	
43	14000		41			778	
43	55000		42			800	
45			43			867	
48			44			913	
49			45			1000	
51			46			1020	
56			48			1050	
58			50			1090	
60			51			1110	
67			51			1370	
68			56			1380	
73			56			1390	
76			57			1400	
85			57			1440	
85			65			1740	
87			68			1800	
88			69			1920	
91			70			1970	
93			70			2220	
100			71			2520	
						3970	
						4330	
						4970	
						5120	
						6360	
						6380	
						22300	

CHIRONOMUS GROWTH

Butyl benzyl phthalate No-Hit	Butyl benzyl phthalate Hit	Cadmium No-Hit		Cadmium Hit	Chromium No-Hit	No-Hit (Cont.)	Chromium Hit	Chrysene No-Hit	No-Hit (Cont)	Chrysene Hit	Copper No-Hit	No-Hit (Cont.)	Copper Hit
10	24	0.07	1.1	0.18	7	42	21.1	5.1	110	9.5	8.5	106	35.4
11	36	0.1	1.2	0.3	10.1	42.8	23	12	110	11	10.7	119	41.4
18	47	0.1	1.3	0.6	12	44.9	23.1	13	117	13	15.4	130	42.9
18	53	0.1	1.3	0.6	12	46	23.6	14	126	61	15.6	136	44.1
21	55	0.1	1.4	0.7	13	53.9	29.2	15	126	161	17.2	140	44.6
24	86	0.1	1.6	1	14.3	55.9	29.4	15	128	280	18.3	142	46
24	131	0.1	1.6	1	15	57.3	31	17	130	318	20.3	146	50.9
25	145	0.1	2.1	1.1	15.2	62	31.2	17	140	393	20.4	154	52.2
25	198	0.1	2.5	1.2	15.7	63.4	31.9	17.9	144	412	20.9	163	57.3
25	407	0.11	2.7	1.3	16.7	66.7	36	19	147	430	21.7	187	62
28	763	0.13	5.6	1.4	16.8	77.1	39	21	157	507	22.5	209	64
31		0.14	> 5.6	1.5	17	80.1	40.5	22	160	541	22.9	210	70.4
32		0.17		1.9	18.3	80.7	41	23	161	562	23.6	267	71.1
32		0.2		2	19.1	133	43	23	170	816	23.6	314	82.3
34		0.2		2	22		43	24	172	819	24.2	315	119
35		0.2		2.2	22		45.3	24	177	1140	24.3	327	158
37		0.2		2.3	23		68.3	24	179	1260	26	363	188
40		0.2		2.6	23.3		80.7	24.6	180	1300	26.6	397	371
41		0.2		2.9	24		96.2	25	187	2320	26.8	571	508
42		0.2		3.01	24		99.5	25	190	2460	27.9	619	651
43		0.2		3.67	24		102	25	193	3000	28.6	627	655
47		0.2		5	24.1		348	26	202	3370	30	651	1460
48		0.2			24.6			27	211	3700	30.7	829	2010
50		0.2			25			27	221	3800	31.2		10800
52		0.2			25			28	249	5730	31.6		
53		0.2			25.4			28	263	5880	32		
56		0.2			25.4			28.1	281	7800	32.4		
56		0.2			26			30	314	8900	32.9		
57		0.2			26			31	320	10000	33		
57		0.2			26			32	390	11000	34.1		
62		0.2			26			32	425	11000	35		
64		0.2			26			33	482	28100	35		
64		0.2			26			33	489	38000	35.5		
66		0.2			26.4			34	508	75000	35.9		
70		0.2			27			34	601		36.2		
73		0.2			27			35	657		36.5		
90		0.2			27			35	707		36.8		
119		0.3			27			35	755		36.8		
121		0.3			27.3			36	1130		38		
160		0.3			28			38	1400		38.3		
163		0.3			28			39	1440		38.5		
165		0.3			28.4			43	1500		40.6		
170		0.3			29			45	1540		40.7		
182		0.3			29			46	1560		41.9		
184		0.3			29			47	1710		43.4		
222		0.31			29			48	2140		44		
258		0.4			29			51	2170		45.6		
274		0.4			29			51	2200		46.9		
280		0.4			29.4			51	2210		48.1		
366		0.4			31			52	3200		50		
1520		0.4			31			55	3430		50.4		
		0.4			31			57	5940		53.2		
		0.45			31			58	7000		61		
		0.5			31			59	11000		61.8		
		0.5			32			61	46000		62.9		
		0.5			32			70			71.1		
		0.6			32			70			74.5		
		0.6			33			70.4			76.7		
		0.6			34			73			81.2		
		0.69			34			91			84.5		
		0.7			35			93			86		
		0.8			36			95			90.9		
		0.9			37			95			94.3		
		0.9			37			98			94.4		
		0.9			38			100			96.6		
		1			40			104			96.7		
		1			41			105			100		

CHIRONOMUS GROWTH					
Dibenz(a,h)anthracene	**Dibenz(a,h)anthracene**	**Dibenzofuran**	**Dibenzofuran**	**Dimethyl phthalate**	**Dimethyl phthalate**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
10	17	10	14	11	11
12	22	10	15	12	16
12	24	12	33	13	37
13	30	12	38	13	42
13	31	13	46	14	54
14	43	13	52	15	58
14	55.9	14	75	16	156
14	58	14	116	19	314
14	72	16	160	21	362
16	82	16	166	31	
16	116	18	168	108	
18	217	19	170	147	
18	424	24	200	158	
18	437	26	204	171	
18	490	26	399	172	
19.3	540	30	1750	270	
21	730	31	2260	311	
26	800	41	3810	436	
28	1200	62		576	
29	1200	64		> 576	
34	1700	90			
34.1	2200	138			
36	3070	160			
37	4700	170			
38		180			
49		234			
50		244			
56		372			
66		384			
125		443			
132		460			
176		660			
200		928			
214		1010			
216					
280					
292					
294					
327					
332					
342					
350					
630					
839					
1700					
2600					
11000					

CHIRONOMUS GROWTH						
Di-n-butyl phthalate	**Di-n-butyl phthalate**	**Di-n-octyl phthalate**	**Di-n-octyl phthalate**	**Fluoranthene**		**Fluoranthene**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**
6.5	9	10	54	5.6	190	14
10	44	11	115	16	192	15
11	61	12	256	16	206	18
11	71	12	413	19	210	44
11	108	13		19	210	276
12	350	13		21	240	453
12	1180	13		22	240	455
13		15		23	268	540
14		17		23	270	674
15		17		23.5	280	695
15		18		26.9	280	939
15		21		27	288	1400
16		21		28	291	1690
17		22		32	301	1780
17		23		34	320	2340
17		25		35	324	2450
19		26		36	334	2660
19		26		39	342	4950
20		27		40	356	6500
21		30		41	359	6600
21		30		41	363	7400
22		32		44	380	7710
23		34		44.7	383	9340
24		34		45	390	15000
24		34		53	428	15000
26		37		54	437	16700
26		39		54	445	18000
27		40		58	450	19200
30		44		58	452	20100
31		45		61	455	24200
34		46		63	500	26000
37		47		63	502	46100
37		48		65	646	100000
40		49		65	699	120000
41		52		67	731	
41		54		68	740	
67		55		69	798	
68		58		70	833	
90		66		71	1260	
103		67		72	1400	
116		74		75	1620	
158		90		76	1640	
254		100		77	2140	
306		110		79	2300	
350		201		80	3140	
481		399		91	3190	
690				91	3210	
805				93	3360	
841				93	3370	
893				96	3450	
1740				97	3600	
> 1740				97	4700	
				110	4780	
				110	5000	
				112	6100	
				116	7730	
				116	9800	
				123	11100	
				124	15000	
				130	180000	
				138		
				143		
				144		
				153		
				157		
				158		
				160		

CHIRONOMUS GROWTH									
Fluorene	**Fluorene**	**High Molecular Weight PAH**	**High Molecular Weight PAH**	**Indeno(1,2,3-c,d)pyrene**		**Indeno(1,2,3-c,d)pyrene**	**Lead**		**Lead**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**
11	30	54	56	8	88	8.2	4.7	44.8	12.6
12	33	107.1	96.6	10	88	18	5.24	47.6	13.5
12	42	116	7370	10	95	68	7.1	48.8	16.5
13	88	131.2	11020	11	97	100	7.3	52.2	29
13	160	134	13690	11	97.2	116	9.21	56	41.5
13	160	136	31640	12	100	130	10.2	58.7	50.2
14	167	470	35390	12	106	134	10.5	62.5	54.4
15	201	629	44500	12	110	134	11.1	68.4	68.1
17	230	711	57000	13	110	155	11.2	79.1	80.7
17	251	799	62900	14	120	170	11.6	87.6	94.6
18	274	1004	95330	14	124	207	12	89.6	118
19	285	1376	111800	14	133	208	12.2	96.6	125
19	570	2068	121500	15	141	342	12.5	99.4	133
19	590	2080	122700	16	144	363	12.7	114	177
22	620	2251	134300	16	160	763	12.7	150	210
22.3	670	2522	250500	16	178	1180	12.7	150	258
23	730	2629	427700	16	180	1500	12.7	152	272
23	1070	8440	765000	17	198	1750	12.9	194	294
24	1200	13290		17.7	199	2340	13.1	204	299
25	1900	13480		18	222	4600	13.2	230	322
33	2080	15080		19	255	6000	13.2	249	357
36	2350	16460		20	260	10000	13.3	431	436
36.2	3240	16780		20	269	13000	13.3	1160	525
37	3400	17410		21	340	13900	13.4		1310
38.1	3890	19960		22	518	14000	13.7		
39	6970	21970		22	643	17000	13.8		
44	15800	28550		22	740	19000	14.4		
47	18300	31170		23	773	41000	14.4		
49		38030		24	889	110000	14.7		
50		54800		24	1160		14.8		
57		72000		25	1220		14.9		
60		120500		27	1340		15.1		
62		471000		27	1350		15.2		
73				28	1450		15.2		
75				29	2300		15.2		
79				30	3400		15.3		
85				30	4120		15.7		
91				30	5100		15.9		
100				30	10000		16.2		
107				31	18000		17.3		
124				34	60000		17.9		
126				36			17.9		
171				36			18.1		
181				40			18.6		
185				43			18.8		
200				43			20.8		
270				44			21		
390				44			21.1		
400				45			22.4		
420				45			23.5		
465				52			23.5		
498				53			23.6		
666				53			25.6		
932				59			25.9		
1540				59			26.1		
1720				61			26.6		
2500				65.6			27.3		
3850				67			27.4		
				68			27.5		
				69			30.1		
				73			30.2		
				74			33.6		
				76			36		
				80			36.2		
				81			38.9		
				81			39		
				83			41.9		

CHIRONOMUS GROWTH											
Low Molecular Weight PAH	**Low Molecular Weight PAH**	**Mercury**	**Mercury**	**Naphthalene**	**Naphthalene**	**Nickel**		**Nickel**	**Phenanthrene**		**Phenanthrene**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**
10.8	23.3	0.02	0.05	3.3	7.8	8	27.2	18.5	4.3	133	11
28.6	1800	0.04	0.06	6.1	27	10	28	21	11	136	13
53	2498	0.04	0.08	10	27	12.9	28	22	14	142	231
71	2700	0.05	0.08	10	30	13	28	22	14	150	234
95	2760	0.05	0.09	11	30	14.7	28	22	14	160	282
160	3110	0.05	0.1	13	35.6	15.5	28	23	14	160	566
233	8130	0.05	0.13	13	48	15.8	29.5	24.1	16	160	570
358	8980	0.05	0.13	13	64	16	29.7	25	17	161	617
422	9200	0.05	0.14	14	65	16	30	25	17	180	629
1225	9380	0.05	0.15	15	86	16	31	27	19	186	848
1763	9520	0.05	0.16	15	110	16	31	27	19	190	1070
2088	10270	0.05	0.17	15	126	16	39	27	19	234	1130
2240	18700	0.06	0.21	16	148	17	39.4	28	19	240	1300
2890	28500	0.06	0.25	18	161	17	43.5	28	19	244	1600
3040	29010	0.06	0.558	18	250	17.6	45.2	35.7	19.3	278	1900
3140	49000	0.06	0.844	19	400	18	46	36	20	332	3990
4380	78300	0.06	1.25	19	440	18.5	48.9	37.9	21	333	4230
4720		0.06	2.22	19	450	18.8	49.4	48.4	21	384	4370
6259		0.06	2.7	20	466	19.2	54	53.1	22	384	4700
6590		0.06	3.74	20	529	20.1	59.6	58.2	23	388	4900
8255		0.06	43	22	627	20.3	61.5	62.4	23	393	5700
8800		0.06		22.2	1310	21	64	77.4	24	469	6100
9130		0.07		23.4	1360	21	70.6	355	25	472	6400
14070		0.07		24	2200	21	113	594	25	569	8240
16870		0.07		24	4890	21			26	587	8420
41970		0.07		27	5630	21			26	730	8950
		0.07		30	40600	21			26	778	14200
		0.08		31		21.2			28	1000	15000
		0.08		31.5		22			29	1040	36200
		0.08		32		22			31.2	1200	39200
		0.09		33		22			32	1480	41100
		0.09		33		22			33	1700	49000
		0.096		34		22			33	1720	
		0.1		37		22			35	1730	
		0.1		40		22			35	1990	
		0.1		42		22			36	2080	
		0.1		49		22.7			36	2660	
		0.11		54		23			37	3620	
		0.11		55		23			38	4440	
		0.12		58		23			39	4700	
		0.12		61		23			41	5300	
		0.12		92		23			44	5470	
		0.13		100		23			49	6190	
		0.13		100		23			54	7570	
		0.13		225		23			54	26000	
		0.13		291		23			60		
		0.14		424		23.7			60		
		0.141		471		23.9			60		
		0.15		501		24			62		
		0.157		650		24			71		
		0.16		913		24			71		
		0.16		1030		24			80		
		0.16		1400		25			80		
		0.2		2280		25			81		
		0.23		3220		25			86		
		0.435		4870		26			86		
		0.54		4970		26			87		
		0.545				26			93		
		0.62				26			93		
		0.659				26			93		
		0.662				26			93.1		
		0.749				27			95		
		0.796				27			96		
		0.8				27			102		
		0.8				27			109		
		0.993				27			128		
		2.01									
		3.04									

CHIRONOMUS GROWTH							
Pyrene		Pyrene	Silver	Silver	Total benzofluoranthenes (b+k (+j))		Total benzofluoranthenes (b+k (+j))
No-Hit	No-Hit (Cont.)	Hit	No-Hit	Hit	No-Hit	No-Hit (Cont.)	Hit
10	150	14	0.1	0.1	11.7	143	15.4
14	158	17	0.1	0.2	15	148	20
17	160	19	0.1	0.2	15	149	41
17	175	37	0.1	0.22	15.1	175	93
19	210	56	0.1	0.3	17	176	188
21	240	375	0.1	0.3	19.2	178	300
21.1	254	455	0.1	0.3	23	186	339
22	260	510	0.1	0.3	25	191	541
24	261	536	0.1	0.3	25	234	552
27	270	626	0.1	0.5	26	245	579
30	280	700	0.1	0.6	26	248	617
30	289	829	0.1	0.7	27	248	855
31	300	1320	0.14	0.8	36	255	881
32.2	304	1350	0.14	0.8	36.9	283	906
33	308	1630	0.15	0.8	39	290	1028
36	319	1820	0.2	0.8	39	293	1151
37	320	2340	0.2		41	297	1200
37	332	2530	0.2		41	311	1923
38	333	3650	0.2		41	312	1960
39	352	5000	0.2		42	316	2310
41	356	5700	0.2		43	335	2320
42	361	7150	0.2		43	338	2620
45	370	7500	0.2		44	339	4800
48	379	11200	0.2		44	348	5530
48.5	380	13300	0.2		45	363	6590
53	380	13600	0.2		46.4	379	7000
54	387	15900	0.2		48	414	7110
54	404	20000	0.2		50	421	13500
55	429	21000	0.2		50	445	14600
57	431	21000	0.2		50	496	18400
63	452	22000	0.2		53	501	20100
64	477	25000	0.2		54	630	22100
66	488	55600	0.2		54	657	41800
67	523	98000	0.2		55	686	47000
67	581	110000	0.2		57	774	144000
68	626		0.2		59	823	
68	634		0.26		59	853	
68	679		0.26		59	1380	
70	715		0.28		60	1410	
71	770		0.3		62	1780	
73	927		0.3		63	2000	
74	1250		0.3		66.9	2020	
74	1320		0.3		67	2270	
75	1590		0.3		68	2450	
77	1710		0.3		69	2800	
82	2190		0.3		70	2830	
82	2700		0.38		72	3400	
89	2710		0.4		76	3400	
91	2960		0.4		76	3620	
92	3460		0.4		77	4440	
96	3540		0.4		82	5600	
97	4280		0.4		83	11000	
100	4410		0.4		87	12000	
107	4700		0.5		91	19900	
108	5120		0.5		102	79000	
110	6800		0.5		103		
117	7000		0.5		110		
118	7540		0.6		117		
120	8790		0.6		118		
120	10000		0.7		119		
121	16000		0.8		120		
124	68000		1		124		
130			1.1		127		
133			1.9		140		
140			3.3		141		
144			> 3.3		142		

CHIRONOMUS GROWTH							
Total organic carbon		**Total organic carbon**	**Total Polychlorinated Biphenyls**	**Total Polychlorinated Biphenyls**	**Zinc**		**Zinc**
No-Hit	**No-Hit (Cont.)**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**
0.21	2.35	1.28	11	112	49.7	238	70.3
0.23	2.41	1.3	11	129	51.3	254	89.3
0.38	2.42	1.44	12	209	55	262	96.8
0.42	2.44	1.46	16	284	55.9	264	164
0.56	2.45	1.67	17	354	58.1	269	167
0.61	2.48	1.77	29	1460	62.2	271	225
0.67	2.51	1.89	40	2090	65	281	279
0.69	2.52	2.03	43		65.6	296	306
0.72	2.57	2.16	43		65.6	314	333
0.74	2.61	2.5	53		66	354	337
0.78	2.8	2.61	57		71.1	359	385
0.82	3.03	2.66	62		72.7	368	397
0.88	3.6	2.71	69		73	374	399
0.89	4.9	2.74	82		74	375	406
0.95	5	2.74	88		75	377	407
0.97	5.2	3	108		76	391	423
1.03	5.7	3	108		76.4	435	435
1.19	6.3	3.4	116		76.9	443	450
1.2	6.4	3.52	116		77	527	593
1.24	9.7	3.69	116		82	550	675
1.26	10.6	4.6	116		83	567	683
1.28	12.1	5.6	130		83	754	1770
1.3	12.2	6.8	253		84	1020	2010
1.3	21.3	7.9	257		84.3	1080	4150
1.37	> 21.3	15.8	300		85		
1.39			304		85		
1.44			379		85.7		
1.45			394		85.9		
1.46			2500		86		
1.56					86		
1.59					87		
1.61					87		
1.65					87		
1.68					89.6		
1.72					90		
1.73					90		
1.77					96		
1.83					97.6		
1.87					98		
1.87					101		
1.91					101		
1.93					104		
1.96					106		
1.96					111		
1.97					113		
1.98					122		
1.98					122		
2.01					124		
2.06					130		
2.07					130		
2.11					131		
2.11					133		
2.13					137		
2.15					142		
2.16					142		
2.18					144		
2.21					145		
2.21					145		
2.25					158		
2.25					161		
2.26					173		
2.27					190		
2.3					203		
2.3					212		
2.3					220		
2.34					227		

CHIRONOMUS MORTALITY							
2-Methylnaphthalene	**2-Methylnaphthalene**	**4,4'-DDD**	**4,4'-DDD**	**4,4'-DDE**	**4,4'-DDE**	**4-Methylphenol**	**4-Methylphenol**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
11	5.1	0.77	1	0.76	2	7.3	16
12	10	0.99	3	0.8	2	11	24
12	13	3	7	2	3	16	48
13	15	3.4	8	2	3.2	117	50
13	16	4.7	8	3	3.8	476	63
14	16	5	8.3	3	5	760	77
15	28	5.6	11	4	5		130
15	28	7.5	12	4.6	6		150
20	30	8.9	16	6.7	6.8		159
24	52	9.2	20	7.8	8		180
36	54	14	22	8.3	8		188
189	62	22	27	8.9	8		215
555	64	24	45	11	8.6		239
	141	30		11	11		382
	160	33		18			512
	170	49		19			551
	180	50		20			699
	180	52		20			710
	188	59		20			1210
	214	70		> 20			1560
	353	96					1730
	443	> 96					2030
	469						2360
	877						6310
	982						
	1720						
	1770						
	2310						
	3470						
	AET - low confidence						
	AET - high confidence						
	next highest hit value						
	outlier						

CHIRONOMUS MORTALITY								
Acenaphthene No-Hit	**Acenaphthene Hit**	**Acenaphthylene No-Hit**	**Acenaphthylene Hit**	**Anthracene No-Hit**	**No-Hit (Cont.)**	**Anthracene Hit**	**Antimony No-Hit**	**Antimony Hit**
6.1	10	3.2	2.5	5	115	12	0.05	0.1
10	11	3.5	8.5	10	126	14	0.06	0.1
11	12	4.5	11	11	150	16	0.1	0.13
11	14	11	12	12	155	20	0.1	0.14
12	14	12	12	12	177	22	0.1	0.2
12	18	13	14	12	210	23	0.2	0.2
14	18	13	17	13	220	28	0.2	0.2
15	19	13	23	13	220	28	0.2	0.2
17	20	14	25	14	343	32	0.2	0.2
18	24	14	30	15	353	37	0.2	0.3
18	33	15	42	16	370	40	0.4	0.3
20	37	15.7	71	17	380	46	0.47	0.3
23	59	19	110	18	429	53	0.5	0.3
23	60	20.8	110	22	510	67	0.6	0.4
23	73	23	120	22	660	110	0.66	0.4
32	90	34	136	23	774	124	1	0.5
36	92	35.8	140	25	965	170	1.6	0.54
37	120	36.8	148	25	1190	220	1.8	0.6
39	130	44	171	27	1520	233	1.9	0.8
43	156	88	200	27	1900	280		1.1
45	162	94	209	29	5700	320		4.4
51	177	314	265	29		350		
52	203	470	265	38.6		356		
56	252		279	40.1		373		
72	260		362	41		406		
75	280		460	42		420		
77	310		480	46		465		
82	310		594	48.1		510		
88	332		640	52		552		
91.9	360		642	53		560		
99	410		697	65		600		
100	520		1020	70		630		
107	523		1260	72.5		717		
110	560		3600	74		814		
112	560			75.1		915		
130	630			85		980		
148	792			95		1110		
170	920			99		1130		
209	940			101		1230		
240	990					1400		
260	1060					1500		
272	1100					1580		
316	1250					1700		
830	1320					1700		
2350	2460					1700		
2790	2460					1900		
2940	6100					2860		
5700	7420					2920		
6290	20800					5900		
29600	86200					6140		
						6600		
						16200		
						16600		

CHIRONOMUS MORTALITY							
Aroclor 1254	**Aroclor 1254**	**Aroclor 1260**	**Aroclor 1260**	**Arsenic**		**Arsenic**	
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**
12	11	15	15	1.8	5.6	1.4	7
17	11	18	24	2	5.6	1.9	7
24	16	20	26	2.7	5.7	2	7.08
25	18	24	27	2.7	5.7	2.1	7.08
37	35	29	38	2.9	5.9	2.3	7.38
51	47	37	40	3	6	3	8
52	62	38	42	3	6	3	8.64
54	70	40	42	3	6	3	8.7
54	70	46	43	3.1	6	3	8.89
57	81	48	46	3.2	6	4	9
58	140	53	57	3.3	6	4	9
70	160	62	57	3.3	6	4	9
78	170	64	74	3.3	6.1	4	9
97	227	64	85	3.4	6.16	4	9
100	230	69	116	3.5	6.58	4	9.14
120	256	77	138	3.5	7	4	11
120	294	98	460	3.5	7	4	11
140	960	130	500	3.55	7	4	12.7
150	1060	130	2500	3.6	7	4	12.8
156		140		3.7	7.7	4	13.1
170		150		3.75	7.8	4.09	13.1
170		184		3.8	8	4.1	13.7
180				3.9	8	4.5	16.5
189				3.9	8	4.7	17
200				3.94	8.03	5	17.2
202				4	8.1	5	20
209				4	8.18	5	20
230				4	8.62	5	21.7
340				4	9.32	5	23
				4	9.46	5	23.9
				4	9.7	5	30.6
				4	10.6	5	31.3
				4	11.7	5	31.4
				4	11.7	5	32
				4	12.2	5	111
				4.2	13	5	123
				4.2	14.3	5	152
				4.3	14.7	5.17	175
				4.3	15	5.81	200
				4.3	15	6	
				4.3	15	6	
				4.3	17	6	
				4.36	17.8	6	
				4.4	19	6	
				4.6	26.6	6	
				4.6	26.8	6	
				4.7	28	6.1	
				4.7	44.9	6.92	
				4.7	49.3		
				4.7	50.7		
				4.74	50.9		
				4.8			
				4.9			
				5			
				5			
				5			
				5			
				5			
				5.1			
				5.3			

CHIRONOMUS MORTALITY							
Benzo(a)anthracene		**Benzo(a)anthracene**		**Benzo(a)pyrene**		**Benzo(a)pyrene**	
No-Hit	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**
4.8	103	11	561	8.8	128	12	358
8.1	105	13	600	10	131	14	430
11	109	14	917	11	133	15	451
13	112	16	958	12	135	16	615
14	112	19	1060	13	145	19	783
15	113	19	1100	13	150	19	890
15	115	22	1220	13	153	21	915
16.9	116	24	1270	14	171	21	1070
17	130	25	1500	15	176	24	1080
17	140	26	1580	16	176	25	1110
18	140	29	1700	16	180	26	1420
18	150	30	1720	18	189	31	1530
18	154	30	2300	18	195	32	1800
19	162	32	2380	18.6	195	34	1840
20	163	33	2620	19	210	36	1890
20	167	35	3200	20	210	36	2210
20	170	35	3340	21	213	37	2220
22	170	36	3500	23	216	38	2500
24.4	179	38	3750	25	223	43	2700
27	186	41	4000	27	231	43	2750
28	188	50	4260	27	240	48	2960
29	190	51	5430	27.4	256	51	3340
29	235	56	6200	28	256	56	4000
29	240	70	7930	28	280	66	4600
31	240	73	8600	29	298	67	4810
32	259	75	9000	32	310	73	4900
32	268	79	11000	32	333	81	6700
32	271	79	11000	33	343	85	9600
35	280	93	12000	34	351	87	11000
37	288	93	13000	40	360	91	13000
37	321	94	25600	40	360	100	13000
38	342	95	37000	40	382	116	14000
39	353	97	44000	43	387	117	15000
41	354	99	77000	45	454	120	24300
43	441	105		49	570	120	39000
49	470	106		58	710	130	55000
52	516	110		60	720	153	86000
55	539	120		68	750	160	
59	590	130		76	820	170	
62	598	148		80	1000	176	
64	724	150		85	1400	206	
67	740	181		88	1620	226	
68	750	190		92	1630	230	
71	760	199		93	1650	248	
71	1080	220		102	3300	270	
73	1180	310		114	11000	334	
77.8	1300	373		120			
78	1330	411		124			
82	1470	523		128			
89	1480						
93	2640						
100	2700						
	5800						

CHIRONOMUS MORTALITY							
Benzo(g,h,i)perylene		**Benzo(g,h,i)perylene**		**Benzoic acid**	**Benzoic acid**	**Beryllium**	**Beryllium**
No-Hit	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
9.6	73.3	11	613	35	82	0.071	0.135
11	73.4	11	791	64	110	0.0883	0.147
11	78	14	821	73	110	0.102	0.153
12	84	15	827	250	250	0.147	0.188
13	85	17	840	300	270	0.151	0.249
13.5	90	17	1150	300	813	0.154	0.256
14	94	18	1200	360	880	0.16	0.317
14	99	18	1330	650	900	0.162	0.385
16	102	19	1350	660	1540	0.162	0.444
16	104	19	1350	720	1650	0.19	0.477
16.8	108	22	1410	740	2020	0.202	0.5
17	110	22	1500	800	2070	0.214	
17	114	23	1660	1300	2170	0.252	
17	115	29	1720	1500	2380	0.261	
18	121	30	1900	2910	2430	0.262	
18	127	32	2510		2640	0.286	
19	133	32	2800		2840	0.308	
19	134	36	3300		3790	0.325	
20	149	42	4020		4110	0.327	
20	164	50	5400		4200	0.348	
20.9	175	51	7100			0.358	
21	186	56	7600			0.361	
22	190	56	8900			0.387	
22	200	57	9400			0.417	
22	210	57	11000			0.427	
29	210	65	11000			0.463	
30	216	68	12100				
30	220	70	27000				
31	220	70	38000				
33	221	77	55000				
35	240	77					
36	246	77					
41	280	82					
43	280	87					
44	310	99					
45	400	100					
46	430	110					
48	490	140					
51	570	146					
65	854	150					
67	965	150					
69	1520	170					
71	2500	181					
	5200	187					
		216					
		223					
		231					
		270					
		308					
		350					
		424					
		497					

CHIRONOMUS MORTALITY				
Bis(2-ethylhexyl) phthalate	**Bis(2-ethylhexyl) phthalate**		**Butyl benzyl phthalate**	**Butyl benzyl phthalate**
No-Hit	**Hit**	**Hit (Cont.)**	**No-Hit**	**Hit**
30	55	1090	10	18
32	62	1370	11	24
32	62	1400	18	24
50	110	1920	21	24
62	120	1970	25	25
70	120	2140	31	25
100	140	2140	47	28
110	160	2220	50	32
110	200	2520	50	32
120	220	2800	52	34
160	240	3010	55	35
170	250	3420	56	36
170	260	3970	57	37
170	275	4970	62	40
170	290	5120	63	41
180	310	6360	64	42
190	320	6380	64	43
220	330	10500	66	47
230	350	22300	70	48
285	350	33300	110	53
300	360		119	53
307	370		121	55
322	370		140	56
330	370		145	57
337	390		180	73
350	420		184	86
360	420		230	90
418	444		274	131
420	450		407	160
440	452		409	163
470	460		430	165
480	460		470	170
519	500		540	182
577	501		980	198
713	510			222
772	520			258
774	540			260
778	546			280
913	547			366
1000	550			763
1020	575			1520
1050	580			
1110	660			
1200	727			
1380	800			
1390	867			
1400				
1440				
1600				
1740				
1800				
1800				
1930				
2000				
2800				
3400				
3510				
4330				
7590				

CHIRONOMUS MORTALITY

Cadmium		Cadmium		Chromium		Chromium		Chrysene		Chrysene	
No-Hit	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**
0.07	0.7	0.074	0.9	10.8	40	7	32	5.1	147	15	1540
0.093	0.8	0.1	0.9	12	40.5	10.1	33	9.5	152	19	1560
0.1	0.834	0.1	0.968	12.2	40.5	12	33.4	11	160	21	2170
0.1	0.875	0.1	0.973	15	41	13	34	12	161	23	2200
0.1	0.913	0.1	1	15.1	43	14.3	35	13	170	24	2210
0.11	0.963	0.1	1	15.2	43.9	15.7	36	13	172	25	3000
0.12	1.13	0.12	1	16.5	45.4	16.7	38	14	179	27	3200
0.13	1.17	0.13	1	16.8	45.5	18.3	38.8	15	180	28	3370
0.159	1.2	0.14	1.1	17	46.3	18.5	39	17	180	31	3430
0.16	1.39	0.17	1.1	17.4	46.5	19.1	39	17	187	32	3700
0.161	1.44	0.2	1.2	17.6	48.5	20.2	41	17.9	202	34	3800
0.17	1.55	0.2	1.23	18.4	49.6	21.5	42	22	211	34	4800
0.173	1.58	0.2	1.3	20.3	50.2	22	42.1	23	220	35	5730
0.18	1.69	0.2	1.3	20.5	50.9	23	42.8	24	221	35	5880
0.18	2.07	0.2	1.3	20.6	52.1	23.1	43	24	230	35	5940
0.187	2.1	0.2	1.3	21.1	52.3	23.3	43.3	24.6	249	39	7000
0.19	2.15	0.2	1.4	22	52.8	23.6	43.5	25	260	43	7240
0.2	2.3	0.2	1.4	23	53.9	24	44.9	25	281	43	7800
0.2	2.39	0.2	1.5	24	58.2	24	45.3	26	290	48	8900
0.2		0.2	1.6	25	60.8	24.1	46	26	314	51	10000
0.2		0.2	1.6	25	61	24.6	53.9	27	318	52	11000
0.2		0.2	1.9	26	133	25.1	55.9	28	340	58	11000
0.2		0.2	2	26		25.4	57.3	28.1	385	59	11000
0.2		0.2	2	26.2		25.4	58	30	390	61	28100
0.2		0.2	2.2	28.9		26	62	32	390	71	38000
0.2		0.21	2.5	29		26	63.4	33	393	91	46000
0.22		0.26	2.6	29		26	66.7	33	412	95	75000
0.24		0.267	2.7	29		26	68.3	35.9	425	95	
0.27		0.292	2.9	29		26.2	77.1	36	430	98	
0.3		0.3	3.01	29.4		26.4	80.1	36.6	482	100	
0.3		0.3	3.67	31		27	80.7	38	489	100	
0.3		0.3	5	31		27	80.7	45	490	104	
0.3		0.3	5.6	31		27	96.2	46	498	110	
0.357		0.3		31		27	99.5	47	507	111	
0.361		0.31		31.8		27.3	102	50	508	130	
0.377		0.4		31.9		28	348	50	601	140	
0.391		0.4		32		28		51	657	140	
0.4		0.45		32		28.4		51	690	157	
0.4		0.52		32.1		28.7		55	707	161	
0.4		0.6		34		29		57	819	170	
0.4		0.6		34.2		29		59	1000	177	
0.472		0.607		36		29.2		61	1100	190	
0.5		0.69		36.5		29.4		70	1140	193	
0.5		0.7		37		29.8		70	1200	210	
0.5		0.75		37		31		70.4	1300	263	
0.506		0.791		37.7		31		73	1670	280	
0.6		0.8		38.2		31.2		76	1710	320	
0.6		0.811		38.2		31.9		78	1800	320	
0.6		0.9		39		32		93	2140	400	
0.651								105	2320	541	
								110	2460	562	
								110	3000	755	
								110	6400	816	
								117		1130	
								126		1260	
								126		1300	
								128		1400	
								130		1440	
								144		1500	

CHIRONOMUS MORTALITY									
Copper		**Copper**		**Dibenz(a,h)anthracene**	**Dibenz(a,h)anthracene**	**Dibenzofuran**	**Dibenzofuran**	**Dibutyltin**	**Dibutyltin**
No-Hit	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
3.8	71.2	8.5	76.7	7.9	12	9.4	9.2	6.9	7.6
4.69	77.9	10.7	81.2	10	14	10	12	16	9.2
5.15	82.3	17.2	84.5	12	14	10	12	20	12
11	90.9	18.1	86	13	14	13	12	26	12
15.2	94.3	20.2	96.7	13	14	14	13	85	17
15.4	94.4	20.2	140	14	18	14	14	96	19
15.6	96.6	20.3	142	16	18	15	16	333	43
16.5	100	21.4	146	16	30	16	24		53
16.7	106	21.7	154	17	34	18	30		70
16.8	119	22.5	158	18	43	19	31		77
18	119	22.9	187	18	66	26	33		92
18.3	125	23.6	210	19.3	72	26	38		107
18.4	130	23.6	267	21	82	41	46		131
20.4	136	24.4	315	22	97	52	62		140
20.9	163	26	327	24	116	204	64		155
22.6	188	26.6	363	26	132	443	75		233
24.2	209	26.7	371	28	176		90		265
24.3	212	27.9	397	29	200		116		288
24.4	229	28.6	508	31	214		138		321
25.9	314	28.7	571	34.1	216		140		492
26.5	619	32.9	627	36	217		160		509
26.8		33	651	37	240		160		661
28.2		34	651	38	280		166		1930
28.3		34.2	655	49	292		168		17000
29.5		35	829	50	327		170		
30		35.5	1460	55.9	332		170		
30.7		35.9	2010	56	342		180		
30.9		36.8	10800	58	350		200		
31.2		36.8		125	390		234		
31.6		38		251	424		244		
32		40.6		294	437		310		
32.4		40.7		540	490		372		
34.1		41.4		800	630		384		
35		41.9			730		399		
35.4		42.7			800		460		
36.2		43.4			839		660		
36.5		44			1200		928		
36.5		44.1			1200		1010		
38.3		44.6			1700		1750		
38.5		45.6			1700		2260		
39.1		46			2200		3810		
42.9		46.9			2600				
43.1		47.7			3070				
43.7		48.1			4700				
43.8		50			11000				
48.6		50.4							
50.9		51.4							
50.9		52.2							
54		53.2							
57.6		53.4							
59.3		54.5							
61		57.3							
62		61.8							
65		62.7							
65.2		62.9							
66		64							
66.9		70.4							
69.4		71.1							
71.1		74.5							

CHIRONOMUS MORTALITY

Dimethyl phthalate	Dimethyl phthalate	Di-n-butyl phthalate	Di-n-butyl phthalate	Di-n-octyl phthalate	Di-n-octyl phthalate	Fluoranthene		Fluoranthene	
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**
12	5.4	6.5	11	10	11	5.6	157	19	3140
13	11	8.1	11	12	12	14	160	23	3210
14	11	9	12	13	13	15	190	27	3360
16	13	10	13	15	13	16	192	28	3450
21	15	11	15	17	17	16	200	32	4500
37	16	12	15	26	18	18	206	46	4700
42	19	14	15	26	21	19	230	54	4780
46	31	17	16	27	21	21	230	58	5000
54	54	17	17	30	22	22	268	58	6100
58	108	19	19	32	23	23	270	63	6600
71	147	22	20	34	25	23.5	276	63	7400
110	156	23	21	34	30	26.9	288	65	7710
160	158	24	21	37	34	34	291	68	7730
171	172	26	24	45	39	35	300	70	7900
190	270	26	27	48	40	36	324	76	9800
311	314	34	30	54	44	36	342	79	11100
	362	37	31	54	46	39	356	87	15000
	436	37	40	55	47	39	363	91	15000
	576	41	67	66	49	40	380	93	15000
		41	90	74	52	40.9	383	96	18000
		44	108	110	58	41	437	97	19200
		61	116	115	67	41	445	97	20100
		68	158	256	90	44	452	110	24200
		71	254		100	44	453	123	26000
		103	306		201	44.7	455	129	46100
		805	350		399	45	460	130	47700
			350		413	53	500	143	100000
			481			54	502	158	120000
			690			61	520	160	180000
			841			64	674	160	
			893			65	695	170	
			1180			67	699	210	
			1740			67.6	710	210	
						69	731	240	
						70	740	240	
						70.2	766	240	
						70.7	798	280	
						71	833	280	
						71	1220	301	
						72	1260	310	
						75	1300	320	
						77	1300	334	
						77	1400	359	
						80	1620	380	
						91	1900	390	
						93	2000	428	
						110	2000	450	
						110	2450	455	
						112	2660	540	
						116	3190	580	
						116	3200	646	
						124	3370	939	
						130	3600	1400	
						130	4040	1640	
						130	4950	1690	
						138	6500	1780	
						144	9340	2140	
						150	15000	2300	
						153	16700	2340	

CHIRONOMUS MORTALITY							
Fluorene	Fluorene	High Molecular Weight PAH	High Molecular Weight PAH	Indeno(1,2,3-c,d)pyrene		Indeno(1,2,3-c,d)pyrene	
No-Hit	Hit	No-Hit	Hit	No-Hit	No-Hit (Cont.)	Hit	Hit (Cont.)
9.2	12	54	116	8	97.2	10	363
11	12	56	470	8.2	100	10	370
13	17	96.6	612	11	100	16	518
13	18	107.1	629	11	101	18	643
13	19	131.2	1004	12	106	20	740
14	23	134	1376	12	116	22	763
15	23	136	2080	12	124	22	773
17	25	441	2251	13	130	23	960
18	29	711	2522	14	134	24	1160
19	33	799	2629	14	134	25	1180
19	39	2068	3457	14	141	27	1220
22	50	17410	7370	15	144	27	1340
22.3	85	31640	8440	16	155	28	1450
24	88		11020	16	160	30	1500
30	100		13290	16	178	34	1600
33	126		13480	17	200	36	1750
36	160		13690	17.7	210	43	2300
36.2	167		15080	18	210	43	2340
37	171		16460	19	220	45	3400
38.1	185		16780	20	222	52	4120
42	200		19960	21	244	59	5100
44	201		21970	22	255	59	6000
47	230		28550	24	260	60	10000
49	251		31170	29	270	67	10000
57	270		35390	29	280	70	13000
60	274		38030	30	283	73	13900
62	310		44500	30	330	80	14000
67.4	390		54800	30	330	81	17000
73	400		57000	31	340	81	18000
75	420		62900	36	460	88	19000
79	465		72000	40	470	90	41000
91	498		95330	44	720	95	60000
107	570		111800	44	889	110	110000
120	590		120500	45	1150	110	
120	620		121500	53	1350	110	
124	660		122700	53	4600	120	
124	666		134300	61	5300	120	
140	670		250500	65.6		133	
160	730		427700	68		150	
180	932		471000	68		160	
181	1070		765000	69		170	
190	1200			74		180	
285	1540			76		198	
470	1720			82		199	
1900	2500			83		207	
2080	3240			88		208	
2350	3400			97		260	
3850	6970					269	
3890	15800					342	
18300	56400						

CHIRONOMUS MORTALITY								
Lead		**Lead**		**Low Molecular Weight PAH**	**Low Molecular Weight PAH**	**Mercury**	**Mercury**	
No-Hit	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**Hit (Cont.)**
3.02	41.5	4.7	68.1	10.8	53	0.02	0.03	0.343
4.27	41.9	5.01	68.4	23.3	71	0.038	0.04	0.359
5.24	44.8	5.99	73.5	28.6	95	0.039	0.04	0.435
6.19	45.9	7.3	79.1	147	160	0.04	0.05	0.545
6.69	47.6	11.1	79.7	233	181	0.04	0.05	0.558
7.1	47.7	11.6	79.9	2498	351	0.042	0.05	0.62
7.17	48.2	12	80.8	6590	358	0.05	0.05	0.659
7.24	48.8	12.2	87.6		422	0.05	0.05	0.662
9.21	50	12.5	89.6		1225	0.05	0.05	0.749
10.2	50.2	12.7	94.6		1763	0.052	0.05	0.796
10.5	51.1	12.7	99.4		1800	0.057	0.06	0.8
11.2	52.2	13.2	102		2088	0.0583	0.06	0.844
11.4	54.4	13.2	105		2240	0.06	0.06	0.993
11.8	64	13.3	114		2700	0.06	0.06	1.25
12.6	80.7	13.3	118		2760	0.06	0.06	2.01
12.7	95.2	13.7	125		2890	0.06	0.06	2.22
12.7	96.6	14.4	133		3040	0.06	0.06	2.7
12.9	111	14.7	150		3110	0.07	0.07	3.04
13.1	122	14.8	150		3140	0.0844	0.07	3.74
13.4	125	14.9	152		4380	0.0853	0.07	43
13.5	171	15	154		4720	0.0877	0.07	
13.8	172	15.1	177		6259	0.09	0.0776	
14.4	184	15.2	194		8130	0.0998	0.08	
14.7	185	15.3	210		8255	0.1	0.08	
15.2	189	15.7	230		8800	0.1	0.08	
15.2	204	15.7	234		8980	0.11	0.08	
15.5	210	15.9	249		9130	0.114	0.08	
15.9	283	16.6	258		9200	0.119	0.0838	
16	284	17.3	272		9380	0.13	0.088	
16.2	295	17.9	294		9520	0.13	0.09	
16.5	335	18.1	299		10270	0.13	0.09	
16.9		20.8	322		14070	0.14	0.096	
17.3		21	357		16870	0.149	0.1	
17.9		23.5	431		18700	0.15	0.1	
18.6		23.5	436		28500	0.15	0.1	
18.8		23.6	525		29010	0.16	0.104	
18.9		25.9	1160		41971	0.16	0.11	
21		26.1	1310		49000	0.165	0.12	
21.1		27.3			78300	0.17	0.12	
22.4		27.4				0.186	0.12	
25.6		29				0.23	0.13	
26.6		30.1				0.232	0.13	
27.5		30.2				0.284	0.13	
33.6		32.4				0.286	0.14	
35		36				0.297	0.141	
36.2		39				0.389	0.157	
37.8		56				0.433	0.16	
38.9		58.7				0.445	0.16	
39.2		62.5				0.461	0.2	
						0.478	0.206	
						0.54	0.21	
						0.546	0.21	
						0.552	0.25	
						0.604	0.253	
						0.673	0.259	
						0.711	0.284	
						0.8	0.335	

CHIRONOMUS MORTALITY											
Monobutyltin	**Monobutyltin**	**Naphthalene**	**Naphthalene**	**Nickel**		**Nickel**		**Phenanthrene**		**Phenanthrene**	
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**
1.7	1	3.3	8.1	7.79	34.4	8	30.4	4.3	180	14	1990
3.97	1.3	6.1	10	8.4	35.7	10	31	11	180	14	2600
4.19	9.5	7.8	13	8.7	37	12.9	31	11	190	14	2660
4.3	11	10	16	11.6	38.8	13	33.6	13	190	17	3620
4.4	11.2	10	18	15.8	38.9	14.7	36	14	231	19	3990
4.8	15	11	19	16	39.1	15.5	37.9	16	234	19	4440
5.2	19	13	22	16	39.3	15.8	39	17	278	22	4700
6.4	21	13	24	16	39.6	16	39.4	19	282	23	4700
6.91	22	14	24	17	40.7	16	39.9	19	332	24	4900
7.1	24	15	30	17.6	44.2	17	41.4	19	333	25	5300
7.13	24.9	15	37	18	45.1	19.9	43.4	19.3	354	25	5470
10	26	15	40	18.5	45.6	20.8	43.5	20	384	26	5700
11	26	18	48	18.5	46.8	21	43.7	21	384	26	6100
11.3	26	19	49	18.8	47.3	21	45	21	388	33	6100
12.1	26.9	19	65	19.2	48.1	21	45.2	23	393	36	6190
12.4	38	20	92	19.3	48.7	21	46	26	469	37	6400
13.6	40	20	100	19.7	53.9	21	48.4	28	472	38	8420
17	54	20	100	20.1	54.9	22	48.9	29	566	39	14200
18.8	59	22.2	110	20.3	55.3	22	49.4	31.2	587	49	15000
20.3	64	23.4	110	20.3	57.6	22	53.1	32	617	54	26000
22	76	27	161	21	58.4	22	54	33	680	63	39200
27	154	27	250	21	60	22	58.2	35	719	65	41100
29	166	27	291	21.2	113	22	59.6	35	880	71	49000
30	194	30	400	22		22	61.5	36	1000	73	120000
38	212	30	424	22		22	62.4	41	1000	93	
38	221	31	440	22		22	64	43	1500	93	
40	267	31.5	450	23		22.7	70.6	44	1600	93	
41	312	32	466	23		23	77.4	45	1720	93	
43	379	33	471	23		23	355	53	1730	95	
46	380	33	501	23		23	594	54	1730	96	
56	396	34	627	23		23		55	1800	97	
98	459	35.6	650	23.6		23		60	2080	128	
508	459	42	913	23.7		23.9		60	4230	136	
	2560	54	1030	24		24		60	4370	160	
	4850	55	1310	24		24		62	4700	160	
		58	1360	24.1		25		65	7570	160	
		61	1400	25		25		65	8240	186	
		64	2200	25		25.7		71	8950	234	
		86	2280	25		26		80	36200	240	
		126	3630	26		26		80		240	
		148	4870	27		26		81		244	
		225	4890	27		26		86		260	
		510	4970	27		26		86		569	
		529	5630	27.2		27		87		570	
		3220		27.3		27		93.1		629	
		40600		28		27		95		730	
				28		27		102		778	
				28		27		109		848	
				28		28		110		1000	
				28		28		110		1040	
				28.7		28.2		120		1070	
				29.3		28.8		130		1130	
				30.6		28.9		133		1200	
				30.8		29.1		142		1300	
				32.9		29.5		150		1480	
				34.2		29.7		150		1700	
				34.3		30		161		1900	

CHIRONOMUS MORTALITY									
Phosphorus	**Phosphorus**	**Pyrene**			**Pyrene**		**Silver**		**Silver**
No-Hit	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**No-Hit (Cont.)**	**Hit**
128	410	10	130	477	19	2340	0.094	0.8	0.1
282	486	14	140	536	27	2530	0.1	0.8	0.1
306	507	14	140	560	30	2700	0.1	1	0.1
349	538	17	158	580	31	2710	0.1	1.1	0.1
352	590	17	160	581	36	2960	0.1	1.32	0.1
393	625	17	160	626	39	3460	0.1	1.4	0.1
402	710	19	175	626	53	4200	0.1	1.6	0.1
425	725	21	200	634	54	4410	0.11	1.8	0.1
428	824	21.1	240	685	57	4700	0.12	1.9	0.1
459	1160	22	250	700	66	5120	0.12	2	0.11
475	1310	24	250	715	67	6800	0.144	2.2	0.14
503	1590	30	254	770	68	7000	0.15	3.3	0.14
516	2770	32.2	260	927	68	7150	0.17	> 3.3	0.16
531		33	289	987	70	7500	0.19		0.2
563		33	304	1250	71	7540	0.199		0.2
615		37	319	1320	74	8100	0.2		0.2
624		37	320	1350	82	8790	0.2		0.2
657		37	332	1400	83	10000	0.2		0.2
691		38	333	1500	88.1	13300	0.2		0.2
694		39	356	1600	91	13600	0.2		0.2
741		41	361	1820	92	15900	0.2		0.2
880		42	375	2100	96	16000	0.2		0.2
908		45	379	2190	100	20000	0.2		0.2
1040		46	380	2300	118	21000	0.2		0.2
1150		48	380	2500	120	21000	0.217		0.2
1180		48.5	387	2870	130	22000	0.22		0.2
1540		50	430	3540	133	25000	0.23		0.2
2060		51.6	431	3650	140	32200	0.23		0.2
2660		54	452	4280	144	55600	0.25		0.2
2790		55	455	5000	150	68000	0.26		0.219
3290		56		5700	150	98000	0.26		0.3
> 3290		63		11200	162	110000	0.27		0.3
		64		18000	210		0.28		0.3
		65.6			210		0.3		0.3
		66			240		0.3		0.3
		67			261		0.3		0.3
		68			270		0.3		0.3
		71.2			280		0.3		0.3
		73			280		0.322		0.3
		74			300		0.38		0.35
		75			308		0.4		0.359
		77			320		0.4		0.36
		80			350		0.4		0.39
		82			352		0.4		0.4
		89			370		0.4		0.43
		92			404		0.4		0.45
		97			429		0.43		0.5
		99			450		0.444		0.5
		107			488		0.45		0.5
		108			510		0.5		0.53
		110			523		0.5		0.7
		110			679		0.545		0.7
		117			829		0.6		0.8
		120			1320		0.6		0.8
		120			1590		0.6		0.8
		121			1630		0.63		1.1
		124			1710		0.77		1.9

CHIRONOMUS MORTALITY							
Total benzofluoranthenes (b+k (+j))		**Total benzofluoranthenes (b+k (+j))**		**Total organic carbon**		**Total organic carbon**	
No-Hit	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**
11.7	311	15	2450	0.22	3.12	0.21	2.8
15	320	23	2620	0.23	3.42	0.35	2.87
15.1	335	36	2800	0.23	3.48	0.38	3
15.4	338	39	3400	0.26	3.52	0.56	3
17	339	41	3400	0.42	3.58	0.6	3.03
19.2	339	41	3620	0.61	3.61	0.67	3.31
20	348	44	4300	0.69	3.71	0.67	3.4
25	350	48	4440	0.72	3.89	0.74	3.48
25	363	50	5180	0.72	3.95	0.78	3.6
26	379	54	5530	0.88	4.01	0.82	3.69
26	414	55	5600	0.95	4.01	0.89	3.8
27	445	59	6590	0.97	4.56	1.19	4.05
36.9	501	59	7000	1.03	4.65	1.2	4.14
39	541	62	7110	1.26	4.74	1.24	4.6
41	552	67	8900	1.27	4.92	1.28	4.74
41	579	69	11000	1.28	5.02	1.3	4.9
42	600	72	12000	1.3	5.81	1.37	4.9
43	617	76	13500	1.3	6.4	1.39	5
43	630	77	14600	1.32	7.07	1.46	5.13
44	630	83	18400	1.4	7.35	1.46	5.2
45	630	91	19900	1.42	7.35	1.57	5.6
46.4	643	102	20100	1.44	8.9	1.59	5.7
50	657	116	22100	1.44	9.82	1.67	6.3
50	686	117	41800	1.45		1.72	6.8
53	774	120	47000	1.52		1.77	7.9
54	799	120	79000	1.56		1.82	9.7
57	823	127	144000	1.61		1.83	10.6
59	853	140		1.65		1.87	12.1
60	890	141		1.68		1.89	12.2
63	906	142		1.73		1.93	15.8
66.9	1028	175		1.77		1.96	21.3
68	1040	176		1.83		1.97	
70	1200	180		1.87		1.98	
76	1390	186		1.91		2.06	
79	1410	190		1.96		2.07	
82	1850	220		1.98		2.11	
87	1860	245		2.01		2.16	
93	1923	283		2.03		2.16	
103	2270	290		2.11		2.18	
110	2750	293		2.13		2.21	
118	2830	300		2.14		2.21	
119	3170	312		2.15		2.25	
124	4800	316		2.15		2.27	
143	13800	421		2.17		2.3	
148		480		2.25		2.3	
149		496		2.26		2.3	
150		770		2.31		2.35	
178		855		2.34		2.42	
187		881		2.35		2.44	
188		1151		2.41		2.5	
191		1380		2.45		2.52	
234		1410		2.48		2.57	
248		1780		2.51		2.61	
248		1960		2.54		2.69	
255		2000		2.61		2.71	
297		2020		2.66		2.74	
310		2320		3.1		2.74	

CHIRONOMUS MORTALITY									
Total Polychlorinated Biphenyls	**Total Polychlorinated Biphenyls**	**Total Sulfides**	**Total Sulfides**	**Tributyltin**	**Tributyltin**	**Zinc**		**Zinc**	
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**No-Hit (Cont.)**	**Hit**	**Hit (Cont.)**
12	11	2.9	0.9	0.503	1.16	13.6	211	47.5	354
17	11	12.6	2.3	0.87	2	17.2	212	48	368
40	16	13.4	2.9	1	2.27	18.6	215	55	374
43	29	35.6	3.3	1.28	4.4	30.7	249	55.9	377
53	43	44.2	3.8	1.95	7.6	34.8	254	58.1	385
57	48	47.4	3.8	2.4	9.5	45.4	262	65	391
69	62	48.1	6.2	2.51	13	49.7	264	70.8	397
82	73	60.6	6.6	2.88	18	51.3	270	71.6	399
88	108	62	7	4.7	40	58.2	271	72.7	406
116	108	74.1	7.8	8.5	60	61.3	281	73	407
116	112	80.1	9	9	62	62.2	296	75	423
116	116	83.8	9.2	9.3	78	65.6	333	77	435
129	284	87	9.9	11	113	65.6	337	81.5	435
130	304	110	10	13	160	66	359	84	443
130	379	146	10.8	19	198	69.9	370	84.3	450
209	394	149	17.5	22	200	70.3	375	85	550
253	1460	150	65.5	25	210	70.8	527	85.7	567
257	2090	161	65.8	27	598	71.1	683	85.9	593
300	2500	202	92.4	32	697	72.7		86	675
354		231	96.3	35	723	73.5		86	754
		247	97.3	37	810	73.7		87	1020
		321	181	100	824	74		87	1080
		341	223	220	936	76		89.6	1770
		360	249	260	1210	76.4		90	2010
		514	493	1860	1410	76.8		96	4150
		702	590		1710	76.9		97.6	
			941		2200	79.3		101	
			2330		2220	79.3		101	
					2490	82		104	
					2530	83		106	
					6650	83		106	
					15700	85		110	
					64600	85.3		113	
						87		114	
						89.3		122	
						90		122	
						90.5		124	
						96.8		124	
						98		130	
						107		131	
						111		137	
						115		142	
						120		142	
						120		144	
						126		145	
						130		158	
						133		161	
						139		164	
						145		203	
						152		220	
						167		225	
						173		227	
						188		238	
						190		269	
						193		279	
						210		306	
						210		314	

MICROTOX					
2-Methylnaphthalene	**2-Methylnaphthalene**	**Acenaphthene**	**Acenaphthene**	**Acenaphthylene**	**Acenaphthylene**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
2.2	11	77	10	42	11
8.8	12	156	10	110	11
141	13	203	11	148	12
170	13	252	11	171	12
180	13	280	11	265	12
180	14	360	12	640	13
443	15	523	12		15
469	15	560	14		17
	15	1060	15		88
	16		18		136
	16		18		140
	20		18		209
	24		19		279
	28		20		314
	36		23		362
	52		23		470
	54		32		594
	62		33		642
	120		45		697
	188		52		1020
	189		59		1260
	214		60		
	353		72		
	555		75		
	877		100		
	982		110		
	1720		130		
	1770		162		
	2310		170		
	3470		177		
			210		
			272		
			310		
			316		
			332		
			792		
			830		
			1250		
			1320		
			2460		
			2460		
			7420		

MICROTOX									
Anthracene No-Hit	**Anthracene Hit**	**Antimony No-Hit**	**Antimony Hit**	**Aroclor 1254 No-Hit**	**Aroclor 1254 Hit**	**Aroclor 1260 No-Hit**	**Aroclor 1260 Hit**	**Arsenic No-Hit**	**Arsenic Hit**
4.8	11	0.54	0.1	7.3	11	15	15	2.1	2
14	12	0.61	0.1	47	16	140	18	2.5	2.8
82	12	0.61	0.1	100	18		20	2.6	3
210	12	0.62	0.1	140	24		24	3.55	3
280	14	0.72	0.2	160	25		27	3.9	3
320	15	1.9	0.2	170	37		29	3.94	3
373	16	2.7	0.2	230	51		37	4	4
420	20	2.9	0.2		52		38	4.2	4
552	22	5.1	0.2		54		40	4.74	4
630	22	> 5.1	0.2		54		42	4.8	4
980	23		0.3		57		43	6.92	4
1130	25		0.3		58		46	7.08	4
1230	27		0.41		62		46	7.08	4
	28		0.45		70		48	7.38	4
	28		0.5		70		53	8.5	4
	29		0.5		78		57	8.7	4
	32		0.6		78		62	8.89	4
	40		0.66		81		64	9.14	4
	41		1		95		64	11.7	4.09
	52		1.1		97		69	14.7	4.36
	53		1.6		150		74	16.5	5
	53		1.8		156		77	19	5
	67		3.5		170		98	19	5
	70		4		170		138	20	5
	74				189		150	21.7	5
	85				202		184	31.3	5
	99				209		460	31.4	5
	115				227		500	111	5
	170				230		2500	123	5
	220				256				5
	220				960				5
	233				1060				5
	320								5.17
	380								5.8
	406								6
	429								6
	465								6
	580								6
	660								6
	717								6
	814								6
	915								6
	1110								7
	1580								7
	1900								7
	2860								7
	2920								8
	16200								8
									8
									8
									8.18
									9
									9
									11
									12.2
									12.7
									12.8
									13
									13
									13
									13.1
									13.7
									14.3
									15
									15
									17
									17
									17.2
									20
									23.9
									26.6
									30.6
									152
									175
									200

MICROTOX					
Benzo(a)anthracene	**Benzo(a)anthracene**	**Benzo(a)pyrene**	**Benzo(a)pyrene**	**Benzo(g,h,i)perylene**	**Benzo(g,h,i)perylene**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
8.6	14	11	13	15	11
13	14	14	15	30	11
17	15	16	16	68	11
27	17	25	18	77	11
59	18	37	19	87	14
75	19	81	19	100	15
120	19	153	21	140	16
170	22	176	21	220	17
190	24	230	24	400	17
523	25	240	25	497	18
750	26	783	26	791	18
917	29	915	27	821	19
1220	29	1000	28	840	19
1270	29	1080	31	1150	19
1700	30	1420	32	1500	20
2620	30	2500	34	2510	21
3500	30	3340	34	4020	22
4260	32	4600	36		22
	32	4810	36		22
	33		38		29
	35		40		30
	36		43		30
	38		48		31
	41		51		32
	41		58		33
	49		67		36
	56		76		42
	64		85		43
	67		87		44
	70		91		51
	71		93		56
	79		114		65
	93		116		69
	99		117		70
	103		120		70
	105		120		77
	105		124		82
	106		133		99
	112		135		108
	113		176		110
	115		189		114
	130		195		127
	154		213		133
	179		223		134
	181		226		146
	188		248		149
	199		333		164
	240		334		170
	280		351		186
	288		358		216
	321		360		221
	342		382		231
	353		615		240
	373		720		280
	411		820		280
	600		890		424
	740		910		570
	740		1070		613
	760		1400		680
	958		1530		827
	1060		1620		854
	1100		1630		1330
	1180		1840		1350
	1300		1890		1350
	1480		2100		1410
	1580		2220		1500
	1600		2750		1520
	1720		2960		1660
	2380		11000		1720
	3750		24300		5200
	5430				12100
	5800				
	25600				

MICROTOX					
Bis(2-ethylhexyl) phthalate	**Bis(2-ethylhexyl) phthalate**	**Butyl benzyl phthalate**	**Butyl benzyl phthalate**	**Cadmium**	**Cadmium**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
23	18	25	10	0.04	0.07
23	30	53	11	0.04	0.07
32	160	55	18	0.04	0.1
55	160	140	18	0.05	0.1
78	180	182	21	0.1	0.1
220	200	222	24	0.159	0.1
433	250	260	24	0.161	0.1
501	307	1520	25	0.2	0.1
580	320		25	0.267	0.1
1090	330		25	0.292	0.2
1600	330		28	0.3	0.2
1970	337		31	0.391	0.2
2140	350		32	0.45	0.2
2520	360		32	0.5	0.2
22300	370		34	0.52	0.2
	390		35	0.607	0.2
	418		40	0.963	0.2
	420		42	0.968	0.2
	440		43	1.17	0.2
	444		47	1.2	0.2
	452		48	1.3	0.2
	460		50	1.3	0.2
	470		52	1.4	0.2
	480		53	2	0.2
	510		55	2.7	0.2
	519		56	2.9	0.2
	520		56	11	0.2
	546		57		0.2
	547		57		0.2
	550		62		0.2
	575		64		0.3
	660		64		0.3
	727		66		0.3
	774		70		0.3
	778		73		0.3
	800		86		0.31
	867		119		0.4
	913		121		0.4
	1000		131		0.4
	1020		145		0.4
	1050		160		0.4
	1110		165		0.472
	1370		170		0.5
	1380		180		0.5
	1390		184		0.5
	1400		198		0.6
	1440		230		0.6
	1740		258		0.6
	1800		274		0.651
	1800		280		0.69
	1930		366		0.7
	2000		407		0.7
	2140		430		0.8
	2220		763		0.811
	2800		980		0.875
	2800				1
	3010				1
	3400				1
	3420				1.1
	3510				1.1
	3970				1.2
	4330				1.3
	4970				1.4
	5120				1.44
	6360				1.55
	6380				1.6
	7590				1.6
	10500				2.1
	33300				2.3
					3.01
					3.67
					5

MICROTOX									
Chromium No-Hit	**Chromium Hit**	**Chrysene No-Hit**	**Chrysene Hit**	**Copper No-Hit**	**Copper Hit**	**Dibenz(a,h)anthracene No-Hit**	**Dibenz(a,h)anthracene Hit**	**Dibenzofuran No-Hit**	**Dibenzofuran Hit**
4.4	12	17	17	4.69	15.6	116	12	15	10
7	13	24	17	7	17	132	13	138	10
12	15	25	21	7.2	19	176	14	140	12
14	17	36	23	8.5	20.3	216	14	168	12
15.1	17.4	43	24	11	23.6	240	14	180	13
20.3	22	59	27	16	26.6	292	16	234	14
23	22	76	27	16	30	390	18	310	14
24.1	23	91	28	16.7	31.2	490	18	384	14
25.1	24	100	30	17	32	839	18	399	15
26.2	24	210	31	17	32.4		22		16
26.2	24	220	32	18.1	32.9		24		16
28.7	24.6	320	33	21.4	33		28		18
29.8	25	755	34	23	35		29		19
38.8	25	1200	34	24.4	35		31		24
39	26	1260	35	27.9	35.9		34		26
40.5	26	1540	36	28.6	36.2		36		26
42.8	26	1560	36	34	36.5		38		33
45.5	26	3000	38	40.1	38.3		43		38
57.3	26	3700	39	41	38.5		49		41
62	27	4800	43	47.7	40.6		56		110
63.4	27	5940	48	50	41.9		72		116
66.7	27		51	54	43.4		82		166
68.3	27		51	62.7	45.6		120		204
89	28		51	125	46.9		125		244
95	28		58	363	48.6		200		372
348	29		61	371	51.4		214		443
	29		70	627	53.2		217		460
	29		70	651	61		230		928
	29		93	829	61.8		294		1010
	29		95	1460	65.2		327		1750
	29		98		71.1		332		2260
	31		104		71.1		342		3810
	31		126		74.5		424		
	31		128		76.7		437		
	31		140		77.9		800		
	31		157		81.2		3070		
	32		160		82.3				
	32		161		84.5				
	32.1		172		86				
	33		177		90.1				
	34		180		90.9				
	34		202		94.3				
	35		211		94.4				
	36		263		96.6				
	36		318		96.7				
	37		320		100				
	37		390		101				
	38		412		106				
	38.2		425		119				
	39		430		119				
	39		482		130				
	40		489		136				
	41		490		140				
	41		541		142				
	42		562		146				
	43		816		154				
	43		930		158				
	44.9		1000		163				
	45.3		1100		187				
	46		1130		188				
	48.5		1300		209				
	53.9		1440		210				
	55.9		1710		212				
	76		1800		229				
	77.1		2100		314				
	79		2140		315				
	80.1		2170		327				
	80.7		2210		397				
	80.7		3430		508				
	96.2		5730		571				
	99.5		5880		619				
	102		6400		651				
	133		28100		655				
					2010				
					10800				

MICROTOX					
Dimethyl phthalate	**Dimethyl phthalate**	**Di-n-butyl phthalate**	**Di-n-butyl phthalate**	**Di-n-octyl phthalate**	**Di-n-octyl phthalate**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
31	11	15	10	11	10
71	11	134	11		12
108	12	306	11		12
156	13	690	11		13
172	13	1180	12		13
436	14	1710	12		13
	15	1740	13		15
	16	> 1740	14		17
	16		15		17
	19		15		18
	21		16		21
	37		17		21
	42		17		22
	54		17		23
	54		19		25
	58		19		26
	110		20		26
	147		21		27
	158		21		30
	160		22		30
	171		23		32
	190		24		34
	270		24		34
	311		26		37
	314		26		39
	362		27		40
	576		30		44
			31		45
			34		46
			37		47
			37		48
			40		49
			41		52
			41		54
			41		54
			44		55
			61		58
			67		66
			68		74
			71		90
			103		110
			108		115
			116		201
			254		256
			350		399
			350		413
			481		
			805		
			841		
			893		

MICROTOX					
Fluoranthene	**Fluoranthene**	**Fluorene**	**Fluorene**	**High Molecular Weight PAH**	**High Molecular Weight PAH**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
5.9	27	24	12	29	300
15	34	120	12	90	2251
28	36	185	13	118	2629
39	45	251	13	254	7370
41	54	270	14	309	9000
43	54	310	15	629	13290
46	58	400	17	1004	13690
55	58	660	19	8440	16460
97	65	666	19	11020	17410
110	65	1070	23	13480	18000
123	68		23	15080	19960
170	70		24	35390	21970
300	72		25	54800	31170
310	76		30		57000
580	77		33		62900
1300	79		33		250500
1640	91		37		
1780	91		39		
3140	96		44		
3360	97		47		
4500	110		73		
7710	116		79		
7900	120		88		
11100	130		124		
	130		140		
	143		140		
	158		167		
	160		180		
	190		190		
	206		201		
	240		250		
	270		274		
	288		285		
	301		465		
	320		470		
	324		498		
	334		932		
	342		1540		
	356		1720		
	359		3240		
	380		3400		
	390		6970		
	428				
	437				
	445				
	450				
	453				
	455				
	502				
	674				
	695				
	699				
	710				
	740				
	833				
	939				
	1400				
	1690				
	1900				
	2000				
	2000				
	2340				
	2800				
	3200				
	3210				
	3370				
	3450				
	3600				
	4700				
	4780				
	7730				
	15000				
	19200				
	24200				
	46100				

MICROTOX							
Indeno(1,2,3-c,d)pyrene	**Indeno(1,2,3-c,d)pyrene**	**Lead**	**Lead**	**Low Molecular Weight PAH**	**Low Molecular Weight PAH**	**Mercury**	**Mercury**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
10	10	4.7	7.8	17	18	0.014	0.024
28	12	6.3	10.2	18	59	0.03	0.044
59	13	6.8	10.5	24	358	0.033	0.05
70	15	7	11	52	422	0.033	0.05
110	16	7.24	11.1	53	1800	0.036	0.05
120	18	7.6	12.2	71	1900	0.042	0.05
198	19	14.8	12.5	98	2760	0.053	0.05
210	20	15.9	12.7	109	3000	0.0583	0.05
460	21	16.6	12.7	2088	3040	0.06	0.05
518	22	17.3	12.7	2700	4720	0.0776	0.06
763	22	27.3	12.9	3140	6590	0.0838	0.06
773	23	32.4	13.1	4380	9130	0.087	0.06
960	24	48.2	13.2	8800	14070	0.104	0.06
1160	24	58.7	13.3	9200	16870	0.114	0.06
1600	25	79.9	13.3		18700	0.141	0.06
2340	27	84	13.4		28500	0.21	0.07
4120	27	125	13.7		78300	0.253	0.07
	28	133	14.4			0.286	0.07
	29	152	14.7			0.343	0.08
	30	154	14.9			0.558	0.0853
	30	185	15.2			0.604	0.09
	30	194	15.2			0.659	0.09
	34	230	15.3			0.796	0.096
	36	234	15.7			0.993	0.1
	36	299	16.2			2.22	0.1
	44	431	17.9			3.04	0.1
	45		18.1				0.1
	45		18.6				0.11
	52		20.8				0.11
	59		21.1				0.12
	61		22.4				0.13
	68		23.6				0.13
	73		25.6				0.13
	76		25.9				0.14
	80		26.1				0.14
	81		26.6				0.15
	81		27.4				0.15
	97		27.5				0.16
	100		30.2				0.16
	106		33.6				0.16
	120		36.2				0.17
	124		38.9				0.186
	130		41.5				0.19
	133		41.9				0.21
	134		44.8				0.23
	144		47.6				0.284
	155		48.8				0.435
	178		50				0.54
	199		50.2				0.545
	207		52.2				0.552
	208		54.4				0.62
	222		56				0.662
	255		62.5				0.673
	260		68.1				0.69
	270		79.7				0.711
	330		89.6				0.749
	363		94.6				0.8
	643		96.6				0.844
	720		99.4				1.25
	740		111				2.01
	770		114				2.7
	889		150				3.74
	1180		150				43
	1220		177				
	1340		184				
	1350		204				
	1450		249				
	1500		258				
	1750		284				
	1800		295				
	5300		436				
	13900		525				
			1310				

MICROTOX

Monobutyltin No-Hit	Monobutyltin Hit	Naphthalene No-Hit	Naphthalene Hit	Nickel No-Hit	Nickel Hit	Phenanthrene No-Hit	Phenanthrene Hit	Pyrene No-Hit	Pyrene Hit
4.8	22	3	10	6.5	13	5.3	14	11	29
5.2	26	29	11	7.79	16	14	17	14	31
9.5	50	110	13	8	16	18	18	34	37
10	54	291	14	8.1	18	27	19	36	42
11	59	424	15	14	21	30	19	39	48
15	60	466	15	16	21	33	19	46	53
19	98	501	15	25.7	21	39	20	55	54
26	166	650	16	27.3	22	52	21	78	57
38	212	1310	18	28	22	53	22	92	64
40	221		19	28.2	22	65	23	118	66
64	267		19	28.9	22	71	23	130	67
76	312		19	29	22	93	24	150	70
154	396		24	29	22.7	110	25	280	71
194	459		24	29.1	23	260	25	320	74
379	508		27	29.3	23	680	26	450	74
380	2560		27	30	23	778	26	1400	77
459	4850		27	30.4	23	1300	29	1590	82
			31	33.6	23	1480	32	2340	82
			32	39	23	2600	33	2710	91
			33	39.6	23	2660	36	3460	92
			34	43.5	23	3990	37	4200	92
			37	45	23	5470	38	7150	96
			48	45.1	23.6	6100	41	8100	110
			65	45.2	23.7		49	8790	120
			110	46	23.9		54		124
			148	47	24		54		133
			160	48.9	24		59		140
			350	49.4	24		60		144
			471	53.1	24		60		160
			510	355	25		86		175
			627		25		87		240
			913		25		93		254
			1360		26		96		261
			2280		26		102		304
			3220		26		109		308
			4870		26		128		320
			4890		26		133		332
			4970		26		136		333
			5630		27		142		352
					27		160		356
					27		160		380
					27		161		404
					28		180		429
					28		180		431
					28		186		452
					28		234		455
					28		234		477
					28		244		488
					28		282		523
					29.5		384		536
					29.7		393		580
					30		469		634
					31		472		700
					31		566		715
					31		629		770
					31		848		829
					37		1000		1320
					37.9		1000		1500
					38.8		1070		1600
					39.4		1130		1630
					40.7		1200		1900
					41.4		1200		2500
					48.4		1500		2530
					51		1720		2960
					54		1800		3000
					56		1990		3540
					58.2		2080		4280
					58.4		3620		4410
					61.5		4440		4700
					62.4		4700		5120
					64		6190		7540
					70.6		8420		13300
					77.4		14200		15900
					113		41100		18000
					594				55600

MICROTOX					
Silver	**Silver**	**Total benzofluoranthenes (b+k (+j))**	**Total benzofluoranthenes (b+k (+j))**	**Total organic carbon**	**Total organic carbon**
No-Hit	**Hit**	**No-Hit**	**Hit**	**No-Hit**	**Hit**
0.06	0.094	14	25	0.21	0.23
0.08	0.098	16	27	0.22	0.25
0.094	0.1	41	27	0.23	0.67
0.1	0.1	53	36	0.3	0.82
0.11	0.1	67	39	0.56	0.95
0.14	0.1	120	41	0.76	0.97
0.16	0.1	127	41	0.996	1.16
0.16	0.1	135	43	1.32	1.19
0.2	0.1	220	44	1.42	1.2
0.2	0.1	320	48	1.57	1.28
0.3	0.1	480	50	1.82	1.39
0.39	0.199	1380	54	2.3	1.44
0.43	0.2	1780	55	2.7	1.45
0.444	0.2	1860	57	2.8	1.46
0.53	0.2	1960	59	3.4	1.46
0.545	0.2	2450	60	3.6	1.56
2.5	0.2	4300	62	3.8	1.65
	0.2	5530	69	3.8	1.72
	0.2	8900	72	4.05	1.73
	0.2	11000	76	4.9	1.8
	0.2		76	4.9	1.83
	0.2		77	5.13	1.87
	0.2		82	5.6	1.91
	0.2		91	6.3	1.96
	0.2		102	7.35	1.96
	0.2		103	8.9	1.97
	0.2		117	12.2	1.98
	0.2		124	21.3	1.98
	0.217		141	> 21.3	2.01
	0.3		148		2.03
	0.3		175		2.06
	0.3		186		2.07
	0.3		191		2.11
	0.3		234		2.11
	0.3		245		2.13
	0.322		293		2.15
	0.35		311		2.16
	0.4		312		2.18
	0.4		316		2.21
	0.4		335		2.25
	0.4		348		2.25
	0.4		363		2.26
	0.4		421		2.27
	0.5		445		2.3
	0.5		496		2.34
	0.5		552		2.41
	0.5		579		2.42
	0.5		617		2.44
	0.53		686		2.45
	0.6		774		2.48
	0.6		823		2.51
	0.6		853		2.52
	0.7		855		2.57
	0.8		881		2.61
	0.8		890		2.66
	1		1151		2.74
	1.1		1280		3
	1.1		1390		3.03
	1.32		1850		3.52
	1.4		2000		3.58
	3.3		2020		4.14
			2270		4.6
			2320		5
			2750		5.2
			2830		5.81
			3200		6.4
			3400		6.8
			3620		7.07
			4440		7.35
			6590		7.9
			7110		9.7
			13800		9.82
			41800		10.6
					12.1
					15.8

MICROTOX			
Total Polychlorinated Biphenyls	**Total Polychlorinated Biphenyls**	**Zinc**	**Zinc**
No-Hit	**Hit**	**No-Hit**	**Hit**
62	11	30.7	58
	16	47	60
	29	49	66
	40	54	73
	43	55	74
	43	55	76
	53	55	77
	57	56	83
	69	70.8	83
	82	81.5	85
	88	84.3	85
	108	89.6	86
	108	101	86
	112	119	87
	116	119	87
	116	120	87
	116	270	90
	129	377	90
	209	406	96
	253	567	97.6
	257	675	98
	284	754	101
	300	1080	106
	304	1130	111
	354		113
	394		114
	1460		120
	2090		122
	2500		130
			130
			131
			133
			137
			145
			145
			158
			161
			173
			190
			203
			210
			210
			212
			227
			238
			243
			254
			262
			264
			269
			271
			281
			296
			333
			337
			354
			359
			368
			369
			370
			374
			375
			391
			407
			423
			435
			443
			527
			550
			593
			683
			1770
			2010
			4150

Appendix C

APPENDIX C. OPTIMAL PERCENTILE RESULTS

The results of the optimal percentile analysis presented in Section 3 are provided in this appendix. For each level of effects (statistical significance only, SQS, and CSL) there are two sets of results provided – the one above is for the data set containing individual PAHs and Aroclors, and the one below is for the same data set containing only summed PAHs and PCBs. In this lower data set, blank spaces indicate individual PAHs and Aroclors that are not present in that data set.

Five sets of percentiles are shown for each of the two data sets. These correspond to different levels of false negatives that Ecology could select to base their SQVs on, and range from 5-25% false negatives, in increments of 5%. The first page shows the reliability results for each of these sets of percentiles for all six reliability parameters. The remaining pages show the chemical concentrations associated with the optimal percentiles of the no-hit distribution corresponding to the selected false negative rates. The false negative and false positive rates are repeated on each page for reference.

STATISTICAL SIGNIFICANCE ONLY:					
UNSUMMED PAHs and PCBs	**% False**		**2003%**	**1988%**	
% False Negatives	**Positives**	**% Sensitivity**	**Efficiency**	**Efficiency**	**% Reliability**
5	70	95	30	78	77
10	54	90	46	82	78
15	42	85	58	84	78
19	37	81	63	85	76
25	26	75	74	89	75
STATISTICAL SIGNIFICANCE ONLY:					
SUMMED PAHs and PCBs	**% False**		**2003%**	**1988%**	
% False Negatives	**Positives**	**% Sensitivity**	**Efficiency**	**Efficiency**	**% Reliability**
5	68	95	32	79	78
10	50	90	50	83	79
14	43	86	57	84	78
19	34	81	66	86	77
25	22	75	78	90	76

STATISTICAL SIGNIFICANCE ONLY:						
UNSUMMED PAHs and PCBs	% False					
% False Negatives	Positives	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Antimony
5	70	12	60	14	39	1.50
10	54	12	95	16	64	2.4
15	42	12	120	19	92	2.7
19	37	12	154	20	101	2.7
25	26	12	186	24	345	2.7
STATISTICAL SIGNIFICANCE ONLY:						
SUMMED PAHs and PCBs	% False					
% False Negatives	Positives					Antimony
5	68					1.5
10	50					2.4
14	43					2.7
19	34					2.7
25	22					2.7

STATISTICAL SIGNIFICANCE ONLY:							
UNSUMMED PAHs and PCBs	% False	Aroclor	Aroclor				
% False Negatives	Positives	1254	1260	Arsenic	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(g,h,i)perylene
5	70	120	130	4.9	62	49	46
10	54	131	130	6.1	101	128	73
15	42	156	130	9.5	154	183	179
19	37	172	130	13.6	175	224	205
25	26	186	130	21.4	257	301	225
STATISTICAL SIGNIFICANCE ONLY:							
SUMMED PAHs and PCBs	% False						
% False Negatives	Positives			Arsenic			
5	68			4.9			
10	50			6.1			
14	43			7.5			
19	34			10.8			
25	22			19.0			

STATISTICAL SIGNIFICANCE ONLY:							
UNSUMMED PAHs and PCBs	% False		Butyl				
% False Negatives	Positives	Bis(2-ethylhexyl) phthalate	benzyl phthalate	Cadmium	Chromium	Chrysene	Copper
5	70	170	88	0.24	36	72	28
10	54	216	108	0.39	47	137	34
15	42	327	222	0.83	52	222	42
19	37	380	286	1.13	52	270	49
25	26	561	362	1.69	61	360	61
STATISTICAL SIGNIFICANCE ONLY:							
SUMMED PAHs and PCBs	% False		Butyl				
% False Negatives	Positives	Bis(2-ethylhexyl) phthalate	benzyl phthalate	Cadmium	Chromium		Copper
5	68	170	88	0.24	36		28
10	50	216	108	0.39	47		34
14	43	280	157	0.80	50		39
19	34	351	265	0.91	52		44
25	22	462	330	1.39	58		58

STATISTICAL SIGNIFICANCE ONLY:					
UNSUMMED PAHs and PCBs	% False			Dimethyl	
% False Negatives	Positives	Dibenz(a,h)anthracene	Dibenzofuran	phthalate	Di-n-octyl phthalate
5	70	20	9	46	0
10	54	25	9	46	26
15	42	33	9	46	26
19	37	42	9	46	26
25	26	70	9	46	26
STATISTICAL SIGNIFICANCE ONLY:					
SUMMED PAHs and PCBs	% False			Dimethyl	
% False Negatives	Positives			phthalate	Di-n-octyl phthalate
5	68			46	0
10	50			46	26
14	43			46	26
19	34			46	26
25	22			46	26

STATISTICAL SIGNIFICANCE ONLY:					
UNSUMMED PAHs and PCBs	**% False**			**High Molecular**	
% False Negatives	**Positives**	**Fluoranthene**	**Fluorene**	**Weight PAH**	**Indeno(1,2,3-c,d)pyrene**
5	70	87	45	150	53
10	54	146	62	335	84
15	42	258	76	484	167
19	37	415	94	614	212
25	26	689	121	982	282
STATISTICAL SIGNIFICANCE ONLY:					
SUMMED PAHs and PCBs	**% False**				
% False Negatives	**Positives**				
5	68				
10	50				
14	43				
19	34				
25	22				

STATISTICAL SIGNIFICANCE ONLY:								
UNSUMMED PAHs and PCBs	% False		Low Molecular					
% False Negatives	Positives	Lead	Weight PAH	Mercury	Naphthalene	Nickel	Phenanthrene	Pyrene
5	70	19	56	0.10	21	30	65	91
10	54	39	109	0.15	29	39	109	140
15	42	51	154	0.28	33	47	190	279
19	37	97	175	0.30	37	48	315	379
25	26	172	199	0.43	48	54	527	577
STATISTICAL SIGNIFICANCE ONLY:								
SUMMED PAHs and PCBs	% False							
% False Negatives	Positives	Lead		Mercury		Nickel		
5	68	19		0.10		30		
10	50	39		0.15		39		
14	43	48		0.23		45		
19	34	75		0.30		47		
25	22	144		0.39		50		

STATISTICAL SIGNIFICANCE ONLY:						
UNSUMMED PAHs and PCBs	% False		Total	Total		
% False Negatives	Positives	Silver	benzofluoranthenes (b+k (+j))	Polychlorinated Biphenyls	Tributyltin	Zinc
5	70	0.26	87	19	11	77
10	54	0.30	248	51	20	86
15	42	0.43	339	78	26	120
19	37	0.45	444	92	31	142
25	26	1.80	630	107	35	191
STATISTICAL SIGNIFICANCE ONLY:						
SUMMED PAHs and PCBs	% False			Total		
% False Negatives	Positives	Silver	PAHs (molar)	Polychlorinated Biphenyls	Tributyltin	Zinc
5	68	0.26	1.9	19	11	77
10	50	0.30	2.9	51	20	86
14	43	0.38	6.4	64	23	109
19	34	0.45	10.0	87	29	133
25	22	1.60	12.8	101	34	173

SQS: UNSUMMED PAHs and PCBs % False Negatives	% False Positives	% Sensitivity	2003% Efficiency	1988% Efficiency	% Reliability
5	69	95	31	76	76
10	51	90	49	80	78
15	42	85	58	82	77
20	35	80	65	84	76
24	24	76	76	88	76
SQS:					
SUMMED PAHs and PCBs	% False		2003%	1988%	
% False Negatives	Positives	% Sensitivity	Efficiency	Efficiency	% Reliability
5	68	95	32	76	76
10	51	90	49	80	78
15	44	85	56	82	77
20	32	80	68	85	76
25	24	75	76	88	75

SQS:								
UNSUMMED PAHs and PCBs	**% False**						**Aroclor**	**Aroclor**
% False Negatives	**Positives**	**2-Methylnaphthalene**	**Acenaphthene**	**Acenaphthylene**	**Anthracene**	**Antimony**	**1254**	**1260**
5	69	12	65	14	46	1.7	120	130
10	51	12	99	18	83	2.7	134	130
15	42	12	149	21	269	2.7	158	130
20	35	12	165	24	334	3.1	170	130
24	24	12	221	40	406	4.0	187	130
SQS:								
SUMMED PAHs and PCBs	**% False**							
% False Negatives	**Positives**					**Antimony**		
5	68					1.7		
10	51					2.4		
15	44					2.7		
20	32					3.0		
25	24					3.7		

SQS:						
UNSUMMED PAHs and PCBs	**% False**					
% False Negatives	**Positives**	**Arsenic**	**Benzo(a)anthracene**	**Benzo(a)pyrene**	**Benzo(g,h,i)perylene**	**Bis(2-ethylhexyl) phthalate**
5	69	4.9	74	84	57	180
10	51	6.2	132	149	94	324
15	42	9.3	177	230	201	403
20	35	10.6	190	260	210	527
24	24	22.4	343	378	307	1120
SQS:						
SUMMED PAHs and PCBs	**% False**					
% False Negatives	**Positives**	**Arsenic**				**Bis(2-ethylhexyl) phthalate**
5	68	4.9				180
10	51	6.1				224
15	44	7.5				280
20	32	10.6				489
25	24	19.0				771

SQS:								
UNSUMMED PAHs and PCBs	% False							
% False Negatives	Positives	Butyl benzyl phthalate	Cadmium	Chromium	Chrysene	Copper	Dibenz(a,h)anthracene	Dibenzofuran
5	69	124	0.30	38	83	30	22	348
10	51	232	0.61	46	175	38	32	446
15	42	312	0.91	51	268	46	47	517
20	35	340	1.13	52	310	51	90	543
24	24	405	2.07	61	541	63	1330	602
SQS:								
SUMMED PAHs and PCBs	% False							
% False Negatives	Positives	Butyl benzyl phthalate	Cadmium	Chromium		Copper		
5	68	124	0.30	38		30		
10	51	109	0.39	48		35		
15	44	157	0.80	50		39		
20	32	333	1.00	52		51		
25	24	384	1.69	57		61		

SQS: UNSUMMED PAHs and PCBs % False Negatives	% False Positives	Dimethyl phthalate	Di-n-octyl phthalate	Fluoranthene	Fluorene	High Molecular Weight PAH	Indeno(1,2,3-c,d)pyrene
5	69	46	0	112	48	178	63
10	51	46	0	190	66	452	100
15	42	46	0	401	88	1200	202
20	35	46	0	498	108	1850	218
24	24	46	0	1210	141	4630	306
SQS:							
SUMMED PAHs and PCBs	% False						
% False Negatives	Positives	Dimethyl phthalate	Di-n-octyl phthalate				
5	68	46	0				
10	51	46	0				
15	44	46	0				
20	32	46	0				
25	24	46	0				

SQS:									
UNSUMMED PAHs and PCBs	**% False**		**Low Molecular**						
% False Negatives	**Positives**	**Lead**	**Weight PAH**	**Mercury**	**Naphthalene**	**Nickel**	**Phenanthrene**	**Pyrene**	**Silver**
5	69	18	113	0.10	21	29	75	107	0.25
10	51	46	206	0.17	30	37	147	182	0.30
15	42	76	517	0.28	33	46	290	379	0.43
20	35	107	690	0.30	40	47	359	420	0.45
24	24	194	16100	0.44	56	54	665	980	1.80
SQS:									
SUMMED PAHs and PCBs	**% False**								
% False Negatives	**Positives**	**Lead**		**Mercury**		**Nickel**			**Silver**
5	68	18		0.10		29			0.25
10	51	41		0.15		41			0.30
15	44	48		0.23		45			0.38
20	32	96		0.30		47			0.43
25	24	172		0.43		49			1.60

SQS: UNSUMMED PAHs and PCBs % False Negatives	% False Positives	Total benzofluoranthenes (b+k (+j))	Total Polychlorinated Biphenyls	Tributyltin	Zinc
5	69	121	22	9	77
10	51	290	55	20	96
15	42	451	80	27	129
20	35	564	89	30	149
24	24	693	110	36	200
SQS:					
SUMMED PAHs and PCBs	**% False**		**Total**		
% False Negatives	**Positives**	**PAHs (molar)**	**Polychlorinated Biphenyls**	**Tributyltin**	**Zinc**
5	68	2.2	22	9	77
10	51	2.9	53	21	88
15	44	6.4	64	24	109
20	32	10.8	87	29	144
25	24	17.8	103	34	193

CSL:					
UNSUMMED PAHs and PCBs	% False		2003%	1988%	
% False Negatives	Positives	% Sensitivity	Efficiency	Efficiency	% Reliability
5	59	95	41	62	68
9	57	91	43	62	67
13	50	87	50	63	68
20	43	80	57	65	68
25	37	75	63	67	69
CSL:					
SUMMED PAHs and PCBs	% False		2003%	1988%	
% False Negatives	Positives	% Sensitivity	Efficiency	Efficiency	% Reliability
5	58	95	42	62	69
10	54	90	46	62	68
15	48	85	52	64	69
19	43	81	57	65	69
25	38	75	62	66	69

CSL:								
UNSUMMED PAHs and PCBs	**% False**						**Aroclor**	**Aroclor**
% False Negatives	**Positives**	**2-Methylnaphthalene**	**Acenaphthene**	**Acenaphthylene**	**Anthracene**	**Antimony**	**1254**	**1260**
5	59	147	110	31	155	0.4	134	65
9	57	151	115	34	177	0.5	140	68
13	50	162	147	50	300	0.5	142	80
20	43	170	201	124	353	2.3	168	103
25	37	172	225	134	355	2.7	178	110
CSL:								
SUMMED PAHs and PCBs	**% False**							
% False Negatives	**Positives**					**Antimony**		
5	58					0.4		
10	54					0.5		
15	48					0.5		
19	43					1.6		
25	38					2.3		

CSL:						
UNSUMMED PAHs and PCBs	% False					
% False Negatives	Positives	Arsenic	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(g,h,i)perylene	Bis(2-ethylhexyl) phthalate
5	59	6.1	130	171	177	336
9	57	6.6	140	197	186	355
13	50	8.6	174	251	216	420
20	43	11.7	276	360	280	580
25	37	13.3	329	439	295	713
CSL:						
SUMMED PAHs and PCBs	% False					
% False Negatives	Positives	Arsenic				Bis(2-ethylhexyl) phthalate
5	58	6.0				322
10	54	6.6				355
15	48	8.6				420
19	43	9.5				539
25	38	11.7				580

CSL:								
UNSUMMED PAHs and PCBs	**% False**							
% False Negatives	**Positives**	**Butyl benzyl phthalate**	**Cadmium**	**Chromium**	**Chrysene**	**Copper**	**Dibenz(a,h)anthracene**	**Dibenzofuran**
5	59	164	0.69	39	177	41	142	112
9	57	166	0.79	41	185	41	182	126
13	50	192	0.90	44	255	44	259	164
20	43	227	1.13	50	394	52	300	180
25	37	230	1.20	52	493	54	319	196
CSL:								
SUMMED PAHs and PCBs	**% False**							
% False Negatives	**Positives**	**Butyl benzyl phthalate**	**Cadmium**	**Chromium**		**Copper**		
5	58	164	0.69	39		40		
10	54	166	0.80	41		41		
15	48	192	0.90	44		44		
19	43	223	0.96	48		50		
25	38	227	1.13	50		52		

CSL:						
UNSUMMED PAHs and PCBs	% False					
% False Negatives	Positives	Dimethyl phthalate	Di-n-octyl phthalate	Fluoranthene	Fluorene	High Molecular Weight PAH
5	59	96	66	218	105	2940
9	57	103	66	236	112	3370
13	50	120	67	364	126	12100
20	43	139	67	684	179	16400
25	37	144	70	757	183	17800
CSL:						
SUMMED PAHs and PCBs	% False					
% False Negatives	Positives	Dimethyl phthalate	Di-n-octyl phthalate			
5	58	93	66			
10	54	103	66			
15	48	120	67			
19	43	132	67			
25	38	139	67			

CSL:								
UNSUMMED PAHs and PCBs	**% False**			**Low Molecular**				
% False Negatives	**Positives**	**Indeno(1,2,3-c,d)pyrene**	**Lead**	**Weight PAH**	**Mercury**	**Naphthalene**	**Nickel**	**Phenanthrene**
5	59	160	46	1080	0.17	51	34	162
9	57	176	48	2140	0.21	54	34	190
13	50	218	75	2680	0.28	60	40	310
20	43	311	94	3390	0.36	100	45	587
25	37	330	103	3860	0.39	111	45	726
CSL:								
SUMMED PAHs and PCBs	**% False**							
% False Negatives	**Positives**		**Lead**		**Mercury**		**Nickel**	
5	58		41		0.17		34	
10	54		48		0.21		34	
15	48		75		0.28		40	
19	43		83		0.30		43	
25	38		94		0.36		45	

CSL:							
UNSUMMED PAHs and PCBs	**% False**			**Total**	**Total**		
% False Negatives	**Positives**	**Pyrene**	**Silver**	**benzofluoranthenes (b+k (+j))**	**Polychlorinated Biphenyls**	**Tributyltin**	**Zinc**
5	59	230	0.30	291	67	26	114
9	57	250	0.30	313	68	29	117
13	50	334	0.36	497	75	37	123
20	43	580	0.43	657	107	120	142
25	37	646	0.44	790	115	198	147
CSL:							
SUMMED PAHs and PCBs	**% False**				**Total**		
% False Negatives	**Positives**		**Silver**	**PAHs (molar)**	**Polychlorinated Biphenyls**	**Tributyltin**	**Zinc**
5	58		0.30	5.9	66	25	110
10	54		0.30	6.8	68	29	117
15	48		0.36	10.0	75	37	123
19	43		0.40	13.4	95	63	135
25	38		0.43	17.7	107	120	142

Appendix D

APPENDIX D. FLOATING PERCENTILE RESULTS

The results of the floating percentile analysis presented in Section 3 are provided in this appendix. For each level of effects (statistical significance only, SQS, and CSL) there are two sets of results provided – the one above is for the data set containing individual PAHs and Aroclors, and the one below is for the same data set containing only summed PAHs and PCBs. In this lower data set, blank spaces indicate individual PAHs and Aroclors that are not present in that data set.

Five sets of percentiles are shown for each of the two data sets. These correspond to different levels of false negatives that Ecology could select to base their SQVs on, and range from 5-25% false negatives, in increments of 5%. The first page shows the reliability results for each of these sets of percentiles for all six reliability parameters. The remaining pages show the chemical concentrations derived by the floating percentile method corresponding to the selected false negative rates. The false negative and false positive rates are repeated on each page for reference.

STATISTICAL SIGNIFICANCE ONLY:					
UNSUMMED PAHs and PCBs	**% False**		**2003%**	**1988%**	
% False Negatives	**Positives**	**% Sensitivity**	**Efficiency**	**Efficiency**	**% Reliability**
4	55	96	45	82	82
10	39	90	61	86	82
15	26	85	74	89	82
20	20	80	80	92	81
25	16	75	84	93	78
STATISTICAL SIGNIFICANCE ONLY:					
SUMMED PAHs and PCBs	**% False**		**2003%**	**1988%**	
% False Negatives	**Positives**	**% Sensitivity**	**Efficiency**	**Efficiency**	**% Reliability**
5	57	95	43	82	81
10	42	90	58	85	81
15	33	85	67	87	80
20	28	80	72	89	78
25	24	75	76	89	75

STATISTICAL SIGNIFICANCE ONLY:						
UNSUMMED PAHs and PCBs	% False					
% False Negatives	Positives	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Antimony
4	55	470	1060	470	600	0.4
10	39	470	1060	470	600	0.4
15	26	470	1060	470	600	0.4
20	20	470	1060	470	600	0.6
25	16	470	1060	470	600	0.6
STATISTICAL SIGNIFICANCE ONLY:						
SUMMED PAHs and PCBs	**% False**					
% False Negatives	**Positives**					**Antimony**
5	57					0.4
10	42					0.4
15	33					0.4
20	28					0.4
25	24					0.4

STATISTICAL SIGNIFICANCE ONLY:						
UNSUMMED PAHs and PCBs	**% False**	**Aroclor**	**Aroclor**			
% False Negatives	**Positives**	**1254**	**1260**	**Arsenic**	**Benzo(a)anthracene**	**Benzo(a)pyrene**
4	55	230	140	4.6	4260	3300
10	39	230	140	7.5	4260	3300
15	26	230	140	20.0	4260	3300
20	20	230	140	31.0	4260	3300
25	16	230	140	31.0	4260	3300
STATISTICAL SIGNIFICANCE ONLY:						
SUMMED PAHs and PCBs	**% False**					
% False Negatives	**Positives**			**Arsenic**		
5	57			4.6		
10	42			7.0		
15	33			8.5		
20	28			31.0		
25	24			55.0		

STATISTICAL SIGNIFICANCE ONLY:					
UNSUMMED PAHs and PCBs	% False				
% False Negatives	Positives	Benzo(g,h,i)perylene	Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Cadmium
4	55	4020	220	260	0.3
10	39	4020	220	260	0.3
15	26	4020	230	260	0.6
20	20	4020	330	260	0.7
25	16	4020	550	260	0.9
STATISTICAL SIGNIFICANCE ONLY:					
SUMMED PAHs and PCBs	% False				
% False Negatives	Positives		Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Cadmium
5	57		220	480	0.6
10	42		220	480	0.6
15	33		220	480	1.0
20	28		220	480	1.0
25	24		230	480	1.0

STATISTICAL SIGNIFICANCE ONLY:						
UNSUMMED PAHs and PCBs	% False					
% False Negatives	Positives	Chromium	Chrysene	Copper	Dibenz(a,h)anthracene	Dibenzofuran
4	55	95	5940	35	300	400
10	39	95	5940	35	300	400
15	26	95	5940	50	300	400
20	20	95	5940	50	300	400
25	16	95	5940	80	300	400
STATISTICAL SIGNIFICANCE ONLY:						
SUMMED PAHs and PCBs	% False					
% False Negatives	Positives	Chromium		Copper		
5	57	100		35		
10	42	100		35		
15	33	100		42		
20	28	100		48		
25	24	100		75		

STATISTICAL SIGNIFICANCE ONLY:						
UNSUMMED PAHs and PCBs	% False					High Molecular
% False Negatives	Positives	Dimethyl phthalate	Di-n-octyl phthalate	Fluoranthene	Fluorene	Weight PAH
4	55	46	26	2000	200	3000
10	39	46	26	5000	200	3000
15	26	46	26	5000	200	3000
20	20	46	26	5000	200	3000
25	16	46	26	5000	200	3000
STATISTICAL SIGNIFICANCE ONLY:						
SUMMED PAHs and PCBs	% False					
% False Negatives	Positives	Dimethyl phthalate	Di-n-octyl phthalate			
5	57	46	26			
10	42	46	26			
15	33	46	26			
20	28	46	26			
25	24	46	26			

STATISTICAL SIGNIFICANCE ONLY:							
UNSUMMED PAHs and PCBs	% False			Low Molecular			
% False Negatives	Positives	Indeno(1,2,3-c,d)pyrene	Lead	Weight PAH	Mercury	Naphthalene	Nickel
4	55	4120	335	500	0.30	100	53
10	39	4120	335	500	0.30	100	53
15	26	4120	335	500	0.50	100	55
20	20	4120	335	500	0.50	100	53
25	16	4120	335	500	0.50	100	53
STATISTICAL SIGNIFICANCE ONLY:							
SUMMED PAHs and PCBs	% False						
% False Negatives	Positives		Lead		Mercury		Nickel
5	57		350		0.20		39
10	42		350		0.20		39
15	33		350		0.20		60
20	28		350		0.20		60
25	24		350		0.50		60

STATISTICAL SIGNIFICANCE ONLY:					
UNSUMMED PAHs and PCBs	**% False**				**Total**
% False Negatives	**Positives**	**Phenanthrene**	**Pyrene**	**Silver**	**benzofluoranthenes (b+k (+j))**
4	55	6100	3000	0.55	140
10	39	6100	3000	0.55	300
15	26	6100	3000	0.55	450
20	20	6100	3000	0.55	650
25	16	6100	3000	0.55	650
STATISTICAL SIGNIFICANCE ONLY:					
SUMMED PAHs and PCBs	**% False**				
% False Negatives	**Positives**			**Silver**	**PAHs (molar)**
5	57			2.20	6
10	42			2.20	7
15	33			2.20	14
20	28			2.20	15
25	24			2.20	20

STATISTICAL SIGNIFICANCE ONLY:				
UNSUMMED PAHs and PCBs	% False	Total		
% False Negatives	Positives	Polychlorinated Biphenyls	Tributyltin	Zinc
4	55	50	75	120
10	39	60	75	120
15	26	60	75	140
20	20	60	75	250
25	16	60	75	250

STATISTICAL SIGNIFICANCE ONLY:				
SUMMED PAHs and PCBs	% False	Total		
% False Negatives	Positives	Polychlorinated Biphenyls	Tributyltin	Zinc
5	57	120	200	100
10	42	120	200	100
15	33	120	200	100
20	28	120	200	250
25	24	120	200	250

SQS:					
UNSUMMED PAHs and PCBs	**% False**		**2003%**	**1988%**	
% False Negatives	**Positives**	**% Sensitivity**	**Efficiency**	**Efficiency**	**% Reliability**
5	57	95	43	79	80
10	44	90	56	82	80
15	26	85	74	88	82
20	20	80	80	90	80
25	15	75	85	92	78
SQS:					
SUMMMED PAHs and PCBs	**% False**		**2003%**	**1988%**	
% False Negatives	**Positives**	**% Sensitivity**	**Efficiency**	**Efficiency**	**% Reliability**
5	55	95	45	80	80
10	45	90	55	82	80
15	33	85	67	85	80
20	26	80	74	87	78
25	23	75	77	88	76

SQS:							
UNSUMMED PAHs and PCBs	**% False**						**Aroclor**
% False Negatives	**Positives**	**2-Methylnaphthalene**	**Acenaphthene**	**Acenaphthylene**	**Anthracene**	**Antimony**	**1254**
5	57	470	1060	470	1200	0.4	230
10	44	470	1060	470	1200	0.4	230
15	26	470	1060	470	1200	0.4	230
20	20	470	1060	470	1200	0.6	230
25	15	470	1060	470	1200	0.6	230
SQS:							
SUMMMED PAHs and PCBs	**% False**						
% False Negatives	**Positives**					**Antimony**	
5	55					0.4	
10	45					0.4	
15	33					0.4	
20	26					32.0	
25	23					32.0	

SQS: UNSUMMED PAHs and PCBs % False Negatives	% False Positives	Aroclor 1260	Arsenic	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(g,h,i)perylene
5	57	140	4.6	4260	3300	4020
10	44	140	6.0	4260	3300	4020
15	26	140	20	4260	3300	4020
20	20	140	31	4260	3300	4020
25	15	140	31	4260	3300	4020
SQS:						
SUMMMED PAHs and PCBs	**% False**					
% False Negatives	**Positives**		**Arsenic**			
5	55		6.2			
10	45		6.2			
15	33		8.5			
20	26		30			
25	23		30			

SQS: UNSUMMED PAHs and PCBs % False Negatives	% False Positives	Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Cadmium	Chromium	Chrysene	Copper
5	57	220	260	0.27	95	5940	80
10	44	220	260	0.29	95	5940	80
15	26	230	260	0.60	95	5940	80
20	20	330	260	0.78	95	5940	80
25	15	550	260	0.97	95	5940	80
SQS:							
SUMMED PAHs and PCBs	% False						
% False Negatives	Positives	Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Cadmium	Chromium		Copper
5	55	240	480	1.0	100		80
10	45	240	480	1.0	100		80
15	33	240	480	1.0	100		80
20	26	240	480	1.0	100		80
25	23	300	480	6.0	100		80

SQS:					
UNSUMMED PAHs and PCBs	**% False**				
% False Negatives	**Positives**	**Dibenz(a,h)anthracene**	**Dibenzofuran**	**Dimethyl phthalate**	**Di-n-octyl phthalate**
5	57	800	400	46	26
10	44	800	400	46	26
15	26	800	400	46	26
20	20	800	400	46	26
25	15	800	400	46	26
SQS:					
SUMMMED PAHs and PCBs	**% False**				
% False Negatives	**Positives**			**Dimethyl phthalate**	**Di-n-octyl phthalate**
5	55			46	45
10	45			46	45
15	33			46	45
20	26			46	45
25	23			46	45

SQS:						
UNSUMMED PAHs and PCBs	**% False**			**High Molecular**		
% False Negatives	**Positives**	**Fluoranthene**	**Fluorene**	**Weight PAH**	**Indeno(1,2,3-c,d)pyrene**	**Lead**
5	57	11000	1000	31000	4120	335
10	44	11000	1000	31000	4120	335
15	26	11000	1000	31000	4120	335
20	20	11000	1000	31000	4120	335
25	15	11000	1000	31000	4120	335
SQS:						
SUMMED PAHs and PCBs	**% False**					
% False Negatives	**Positives**					**Lead**
5	55					350
10	45					350
15	33					350
20	26					1200
25	23					1200

SQS: UNSUMMED PAHs and PCBs % False Negatives	% False Positives	Low Molecular Weight PAH	Mercury	Naphthalene	Nickel	Phenanthrene	Pyrene	Silver
5	57	6600	0.50	500	60	6100	8800	2.0
10	44	6600	0.50	500	60	6100	8800	2.0
15	26	6600	0.50	500	60	6100	8800	2.0
20	20	6600	0.50	500	60	6100	8800	2.0
25	15	6600	0.50	500	60	6100	8800	2.0
SQS: SUMMED PAHs and PCBs % False Negatives	**% False Positives**		**Mercury**		**Nickel**			**Silver**
5	55		0.17		28			2.2
10	45		0.20		60			2.2
15	33		0.30		60			2.2
20	26		0.30		60			2.2
25	23		0.30		60			2.2

SQS: UNSUMMED PAHs and PCBs % False Negatives	% False Positives	Total benzofluoranthenes (b+k (+j))	Total Polychlorinated Biphenyls	Tributyltin	Zinc
5	57	140	60	75	120
10	44	300	60	75	120
15	26	11000	60	75	140
20	20	11000	60	75	250
25	15	11000	60	75	250
SQS: SUMMED PAHs and PCBs % False Negatives	**% False Positives**	**PAHs (molar)**	**Total Polychlorinated Biphenyls**	**Tributyltin**	**Zinc**
5	55	2.7	120	200	80
10	45	9.5	120	200	80
15	33	15	120	200	100
20	26	15	150	220	100
25	23	21	150	220	140

CSL:			
UNSUMMED PAHs and PCBs	**% False**		**2003%**
% False Negatives	**Positives**	**% Sensitivity**	**Efficiency**
5	50	95	50
10	37	90	63
15	26	85	74
20	23	80	77
25	21	75	79
CSL:			
SUMMED PAHs and PCBs	**% False**		**2003%**
% False Negatives	**Positives**	**% Sensitivity**	**Efficiency**
5	50	95	50
10	44	90	56
15	24	85	76
20	17	80	83
25	16	75	84

CSL:							
UNSUMMED PAHs and PCBs	**% False**						**Aroclor**
% False Negatives	**Positives**	**2-Methylnaphthalene**	**Acenaphthene**	**Acenaphthylene**	**Anthracene**	**Antimony**	**1254**
5	50	555	1320	640	1580	0.4	340
10	37	555	1320	640	1580	0.6	340
15	26	555	1320	640	1580	0.6	340
20	23	555	1320	640	1580	0.6	340
25	21	555	1320	640	1580	0.6	340
CSL:							
SUMMED PAHs and PCBs	**% False**						
% False Negatives	**Positives**					**Antimony**	
5	50					0.6	
10	44					0.6	
15	24					0.6	
20	17					0.6	
25	16					0.6	

CSL:						
UNSUMMED PAHs and PCBs	**% False**	**Aroclor**				
% False Negatives	**Positives**	**1260**	**Arsenic**	**Benzo(a)anthracene**	**Benzo(a)pyrene**	**Benzo(g,h,i)perylene**
5	50	140	7.7	5800	4810	5200
10	37	140	51	5800	4810	5200
15	26	140	51	5800	4810	5200
20	23	140	51	5800	4810	5200
25	21	140	51	5800	4810	5200
CSL:						
SUMMED PAHs and PCBs	**% False**					
% False Negatives	**Positives**		**Arsenic**			
5	50		7.6			
10	44		8			
15	24		51			
20	17		51			
25	16		51			

CSL:						
UNSUMMED PAHs and PCBs	**% False**					
% False Negatives	**Positives**	**Bis(2-ethylhexyl) phthalate**	**Butyl benzyl phthalate**	**Cadmium**	**Chromium**	**Chrysene**
5	50	320	370	1	100	6400
10	37	320	370	1	100	6400
15	26	320	370	1	100	6400
20	23	400	370	1.5	100	6400
25	21	500	370	1.5	100	6400
CSL:						
SUMMED PAHs and PCBs	**% False**					
% False Negatives	**Positives**	**Bis(2-ethylhexyl) phthalate**	**Butyl benzyl phthalate**	**Cadmium**	**Chromium**	
5	50	300	600	6	100	
10	44	300	600	6	100	
15	24	300	600	6	100	
20	17	345	600	6	100	
25	16	410	600	6	100	

CSL:						
UNSUMMED PAHs and PCBs	% False					
% False Negatives	Positives	Copper	Dibenz(a,h)anthracene	Dibenzofuran	Dimethyl phthalate	Di-n-octyl phthalate
5	50	830	840	440	440	45
10	37	830	840	440	440	45
15	26	830	840	440	440	45
20	23	830	840	440	440	45
25	21	830	840	440	440	45
CSL:						
SUMMED PAHs and PCBs	% False					
% False Negatives	Positives	Copper			Dimethyl phthalate	Di-n-octyl phthalate
5	50	44			180	100
10	44	44			180	100
15	24	450			180	100
20	17	450			180	100
25	16	450			180	100

CSL:						
UNSUMMED PAHs and PCBs	**% False**			**High Molecular**		
% False Negatives	**Positives**	**Fluoranthene**	**Fluorene**	**Weight PAH**	**Indeno(1,2,3-c,d)pyrene**	**Lead**
5	50	230	3000	54800	5300	430
10	37	400	3000	54800	5300	430
15	26	15000	3000	54800	5300	430
20	23	15000	3000	54800	5300	430
25	21	15000	3000	54800	5300	430
CSL:						
SUMMED PAHs and PCBs	**% False**					
% False Negatives	**Positives**					**Lead**
5	50					430
10	44					430
15	24					430
20	17					430
25	16					430

CSL: UNSUMMED PAHs and PCBs % False Negatives	% False Positives	Low Molecular Weight PAH	Mercury	Naphthalene	Nickel	Phenanthrene	Pyrene	Silver
5	50	9200	0.5	1310	70	7600	16000	2.5
10	37	9200	0.5	1310	70	7600	16000	2.5
15	26	9200	0.75	1310	70	7600	16000	2.5
20	23	9200	0.75	1310	70	7600	16000	2.5
25	21	9200	0.75	1310	70	7600	16000	2.5
CSL:								
SUMMED PAHs and PCBs	**% False**							
% False Negatives	**Positives**		**Mercury**		**Nickel**			**Silver**
5	50		0.5		30			3
10	44		0.5		38			3
15	24		0.5		70			3
20	17		3		70			3
25	16		3		70			3

CSL:					
UNSUMMED PAHs and PCBs	**% False**	**Total**	**Total**		
% False Negatives	**Positives**	**benzofluoranthenes (b+k (+j))**	**Polychlorinated Biphenyls**	**Tributyltin**	**Zinc**
5	50	13800	120	60	125
10	37	13800	120	75	125
15	26	13800	120	75	160
20	23	13800	120	75	160
25	21	13800	120	75	250
CSL:					
SUMMED PAHs and PCBs	**% False**		**Total**		
% False Negatives	**Positives**	**PAHs (molar)**	**Polychlorinated Biphenyls**	**Tributyltin**	**Zinc**
5	50	9	120	6600	125
10	44	14	120	6600	125
15	24	50	120	6600	150
20	17	88	120	6600	450
25	16	90	120	6600	450