Final Exposure and Fate Assessment Screening Tool Peer Review Summary

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1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) developed the Exposure and Fate Assessment Screening Tool (E-FAST), a "screening level" computer model that allows users to generate 1) estimates of chemical concentrations in water to which aquatic life may be exposed and 2) estimates of human inhalation and drinking water exposures (potential dose rates) resulting from chemical releases to air, water, and land. E-FAST can also be used to assess inhalation and dermal exposures to chemicals that may result from the use of certain types of consumer products. The exposed population is either some segment of the general population or consumers. Exposures to workers in occupational settings are not assessed in this model.

E-FAST consists of four modules:

1) General Population Exposure from Industrial Releases;
2) Down the Drain;
3) Consumer Exposure Pathway; and
4)Aquatic Environment Exposure/Risk.

E-FAST is characterized by EPA as a "screening model." Screening model results are intended to be conservative estimates because predicted concentrations and exposures are likely to be higher, or at least higher than average, as compared to concentrations and exposures that might actually occur in a real world setting. It should be noted that because E-FAST incorporates either a combination of upper percentile and mean exposure parametric values or all upper percentile parametric values as defaults, the potential dose rate estimates are considered "high end to bounding" estimates.

In addition, the exposures estimated in E-FAST are potential dose rates (PDRs). PDRs are the predicted amounts of chemical inhaled, ingested, or on the surface of the skin. E-FAST does not estimate absorbed doses via inhalation or ingestion. E-FAST can estimate absorbed dermal doses if the user provides the dermal permeability coefficient for the chemical being assessed.

EPA peer review guidelines indicate that models, which are scientific and technical work products that support regulatory actions, should undergo peer review. In order to address this guideline for E-FAST, EPA contracted ERG to coordinate a peer review of E-FAST using protocols established in the EPA Peer Review Handbook. ERG selected five experts to peer review three of the four E-FAST modules. The Consumer Exposure Pathway module has previously undergone external peer review and was not included in this peer review. Each reviewer was given a maximum of 45 days to submit independent comments. This report presents the peer review comments submitted by the experts in the following sections:

- Section 2.0 - General Comments;
- Section 3.0 - General Population Exposure Module;
- Section 4.0 - Down the Drain Module;
- Section 5.0 - Aquatic Environment Exposure/Risk Module; and
- Section 6.0 - Summary Comments.

In each subsection, the relevant charge topics assigned to the reviewers are noted in bold and the responses from the reviewers are described underneath. Each section includes a summary of the main points made by the reviewers and discusses those comments that were made repeatedly by several reviewers, those comments/issues described by reviewers as being critical, and those comments which the reviewers described as suggestions for improvement but which are not critical.

To summarize, the most significant comments reviewers provided for E-FAST include:

- Most reviewers had a low to moderate level of confidence in E-FAST, primarily as a result of the extent of documentation available for the various E-FAST parameters and calculations. This could be addressed to some degree by making clear the expected knowledge level of the intended audience, tailoring the Documentation Manual for that audience, and including additional detail in both the Documentation Manual and the online help system.

- Expand E-FAST printing capabilities; and

- Expand and describe more clearly the E-FAST result output file capabilities.

2.0 GENERAL COMMENTS

This section presents general E-FAST comments submitted by all five peer review experts for any of the three modules, including comments regarding the documentation available for the model.

2.1 E-FAST Ease of Use

Is the model intuitive and easy to use? Specifically note any data entry screens you found confusing or unclear. Provide suggestions to improve the user-friendliness of E-FAST.

Overall, most reviewers indicated that the model is not intuitive. One reviewer generally found E-FAST easy to use, but notes a number of questions that arose while developing exposure estimates. The reviewer states that it was not immediately clear how best to perform estimates for multiple chemicals and/or multiple facilities. The reviewer states that the individual data entry screens were clear, but that it was not clear what information/data were saved if a user moved between and among screens. The reviewer suggests that some guidance on how to perform exposure estimates for multiple chemicals and/or facilities, possibly through the use of a tutorial provided with the module, might be helpful. The reviewer noted some additional suggestions and issues, these are provided in Appendix A.

One reviewer feels that the model data input is not intuitive. The reviewer recommends that a flowchart that shows the order of data input be provided. Since many laptops no longer have floppy disk drives, the reviewer also suggests that the program be revised such that a floppy drive is not required. The reviewer recommends that the documentation and screens explain that the output is automatically saved to a file in a format that can be read by word processors, and that the file extension be changed to *.doc so it is automatically read when opened with Windows Explorer. The reviewer also notes that the file names and extensions saved to the floppy disk are not intuitively obvious in indicating what information they contain, and suggests that a key to file names and extensions be provided in the documentation.

Another reviewer feels that the E-FAST model is relatively intuitive and easy to use. The reviewer would like to be able print various screens, and recommends incorporating an option that would show the actual calculations that were performed by the modules.

One reviewer feels that each of the modules should have its own electronic "handbook," with each parameter linked to an explanation of what is required, the format, and the units. The reviewer comments that the model is very fast, and that the major data screens are sufficient.

One reviewer feels that the underlying calculations in the model are not intuitive. The reviewer suggests that including three or four examples in the documentation that show all the screens, from the initial input screen to the results screen, for each example would be helpful.

One reviewer feels that the Down the Drain module disposal inputs screen is not intuitive, and suggests that it might be easier to use if better documentation was provided, including context-sensitive help screens. The reviewer notes that the current help screens provide no more information than is provided in the hard-copy documentation, and that documentation is inadequate. The reviewer recommends providing information indicating whether the "Chemical ID" input is supposed to be a chemical name or CAS Number to make the disposal inputs screen more user-friendly.

This reviewer suggests that the preferred source of all other input data on the "disposal input" screen be indicated. The reviewer suggests that if the data are from a Toxic Substances Control Act Section 5 submittal, it would be useful to provide a section in the documentation that explains the way these data are provided in a submittal. The reviewer notes that there are numerous potential sources of bioconcentration factors, concentration of concern, and treatment efficiencies, and recommends that the preferred sources be identified to ensure consistency among users of the program. The reviewer also recommends that guidance be provided on the preferred method of derivation if measured concentrations of bioconcentration factors exist. The reviewer suggests that context-sensitive help and hard-copy documentation be provided that indicate whether requirements of state programs can be incorporated into the

model, or whether it is limited to use of Federal ambient water quality criteria for concentrations of concern.

Another reviewer believes that the model is not very intuitive or easy to use and that there is significant potential for misuse by the uneducated user. The reviewer also found several software bugs. The reviewer highlights specific examples in Appendix E. The reviewer also notes the user manual does attempt to address the application and differences between these modules. In addition, the reviewer notes that the Documentation Manual does not explain to users that do not have Word Perfect how to obtain an output report for a module of interest.

2.2 E-FAST Documentation

Does the E-FAST documentation adequately explain the program? Please note any areas where additional detail should be provided.

One reviewer indicated that the documentation is clear and concise. The reviewer would like more detail on the use of Standard Industrial Classification code data (e.g., stream flows) for facilities, which facilities are included, and how the data were selected. The reviewer notes that these data would help the user assess whether or not his/her facility is being fairly assessed.

Another reviewer states that the manual is generally clear and concise, but that it does not include enough detail on the actual use and operation of the model. The reviewer suggests that a few flowcharts, screen shots (such as in the Help System), a list of terms and acronyms, and a few example problems would improve the usefulness of the documentation.

One reviewer notes they were comfortable with the model only after reading through the documentation several times and trying the model. The reviewer suggests that organizing the documentation text to more closely match the tabs in the models would be helpful. The reviewer also recommends that a discussion of uncertainty in risk estimates, including a discussion of source, magnitude and direction, be added where possible. For instance, the fish

ingestion rate for a child is based on a body weight for ages 6 to 11, while the default body weight is an average body weight for children ages 2 to 12. This is likely to result in an oral dose estimate that is slightly high, and a slightly high risk estimate.

This reviewer indicates that the E-FAST documentation could be expanded significantly, and suggests describing the kinds of information expected in all input fields. Specific examples provided by the reviewer can be found in Appendix C. The reviewer notes that the documentation is under-referenced regarding input values, and that it must be intended for a user that already knows where to obtain all the input values.

This reviewer also recommends that instructions for printing screens and more detail on how input and results are saved in a form to disk that can be read by a word processor be provided. The reviewer notes specifically for the Aquatic Environment Exposure/Risk module that the Probabilistic Dilution Model documentation does not appear to be cited in the user's guide.

Another reviewer notes that the E-FAST documentation is adequately detailed in some areas (e.g., Analysis of Reaches with USGS Gaging Stations), and inadequately detailed in others (e.g., guidance for the user on which module to select). The reviewer provides further detail for specific sections in the documentation, see Appendix E.

One reviewer feels that sorting out the relevant details from the various manuals provided for this peer review is time consuming and not user friendly, and suggests making a hard copy/virtual manual for each module.

2.3 E-FAST Help Screens

Are the Help screens adequate? Describe any additional help screens that you would find useful.

One reviewer suggests that adding help screens that provide more detail on the combination of exposed populations and health concerns, as well as help screens describing limitations of the model results, would be useful.

This reviewer believes the Help screens are generally adequate, but suggests that each parameter be linked to these Help screens. Specific details are provided by the reviewer in Appendix D.

One reviewer feels that the Help screens reflect the contents of the user manual very well, and in fact appear to contain supplemental information. The reviewer notes that it is easy to navigate between screens, and the Help program provides intuitive context-sensitive links between related screens and information. The reviewer comments that the only shortcomings of the Help program and the user manual are that in some instances they fail to provide crucial details to guide the user through the model (e.g., if the user selects Help in the Intro screen, they are not guided as to which module to select to perform their analysis).

This reviewer points out two misdirected links in the online help. When the user selects the Help button in the Aquatic Exposure/Risk PDM Site Specific and SIC code screens, they are instead directed to the online help for the Site Specific or SIC code screens of the General Population Module.

One reviewer notes that the help screen on the *PDM Site Results screen discusses gaging stations, but this is not evident on the results screen. The reviewer suggests that providing more information on potential sources of chronic aquatic life values, and clearly identifying the location of the information in a Toxic Substances Control Act submittal that are required as input would be useful.

Two reviewers indicate the Help screens are adequate and reflect the contents of the Documentation Manual. One of these reviewers notes that it is easy to navigate between screens, as the Help program provides intuitive links between related screens and information.

2.4 E-FAST Output

Are the E-FAST output screens adequate? Please note any changes or additions that you would find useful.

One reviewer states the output screens are adequate for the intended calculation purpose, although there are no instructions on printing the results and only a few runs can be made on one output table without starting over. The reviewer notes that it would be useful to know more information about the length of the reach and the spatial relationship between the effluent release point and the gaging stations used to calculate the flows. This additional information would provide a sense of the accuracy and realism of the flow estimate for a specific site source.

This reviewer feels it would be helpful to provide a list of major uncertainties and limitations of model results.

Another reviewer comments that it may not be clear to the user the ultimate use of some of the data displayed in the output screens. Two reviewers suggest allowing the user to print out each output screen. One of those reviewers would like to print the report summary from the Disposal Results screen. The other reviewer would like to print the report summary from the Site Specific or SIC Code screens.

Another reviewer feels that each parameter should be linked to an explanation of the parameter.

2.5 Exposure Parameters

Are the default number of exposure events during lifetime and default number of years in a lifetime appropriate for the selected exposed population? Please provide your rationale for determining the appropriateness of the default values. Note any defaults that you feel are inappropriate and suggest alternate values.

Most of the reviewers believe that the default values are appropriate and reflect current guidance. One reviewer notes that the default values are standard if both males and females are considered.

One reviewer indicates that the default values are appropriate. The reviewer feels that the high value for the wastewater treatment removal is not necessary if it is not used in the model. The reviewer suggests that one part per billion (ppb) be used as the default value for the concentration of concern if one is not available for a chemical.

One reviewer could not find a default number of exposure events during a lifetime in the General Population Exposure module. The reviewer feels that the number of release days per year of 365 days per year is overly conservative, because it assumes no vacation away from home for a non-working resident. The reviewer suggests that the value should be reduced by at least 14 days. In addition, the reviewer notes that for fish consumption, it appears the exposed population consumes fish every day; this seems overly conservative. The reviewer comments that the number of years in a lifetime appears appropriate.

This is not one reviewer's area of expertise, and no comment was offered.

2.6 Additional Exposure Parameters

Please refer to Table 1-1, Default Exposure Parameter Values Used in E-FAST, on page four of the E-FAST Documentation Manual. Are the default average body weight during lifetime, drinking water intake, inhalation rate, fish ingestion rate, non-carcinogenic averaging times, and carcinogenic averaging times values appropriate for the selected exposed population? Please provide your rationale for determining the appropriateness of the default values. Note any defaults that you feel are inappropriate and suggest alternate values.

Two reviewers indicate that the default values are appropriate and reflect current guidance. Two reviewers suggest that latency period rather than lifetime be used for the carcinogenic averaging time, and suggest the module be linked to a database for latency periods of specific chemicals. In addition, one of these reviewers notes that the lifetime for males and females is the default if no data are known on latency period. For example, the latency period for formaldehyde in humans appears to be 10 years, and that for 2,3,7,8-tetrachlorodibenzo-p-dioxin, 20 years.

One reviewer comments that exposures during the period between 12 years and 18 years of age do not appear to be addressed in the General Population Exposure module. The reviewer suggests that a time-weighted chronic exposure that includes this age group be calculated for chronic adult exposure, and concludes that there is a high degree of confidence that this added exposure is real.

Another reviewer specifically notes that the data for females and males are combined for infants, children, and adults in the Down the Drain module .

3.0 GENERAL POPULATION EXPOSURE MODULE

This section presents comments specific to the General Population Exposure module of E-FAST submitted by the peer review experts.

3.1 General Release Info Screen

Is the General Release Info screen easy to understand and use? Please provide recommendations for refinement and enhancement.

One reviewer notes that the General Release Info screen is easy to understand and use.

Another reviewer suggests that indicating specifically where this information is usually provided in a Toxic Substances Control Act submission in the documentation and help screens would be useful. One reviewer feels that the differences between manufacturing, processing, industrial use, commercial use, and other use need explanation. The reviewer also recommends that the term "scenarios" be explained.

3.2 Select a Facility Screen

Is the Select a Facility screen and option to locate facilities by National Pollutant Discharge Elimination System number, Facility name, SIC code, or Reach number clear and easy to use? Please provide recommendations for refinement and enhancement. Are the required parameters to be entered before continuing to the Pchem screen apparent? Please provide recommendations for refinement and enhancement.

All the reviewers indicate that the Select a Facility screen and the option to locate facilities are easy to understand and use. The reviewers also believe the required parameters for continuing to the Pchem screen are apparent.

One reviewer suggests including a hypothetical Toxic Substances Control Act submittal or a specific preferred reference in an appendix to provide the reader with an example of where the data can be found. The reviewer feels linking the appendix of information to the corresponding areas of the screen would be helpful. The reviewer also recommends including both acute and chronic data input cells so the model does not have to be run twice. The reviewer also suggests displaying exceedances of both acute and chronic concentrations of concern on one result screen.

One reviewer states that the field for number of days per year release assumes the same biological effects for interspersed days as consecutive days. The reviewer suggests that this should be revised since this may not be true for chemicals that bioaccumulate. The reviewer offers that the actual Standard Industrial Classification code is not given, but the Standard Industrial Classification code industry description; the reviewer suggests that the description pull down is better.

3.3 Pchem Properties, Exposure Factors, and Fate Screens

Are the Pchem Properties, Exposure Factors, and Fate screens easy to use? Is the ability to change default values apparent and clear? Please provide recommendations for refinement and enhancement.

One reviewer notes that the Pchem Properties, Exposure Factors, and Fate screens are easy to use. The reviewer also comments that the ability to change default values are apparent and clear.

One reviewer did not see default values for Pchem properties and most Fate parameters. The reviewer suggests that it would be helpful to provide the numerical values from the groundwater migration potential help screen in the drop down menu along with the category name.

Another reviewer suggests that the units for the bioconcentration factor should be given (i.e., mg chemical/kg fish per mg chemical/L water). The reviewer finds the defaults for the exposure and fate screens satisfactory. The reviewer also feels the "clip to page width" printout option should not be checked for disk printout since it does not print out. The reviewer notes the other two options work but waste paper. The reviewer recommends using a vertical instead of horizontal tile for a small number of results if possible.

3.4 Releases to Surface Water from Manufacturing, Processing, and Industrial Use Sites

3.4.1 Surface Water Concentrations in River and Streams

Is the surface water concentration estimation calculation for rivers and streams adequately explained and appropriate? Specifically note any areas for improvement, alternate calculation methodologies, or alternate QA/QC methodologies.

Two reviewers indicate that the surface water concentration estimation calculation for rivers and streams is adequately explained in the documentation. One reviewer addresses the statement in the documentation, "...the State of Texas uses the 7Q2 instead of the 7Q10 for evaluating chronic exposures." The reviewer advises that other states may use different flow conditions to evaluate acute and chronic exposures, and more discussion should be provided of this situation if state numerical criteria are used as concentrations of concern.

One reviewer notes that Equation 2-1 in the E-FAST Documentation Manual is sufficient, except that removal efficiency for the chemical must be known. The reviewer suggests that a link be added to required values if they exist, or to efficiencies of representative POTWs for specific chemicals. The reviewer states that the default procedures are explained well for specific data that are not known.

3.4.2 Local Historical Stream Flow Data

Please comment on the appropriateness of the use of historical stream flow values obtained from the Gage file in EPA's STORET system. Is this an appropriate resource for this information? Please provide your rationale for determining the appropriateness of this source of information. Note any other sources you believe are appropriate.

One reviewer is not familiar with the STORET system, or any other source that may be more appropriate.

Two reviewers comment that the Gage file is an appropriate resource for historical stream flow values. Specifically, one reviewer notes that the Texas surface water quality standards document provides flows for classified stream segments, and that in general, state surface water quality standards should be consulted as a source of stream flows if state numerical criteria and standards are used as concentrations of concern.

3.4.3 Generic Historical Stream Flow Data

Please comment on the appropriateness of using receiving stream flows for facilities with Standard Industrial Classification codes most commonly encountered in new chemical submissions under Section 5 of Toxic Substances Control Act. Is this an appropriate resource for this information? Please provide your rationale for determining the appropriateness of this source of information. Note any other sources you believe are appropriate.

One reviewer has concerns about assuming that stream flows relate in any way to Standard Industrial Classification codes. As a user, the reviewer would want to review the data that were used to develop these default values.

Another reviewer notes that using receiving stream flows for facilities with Standard Industrial Classification codes most commonly encountered in new chemical submissions under Section 5 of Toxic Substances Control Act appears to be an appropriate source, since the EPA has an extensive database on those industries. The reviewer suggests that the appropriateness of the procedures used to develop stream flows for those facilities could be strengthened if the documentation discussed whether the stream flows incorporated in the model match the stream flows used to establish maximum daily loads or National Pollutant Discharge Elimination System permit limits for those facilities.

One reviewer indicates that the current approach is better than assuming a generalized case. The reviewer notes that it although this approach may not describe the local situation, data can be input directly if known.

3.4.4 Low Flow Conditions

E-FAST stream flow data are based on estimated flows at the downstream end of specific stream segments, and the estimated stream flow for any given stream segment presumably includes the discharge flow from any facility on that segment. For facilities on small streams, this may result in underestimates of actual stream flows. For example, the discharge from a facility with a discharge flow of 10 million liters per day releasing to a stream which has an estimated low flow of 10 million liters per day is not insignificant; the discharge flow is assumed in E-FAST to constitute all of the receiving stream's flow. Based on the available data, there are a significant number of facilities for which the facility discharge flow constitutes a large fraction of the stream flow under low flow conditions. Please comment on the impact of this potential underestimation on the estimates generated by E-FAST.

One reviewer states that evaluation of stream flows is not his area of expertise; however, the reviewer does not think that a potential underestimation for stream flow (and subsequent dilution) will result in more conservative risk assessments than the other conservative parameters/assumptions embedded in the other E-FAST calculations/models.

One reviewer does not understand how this situation would cause an underestimate of in-stream concentration of a chemical if this assumption applies to low flow conditions. The reviewer thinks that assuming the facility contributes to the entire stream flow during low flow conditions represents a conservative estimate of the in-stream concentration of a chemical.

One reviewer suggests that E-FAST could equate low stream flow with discharge flow to be conservative.

3.4.5 Arithmetic Mean and 7Q10 Flows

Please comment on the appropriateness of the following:

- **the use of arithmetic mean and 7Q10 flows available from the Gage file in EPA's STORET system; and**
- **the use of 7Q10 Flow to estimate surface water concentrations used to calculate estimates of exceedances of chronic concentrations of concern for aquatic life.**

Please provide your rationale for determining the appropriateness of this source of information and note any other sources you believe are appropriate.

This is not one reviewer's area of expertise, and no comment was offered.

Another reviewer is not familiar with the data in the Gage file in EPA's STORET system and cannot comment on its use to estimate arithmetic mean and 7Q10 flows. The reviewer notes that Texas uses the harmonic mean flow and 7Q2 flows for evaluating compliance with water quality standards. Other states may also use different flow conditions for evaluating compliance with water quality standards. The reviewer suggests the harmonic mean flow might be more appropriate than the average. The reviewer states that the 7Q10 is probably fairly well accepted across the country, and is a reasonable benchmark flow for purposes of consistency. The reviewer also states that it is consistent with the duration of some chronic invertebrate toxicity tests, but not all.

One reviewer notes that the arithmetic mean flows are conservative as compared to geometric mean flows as long as flows follow a log normal distribution rather than a normal distribution.

3.4.6 Harmonic Mean, 30Q5, and 1Q10 Flow Calculations

Please comment on the appropriateness of the following:

- **the equations use to calculate harmonic mean, 30Q5, and 1Q10 flows from the Arithmetic Mean and 7Q10 flows;**
- **the use of Harmonic Mean Flow to estimate surface water concentrations used to calculate chronic human exposures via drinking water and fish ingestion;**
- **the use of 30Q5 Flow to estimate surface water concentrations used to calculate acute human exposures via drinking water and fish ingestion;**
- **the use of 30Q5 Flow to estimate surface water concentrations used to calculate acute human exposures via drinking water and fish ingestion;**
- **the use of 1Q10 Flow to estimate surface water concentrations used to calculate estimates of acute surface water concentrations to compare to the concentrations of concern for aquatic life.**

Please provide your rationale for determining the appropriateness of these equations. Provide suggestions for alternate estimation approaches if appropriate.

This is not one reviewer's area of expertise, and no comment was offered.

Another reviewer does not have the expertise to comment on the equations. The reviewer notes that the use of Harmonic Mean Flow to estimate surface water concentrations used to calculate chronic human exposures via drinking water and fish ingestion is used in the state of Texas, and is probably the most representative statistic for a central tendency estimate of exposure. The reviewer also offers that the use of this value represents a limiting condition, but might underestimate the total number of days that a concentration of concern is exceeded. Higher flows might also exceed the concentration of concern. The reviewer suggests revising this part of the model and predicting the number of days the concentration of concern exceeds the criterion.

One reviewer indicates that Equations 2-2, 2-3, and 2-4 in the Documentation Manual are sufficient. The reviewer states that units of HM, AMF, 30Q5, 7Q10, and 1Q10 should be explicitly given in cubic feet per second in the Documentation Manual.

3.4.7 Surface Water Concentrations in Bays, Lakes, and Estuaries

Is the surface water concentration estimation calculation for bays, lakes, and estuaries adequately explained and appropriate, including the use of dilution factors? Specifically note any areas for improvement, alternate calculation methodologies, or alternate QA/QC methodologies.

One reviewer notes that the surface water concentration estimation calculation for bays, lakes, and estuaries is adequately explained and appropriate.

Another reviewer questions whether the dilution factor is provided in the Toxic Substances Control Act submittal. The reviewer suggests adding a table in the documentation that shows the dilution factors for representative water bodies to allow users to assess the implications of assigning a value of one to the acute value.

One reviewer states that wastewater treatment efficiency (WWT) is often unknown. The reviewer suggests that a WWT for "representative" POTWs or any mandated efficiency level be used as default in lieu of unknown data. The reviewer recommends explaining the dilution factor in more detail, as well as the chemicals for which these data were obtained.

3.4.8 Estimation of Drinking Water and Fish Ingestion Exposures

Are the mathematical equations used to calculate drinking water and fish ingestion exposures adequately explained? Specifically note any areas of concern, areas for improvement, or alternate calculation methodologies.

Two reviewers express that the mathematical equations used to calculate drinking water and fish ingestion exposures are adequately explained.

One reviewer suggests adding a discussion of uncertainty in risk estimates as related to source, magnitude, and direction. The reviewer states, for instance, that the fish ingestion rate for a child is based on a body weight for ages 6 to 11, while the body weight is for children ages 2 to 12. The reviewer notes that this is likely to result in an oral dose estimate that is slightly high, and a slightly high risk estimate. The reviewer also notes that although adolescents fish frequently and may be a sensitive subpopulation, they are not considered in the model.

One reviewer states that the mathematical equations used to calculate drinking water and fish ingestion exposures are sufficient for acute exposures with the exception of drinking water treatment efficiency in the Documentation Manual. The reviewer notes that drinking water treatment efficiency is unknown, and should be linked to a chemical specific database for "representative" water treatment facilities that employ the most common technologies. The reviewer also notes that chronic exposures are not accounted for using this equation since the effects of days of chemical release (consecutive or interspersed) are calculated based on the potential acute dose rate and the potential average daily dose. The reviewer asserts that this is a serious defect since the averaged data assume a chronic effect rather than an acute effect that might be observed for consecutive day exposure.

The reviewer suggests that this limitation should be mentioned in the Documentation Manual and in the computer version. An extra field that requires users to input consecutive days in addition to total days would be an improvement. Acute toxicity could be calculated based on consecutive day exposures and chronic toxicity calculated using interspersed exposures, depending on the bioaccumulatory properties of the analyte.

3.4.9 Drinking Water Exposure Default Assumption

Please comment on the appropriateness of the default assumption that the estimated stream concentration is the concentration that people will ingest via drinking water. Please provide the rationale for your assessment.

One reviewer indicates that this assumption seems to be an appropriate, conservative assumption.

One reviewer states that the Surface water concentration term in the model should indicate whether one or both of the concentrations described is used. The reviewer recommends that the Surface water concentration term be referenced to specific model tabs or input cells. The reviewer also suggests that the "Reldays" term be clarified, including an explanation of the default value for this parameter and the units associated with this parameter, if any.

3.4.10 Drinking Water Exposure Estimates

Please comment on the appropriateness of ADR_{POT}, ADD_{POT}, $LADD_{POT}$, ADC, and LADC equations. Is the conversion of the estimated surface water concentration to a drinking water exposure estimate accurate? Please provide your rationale and alternate estimation approaches if appropriate.

One reviewer states that the ADR_{POT}, ADD_{POT}, $LADD_{POT}$, ADC, and LADC equations are appropriate.

Another reviewer comments that since this is a screening model, its accuracy cannot be judged. The reviewer notes that these equations do not include an adolescent exposure, therefore that age group is not evaluated in the model.

One reviewer indicates that the units for Bioconcentration factor are incorrect, and the "Reldays" term has the same problem as previously discussed.

3.4.11 Drinking Water Exposure Estimates - Defaults

Are the default drinking water intake, body weight, exposure duration, and averaging times appropriate? Is the ability to edit default values clear and easy to use? Please provide your rationale for determining the appropriateness of the default values. Note any defaults that you feel are inappropriate and suggest alternate values.

All reviewers express that the default values are appropriate and reflect current guidance based on the most recent version of the Exposure Factors Handbook. One reviewer states that editing is clear and easy to perform. Another reviewer suggests that the model should allow users to time-weight exposure estimates by combining values for adolescents with adults to generate a chronic exposure estimate.

3.4.12 Drinking Water Exposure Estimates - Stream Flows used to Calculate Surface Water Concentrations

Please comment on the use of the harmonic mean stream flow to calculate surface water concentrations used in the ADD_{POT}, $LADD_{POT}$, ADC, and LADC drinking water exposure estimation equations for rivers and streams. Please comment on the use of the 30Q5 stream flow to calculate surface water concentrations used in the ADD_{POT} drinking water exposure estimation equations for rivers and streams. Please provide your rationale for determining the appropriateness of the use of these flows and suggest alternate approaches.

This is not one reviewer's area of expertise, and no comment was offered.

One reviewer notes that the state of Texas uses the harmonic mean flow to evaluate in-stream concentrations relative to the water quality standard for protection of human health; therefore, this statistic appears appropriate. The reviewer also comments that because the rationale for use of the 30Q5 stream flow is consistent with the EPA Office of Water guidance, the use of this value seems appropriate.

Another reviewer finds the use of these flows appropriate, and states that these are standard assumptions.

3.4.13 Drinking Water Exposure Estimates - SIC Code Basis

Comment on the use of 50th percentile harmonic mean flow and 10th percentile harmonic mean flow to complete SIC code estimates of drinking water ingestion rates. Please provide your rationale for determining the appropriateness of the use of these flows and suggest alternate approaches if appropriate.

One reviewer suggests that the user be provided with an opportunity to assess the Standard Industrial Classification code information used to develop the model. The reviewer has serious reservations about the use of this Standard Industrial Classification code data, and the reviewer suggests that it would be more appropriate to use default values for various stream/river sizes and areas of the country than to provide default values by Standard Industrial Classification code.

One reviewer recommends that the documentation on the use of 50th percentile harmonic mean flow and 10th percentile harmonic mean flow to complete Standard Industrial Classification code estimates of drinking water ingestion rates be reworded to improve clarity of the information. The reviewer made the assumption that these two values are from a distribution of harmonic mean flows for the database of reaches for facilities in the Needs Survey, and interpreted the two values to represent the median of the distribution (representative flow) and the 10th percentile of the distribution, which would be a small stream (worst case flow). The reviewer concludes that these two conditions appear justified based on the statement that the model addresses these two conditions under all exposure scenarios.

Another reviewer notes that the estimates are based on real data rather than default data.

3.4.14 Drinking Water Exposure Estimates - Lakes

E-FAST does not calculate potential drinking water exposures for releases to lakes due to uncertainty about the appropriateness of dilution factors. Please comment on the appropriateness of this approach. Provide the rationale for your assessment and alternate approaches.

One reviewer recommends allowing users to insert a dilution factor. The reviewer notes that if this is not appropriate, a conservative dilution factor should be placed in the model as a default value.

Because the documentation indicates a need for consistency with the assumptions about dilution factors for estimating surface water concentrations in bays, lakes, and estuaries one reviewer notes that not calculating potential drinking water exposures for releases to lakes does not appear justified. The reviewer states that while the approach is not adequately justified, no reason is given for not using the same approach for estimating drinking water exposures.

Another reviewer comments that this approach is appropriate. The reviewer suggests that other factors to consider in a flowing stream that are negligible beyond a certain flow include: water evaporation, depth, and sediment type.

3.4.15 Fish Ingestion Estimates

Please comment on the appropriateness of ADR_{POT}, ADD_{POT}, $LADD_{POT}$, ADC, and LADC equations. Is the use of bioconcentration factor appropriate? Is the use of harmonic stream flow to calculate fish ingestion values appropriate? Is the use of different daily ingestion rates to calculate chorionic versus acute fish ingestion exposures appropriate? Please provide your rationale and alternate estimation approaches.

One reviewer comments that all equations, factors, and rates seem appropriate. The reviewer recommends adding separate exposure calculations for shellfish ingestion.

Another reviewer notes that the bioconcentration factors (BCFs) do not consider food chain uptake. The reviewer suggests that the model documentation clarify that the Bioconcentration factors must represent skin-on-fillet and not whole body Bioconcentration factors. In addition, the reviewer suggests that an option be provided for the use of skin-on-fillet bioaccumulation factors, which should more accurately represent exposure for some chemicals.

In addition, this reviewer indicates that the use of harmonic mean stream flow is appropriate. The reviewer notes that fish are long-lived, larger fish are typically consumed, and bioaccumulation increases with time. The reviewer suggests that the harmonic mean flow probably better represents long-term exposure conditions for fish than other statistics.

This reviewer also suggests that the use of different ingestion rates probably represents different populations, not different exposure durations. The reviewer states that because a larger ingestion rate produces a larger dose, the equivalent of an acute exposure can be estimated using this approach.

Another reviewer notes that Bioconcentration factor only applies for equilibrium conditions, which does not apply to most microecosystems, and the assumption gives a conservative answer.

3.4.16 Fish Ingestion Estimates - Defaults

Are the default fish ingestion rate, body weight, exposure duration, and averaging time appropriate? Is the ability to edit default values clear and easy to use? Please provide your rationale for determining the appropriateness of the default values. Note any defaults that you feel are inappropriate and suggest alternate values.

All of the reviewers comment that all default values are appropriate. One reviewer notes that the default values are easy to edit, and reflect current guidance. The reviewer recommends adding exposure calculations and default values for shellfish ingestion.

One reviewer indicates that the default values are appropriate for the populations represented based on the appropriateness of the source of the values. However, the adolescent age group is not represented, and the chronic life-time exposure for the ADD_{POT} and $LADD_{POT}$ are probably underestimated.

3.5 Releases to Land

3.5.1 Estimation of Groundwater Concentrations from Landfill Releases

Are the mathematical equations used to calculate groundwater concentrations from landfill releases adequately explained? Specifically note any areas of concern, areas for improvement, or alternate calculation methodologies.

One reviewer notes that the mathematical equations used to calculate groundwater concentrations from landfill releases are adequately explained.

Another reviewer comments that the number of sites, N, is not adequately described. The reviewer states that there does not seem to be an input box in the model for "N" and questions whether a user is supposed to estimate this based on the landfill dimensions provided in the documentation.

One reviewer suggests that the Resource Conservation Recovery Act Treatment Standards should be used for specific chemical as defaults, and that these values should be linked in the model.

3.5.2 Maximum 70-year Average Groundwater Concentrations

Is the use of the relationship between the maximum 70-year average groundwater concentrations and annual release quantities appropriate? Please provide your rationale for determining the appropriateness of this source of information and note any other sources you believe are appropriate.

One reviewer notes that the use of the relationship between the maximum 70-year average groundwater concentrations and annual release quantities is appropriate. The reviewer states that this is a conservative approach, but cannot offer a more appropriate approach.

Another reviewer indicated that the appropriateness of the values cannot be determined with the information provided. The reviewer suggests that additional detail on the assumptions used to derive the migration factor and Equation 2-12 should be provided in an appendix to the documentation. The reviewer comments that SESOIL and AT123D have many input values that would need to be reviewed to determine the appropriateness of the relationship.

One reviewer suggests that Equation 2-12 in the Documentation Manual has the migration factor as the major unknown, though Koc is likely to be applied correctly in this situation since equilibrium is approached for the contaminated environmental media. The reviewer recommends that the model be given explicitly since the distance to groundwater is often much greater than eight meters, and the depth of the well at 20 meters is at odds with the eight meter distance to groundwater. The reviewer questions whether the downgradient is truly 8/20 over 200 meters as stated in the Documentation Manual. The reviewer notes that this may also affect the migration factor calculation. The reviewer does not agree with a migration factor of "zero", and questions whether it is less than 2×10^{-6} or some other quantity, and, if so, that it be documented.

3.5.3 Migration Factors

Are the use and calculation of migration factors adequately explained and appropriate? Specifically note any areas for improvement, alternate calculation methodologies, or alternate QA/QC methodologies. Are SESOIL and AT123D appropriate models for estimating the transport of chemicals through the soil and groundwater? Is the ability to edit the migration factor clear and easy to use? Please provide your rationale for determining the appropriateness of this source of information and note any other sources you believe are appropriate.

One reviewer comments that migration factors are adequately explained and editing is clear and easy to use. The reviewer states that SESOIL and AT123D are the models of choice for transport through soil and groundwater, and they are well accepted and familiar to the modeling community.

Another reviewer notes that SESOIL and AT123D are appropriate models. The reviewer suggests that other simpler and possibly appropriate models are provided in other EPA documents, including those on selecting groundwater models and development of alternate concentration limits. The reviewer was unable to edit the migration factor, and was only able to select the categories described in the documentation.

See Section 3.5.3 for the third reviewer's comments.

3.5.4 Migration Factor - Defaults

Are the default loading of chemicals in a 1-hectare landfill, distance to groundwater, and depth of a drinking water well from the edge of a landfill appropriate? Note any defaults that you feel are inappropriate and suggest alternate values.

Two reviewers state that the default values are reasonable. One reviewer comments that although no consensus exists for these values, these are good starting points and, therefore, does not suggest any alternate values.

Another reviewer indicates that these dimensions vary all over the place, and the documentation should note that the groundwater well is assumed to be downgradient and screened in the center of a stable plume that will be maintained for the averaging time assumed in the exposure calculations.

See Section 3.5.3 for the third reviewer's comments.

3.5.5 Estimation of Drinking Water Exposures

Are the mathematical equations used to estimate drinking water exposures from releases to land adequately explained? Specifically note any areas of concern, areas for improvement, or alternate calculation methodologies.

Two reviewers comment that the mathematical equations used to estimate drinking water exposures from release to land are adequately explained. One of the reviewers states that no treatment should be assumed, since the documentation addresses use of private wells for drinking water. As an alternative, the reviewer suggests that instructions should be provided in the Documentation Manual that drinking water treatment efficiency (DWT) should be set to zero for evaluation of exposure for a private well.

One reviewer notes that the Drinking water treatment efficiency value is the most uncertain. The reviewer suggests that mandated Drinking water treatment efficiencies and the allowable concentrations in drinking water should be linked for specific chemicals. The reviewer also recommends that the safe drinking water concentration be used as the default if one exists rather than asking users to estimate Drinking water treatment efficiency and migration factor.

3.5.6 Drinking Water Exposure Estimates

Please comment on the appropriateness of ADD_{POT}, $LADD_{POT}$, ADC, and LADC equations. Please provide your rationale and alternate estimation approaches if appropriate.

One reviewer states that these equations are entirely appropriate, and they reflect the current guidance.

Another reviewer suggests using the safe drinking water concentration as default for reference migration rates and Drinking water treatment efficiencies.

No comment was provided by the third reviewer.

3.5.7 Drinking Water Exposure Estimates - Defaults

Are the default drinking water intake, body weight, exposure duration, and averaging times appropriate? Please provide your rationale for determining the appropriateness of the default values. Note any defaults that you feel are inappropriate and suggest alternate values.

Two reviewers comment that the default values used in the model are entirely appropriate, reflect current guidance, and are well accepted by the modeling community.

One reviewer suggests adding a discussion of uncertainty in risk estimates as related to source, magnitude, and direction. The reviewer states, for instance, that the fish ingestion rate for a child is based on a body weight for ages 6 to 11, while the body weight is for children ages 2 to 12. The reviewer notes that this is likely to result in an oral dose estimate that is slightly high, and a slightly high risk estimate. The reviewer states that adolescents fish frequently and may be a sensitive subpopulation, but are not considered in the model.

3.6 Releases to Air

3.6.1 Estimation of Air Concentrations from Stack Releases

Is the mathematical equation used to estimate air concentrations from stack releases adequately explained? Specifically note any areas of concern, areas for improvement, or alternate calculation methodologies.

One reviewer notes that the mathematical equation used to estimate air concentrations from stack releases is adequately explained for someone familiar with air dispersion modeling.

Another reviewer suggests presenting the derivation of the conversion factor in Equation 2-15 in a documentation appendix to allow users to determine whether the assumptions are adequate. In addition, the reviewer recommends providing additional justification for the assumed dimensions of the stack height. The reviewer suggests following an approach similar to the derivation of stream flow parameters (i.e., based on the distribution of representative incinerators). The reviewer could not determine whether the hypothetical facility parameters represent central tendency or worst case.

One reviewer does not agree that the equation is adequately explained. The reviewer recommends providing justification in addition to the empirical assertion for Equation 2-15 in the Documentation Manual. The reviewer states that many stacks are operated at either much higher or lower temperatures, and the effect of stack temperature should be modeled since they are easy to measure.

3.6.2 Maximum Annual Average Ground Level Air Concentrations

Is the prediction of the maximum annual average ground level air concentration appropriate? Is the use of the generic Industrial Source Complex - Long Term model method appropriate? Please provide your rationale for determining the appropriateness of this source of information and note any other sources you believe are appropriate.

One reviewer suggests allowing the user access to more detailed information on how the values, relationships, and calculations were developed, for this and other default values used in E-FAST. The reviewer believes that this methodology is appropriate, trusting that the predictive equation was properly derived. The reviewers states that since EPA is moving away from the Industrial Source Complex (ISC) models as their models of choice, it would be appropriate to determine if this same predictive equation holds for the model(s) currently being promoted by EPA.

Another reviewer is not satisfied with the explanation of why the maximum annual average ground level air concentration is appropriate for calculation of a $LADD_{POT}$. The reviewer notes that the meteorological data and assumptions need to be reviewed to determine how to produce maximum annual average ground level air concentrations. The reviewer cannot understand why a central tendency and worst case exposure are not developed for this exposure pathway. The reviewer states that the use of the generic Industrial Source Complex - Long Term model is consistent with this screening-level evaluation; however, the reviewer suggests providing additional explanation of why only a maximum annual average concentration is used when two exposure estimates were developed for other exposure pathways.

One reviewers suggests that the worst case is a temperature inversion with a low ceiling and stagnant air with wind velocity near 0 m/sec. The reviewer recommends that this should be modeled for a worse case since it is important for such areas which experience frequent such inversions. The reviewer suggests reviewing Bhopal reports.

3.6.3 Emissions from a Hypothetical Facility - Defaults

Are the default stack height, stack diameter, exit gas temperature and velocity, and human receptor location appropriate? Please provide your rationale for determining the appropriateness of the default values. Note any defaults that you feel are inappropriate and suggest alternate values.

One reviewer notes that the default parameters are all appropriate for tall stacks, such as boilers and incinerators. The reviewer states that these types of stacks are well characterized, and these default values are typical and, therefore, appropriate.

Another reviewer recommends adding the rationale for selecting those values justified in an appendix to the documentation. The reviewer could not determine their appropriateness without the distributions for those parameters.

One reviewer indicates that gas temperature variations should be modeled with thermal degradation accounted for in each chemical. The reviewer suggests that the major default assumption is that all of the chemical escapes and that a climatic temperature inversion exists, an approach the model currently lacks.

3.6.4 Estimation of Air Concentrations from Fugitive/Vent Releases

Are the mathematical equations used to estimate air concentrations from fugitive/vent releases adequately explained? Specifically note any areas of concern, areas for improvement, or alternate calculation methodologies.

All of the reviewers comment that the mathematical equations used to estimate air concentrations from fugitive/vent releases are adequately explained. One reviewer is unsure if the exposures due to stack and fugitive dust releases use consistent exposure assumptions. The reviewer notes that the following examples seem inconsistent: the distance to receptor, mean wind speed, and frequency wind blows to receptor. In addition, the reviewer indicates that the assumption of continuous fugitive dust release seems excessively conservative.

Another reviewer suggests that the temperature inversion climatic condition be modeled.

3.6.5 Maximum Annual Average Ground Level Air Concentrations

Is the prediction of the maximum annual average ground level air concentrations appropriate? Is the use of the sector averaging form of the Gaussian algorithm appropriate? Please provide your rationale for determining the appropriateness of this source of information and note any other sources you believe are appropriate.

One reviewer comments that the prediction of the maximum annual average ground level air concentrations and the use of the sector averaging form of the Gaussian algorithm are appropriate.

Another reviewer notes that the use of maximum annual average ground level air concentrations is appropriate for estimation of a potential acute dose rate, but seems overly conservative for estimation of an average daily dose or life-time average daily dose. The reviewer suggests that the use of the sector averaging form of the Gaussian algorithm seems appropriate for a residential exposure scenario, since the resident is unlikely to be exposed at locations other that at the residence.

See Sections 3.6.2 through 3.6.4 for the third reviewer's comments.

3.6.6 Ambient Air Concentration Estimates - Defaults

Are the default assumptions of neutral atmospheric stability, average wind speed and direction toward receptor, downwind distance of receptor, and stack height appropriate? Please provide your rationale for determining the appropriateness of the default values. Note any defaults that you feel are inappropriate and suggest alternate values.

One reviewer comments that all default assumptions are appropriate. The reviewer recognizes that much work has been performed, it is well documented in the literature, and that these default assumptions fall within the range of those that have been found to predict worse-case exposure scenarios.

Another reviewer indicates that the default values that provide only a maximum exposure should be supplemented with default values that provide a median or central tendency exposure. The reviewer states that values used in the two sets of equations seem reasonable; however, values for parameters that are common to the estimation of exposure from stack emissions and fugitive dust emissions should be consistent.

See Sections 3.6.2 through 3.6.4 for the third reviewer's comments.

3.6.7 Estimation of Inhalation Exposures to Stack and Fugitive/Vent Releases

Are the mathematical equations used to estimate inhalation exposures to stack and fugitive/vent adequately explained? Specifically note any areas of concern, areas for improvement, or alternate calculation methodologies.

One reviewer notes that the mathematical equations used to estimate inhalation exposures to stack and fugitive/vent are adequately explained.

Another reviewer indicates that the Equation 2-18 documentation states a continuous release rate is assumed in the derivation of the air concentration from stack emissions. However, a parameter F in Equation 2-19 allows input of a different number of days. The reviewer feels that this is superfluous and should be deleted since there is no way to change it using the model input screen. The reviewer also notes that the parameter factor is also in the equation for exposure due to fugitive dust, and it can be changed in the model. However, Equation 2-18 says that the parameter factor is necessary for the derivation of the concentration term. This appears to be an inconsistency between Equations 2-18, 2-21, and 2-22. The reviewer feels that this apparent discrepancy needs clarification.

One reviewer comments that Inhalation Rate (used in Equation 2-19) varies with physical activity and that a set of these values should be provided. The reviewer notes that the people with the highest physical activity (e.g., joggers and workers doing heavy work) will be the worst cases, and this should be discussed in both the Documentation Manual and in the computer version.

3.6.8 Exposure Estimate to Stack Releases

Please comment on the appropriateness of $LADD_{POT}$, ADD_{POT}, LADC and ADC equations. Is the use of the "Factor" developed for estimation of air concentrations from stack releases appropriate? Please provide your rationale and alternate estimation approaches if appropriate.

One reviewer comments that these equations are entirely appropriate. The use of the "Factor" is fine, provided it holds up to scrutiny under the new model(s) being promoted by EPA.

One reviewer notes that the derivation of the "Factor" is not presented in Section 2.3.1 as indicated in the definition below Equation 2-26 on page 15 of the documentation. Therefore, the documentation does not provide sufficient information to determine whether the value is appropriate.

One reviewer states that the worst case scenario is not considered.

3.6.9 Exposure Estimate to Stack Releases - Defaults

Are the default inhalation rate, exposure duration, body weight, and averaging times appropriate for stack releases? Please provide your rationale for determining the appropriateness of the default values. Note any defaults that you feel are inappropriate and suggest alternate values.

One reviewer comments that all default values are appropriate. They reflect current guidance and are well accepted by the modeling/risk assessment community.

One reviewer notes that only values for adults are given on page 14 and 15. When the reviewer ran the model for an infant exposure, the reviewer received an error message "floating point division by zero." As previously mentioned, there is also a lack of exposure consideration for adolescents.

One reviewer indicates that the acute inhalation rate is the highest, and suggests using 26.4 m^3/day rather than 13.3 m^3/day as provided in Table 1.1. The reviewer also recommends that 1.1 x 8 + 0.55 x 16 = 17.6 m^3/day would be realistic.

3.6.10 Exposure Estimate to Fugitive/Vent Releases

Please comment on the appropriateness of $LADD_{POT}$, ADD_{POT}, LADC and ADC equations. Is the use of the "Factor" developed for estimation of air concentrations from fugitive releases appropriate? Please provide your rationale and alternate estimation approaches if appropriate.

One reviewer indicates that these equations are entirely appropriate. The use of the "Factor" is fine, provided it holds up to scrutiny under the new model(s) being promoted by EPA.

Another reviewer states that it is not clear that the "F" parameter (release days per year) can be used with the "Factor," since the "Factor" was developed by assuming a continuous release. The "F" term appears to be an input term. The reviewer suggests that this needs clarification before the equations for $LADD_{POT}$, ADD_{POT}, LADC and ADC can be considered appropriate. The reviewer also recommends providing the units for LADC and ADC. The reviewer notes that the file that is saved to disk contains the correct units, and suggests mentioning that the correct information is automatically saved to disk.

One reviewer suggests that the use of the "Factor" is not applicable for weather inversion conditions, the worst case scenario.

3.6.11 Exposure Estimate to Fugitive/Vent Releases- Defaults

Are the default inhalation rate, exposure duration, body weight, and averaging times appropriate for fugitive/vent releases? Please provide your rationale for determining the appropriateness of the default values. Note any defaults that you feel are inappropriate and suggest alternate values.

One reviewer comments that the default values are entirely appropriate. The reviewer states that they reflect current guidance and are well-accepted by the modeling/risk

assessment community. The review suggests that it would be appropriate to provide the user with some guidance on which equation to use if they are dealing with an intermediate height stack. This guidance would likely recommend that the user apply the "Fugitive/Vent Releases" technique to an intermediate height stack.

Another reviewer's concerns were previously summarized for the default values for the exposure estimate for stack releases in Section 3.6.10.

One reviewer states that the default values are generally appropriate.

3.6.12 *Env. Rel., *Rivers or *Lakes, *Fugitive, *Incineration, *Landfill, and *PDM Site Results Screens

Are the *Env. Rel., *Rivers or *Lakes, *Fugitive, *Incineration, *Landfill, and *PDM Site results screens adequate and easy to understand? Is there any additional information that should be displayed? Please provide recommendations for refinement and enhancement.

Are the parameters required before results can be calculated, saved, and displayed apparent? Please provide recommendations for refinement and enhancement.

One reviewer comments that the screens are adequate and easy to understand. The reviewer made some initial errors when trying to quickly run through the models, but was able to readily see where the errors were and insert the needed data.

Another reviewer suggests that the LADC and ADC should be in mg/m^3, and the units for LADC and ADC be provided in Section 2.3.3 of the documentation. The reviewer notes that the units are in mg/kg in the incineration results screen. The reviewer suggests units of mg/L for Rivers, as noted within Section 2.2.2 of the documentation. The reviewer did not see a Lakes result in the model.

One reviewer suggests using a minimum incineration efficiency (e.g., 99.99% of Hazardous Air Pollutants) as the default for specific chemicals for reference conditions.

Is the ability to access and print the exported General Population Exposure results clear and easy to use? Please provide recommendations for refinement and enhancement.

All of the reviewers suggest improving the printing capabilities. Each reviewer recommends allowing users to print all input and results screens. One reviewer notes that printing does not occur when the 'clip to page width option" is checked, and printing results in too many pages printed for a small number of chemicals/facilities. The reviewer suggests that the horizontal tile setup be converted to a vertical tile arrangement for a limited number of chemicals/facilities.

3.7 References

Are references identified appropriately? Would any additional reference citations be helpful? Please note any additional references that should be cited.

All reviewers note that the references provided are identified appropriately. One reviewer recommends that the user be provided access to study data used by the model developers to derive certain equations, relationships, and default values that are not well known to the user.

One reviewer suggests providing the documentation for the air and groundwater models. Another reviewer suggests including temperature inversion model references.

4.0 DOWN THE DRAIN MODULE

This section presents comments specific to the Down the Drain module of E-FAST submitted by the peer review experts.

4.1 Disposal Input Screens

Is the Disposal Inputs screen easy to understand and use? Please provide recommendations for refinement and enhancement.

One reviewer comments that the disposal inputs screen is not intuitive, although it might be easy to use if better documentation was provided, including context-sensitive help screens. The reviewer states that the current help screens provide no more information than is provided in the hard-copy documentation, and that documentation is inadequate. The reviewer suggests improving the user-friendliness of the disposal inputs screen, and providing information indicating whether the "Chemical ID" input is supposed to be a chemical name or CAS Number. In addition, the reviewer suggests providing more information on the optimum content of the chemical ID.

The reviewer also recommends indicating the preferred source of all other input data on the disposal inputs screen. The reviewer notes that numerous potential sources exist for bioconcentration factors, concentrations of concern, and treatment efficiencies, and the preferred sources should be identified to ensure consistency among users of the program. The reviewer suggests providing that context-sensitive help and hard-copy documentation that indicates whether requirements of state programs can be incorporated into the model, or whether it is limited to use of Federal ambient water quality criteria for concentrations of concern.

One reviewer questions why the user is prompted to enter high and low wastewater treatment efficiency data if the model considers only low removal data. The reviewer states that this could potentially be confusing to the user. The reviewer suggests allowing only one input value and using language similar to "enter lowest removal efficiency."

In addition, the reviewer notes that input data appear to carry over between modules, whether intended or not. The reviewer provides the following example: the reviewer executed the General Population Exposure module for a Manufacture scenario and then ran the Down the Drain scenario. The Disposal Results screen showed the Release Activity to be Manufacturing, when in fact, this module is supposed to consider Down the Drain discharges only. The reviewer notes that these data are displayed in the Down the Drain module only for informational purposes; this could potentially be confusing to the user.

4.2 Estimating Household Wastewater Releases

Is the mathematical equation used to estimate household wastewater total daily per capita releases adequately explained? Specifically note any areas of concern, areas for improvement, or alternate calculation methodologies.

One reviewer comments that the mathematical equation used to estimate household wastewater daily per capita releases is not adequately explained. The reviewer questions the source of ProdVol/Pop. The reviewer notes that the relationship between ProdVol/Pop and Hg is a simple unit difference, and that the source of ProdVol is not given. Production volume usually means produced in commerce and not the mass of a chemical released to wastewater. The reviewer notes that the basis of the true relationship between the independent and dependent variables needs to be explained and referenced, since the user determines an annual mass released to wastewater. In addition, the reviewer states that while the release of the chemical is probably directly related to the production volume, this factor is not shown in Equation 3-1. No source of this parameter value is given; therefore, the equation is clearly inappropriate. The reviewer suggests using the 2000 Census data for Pop in Equation 3-1.

Two reviewers note that the equation is adequate. One reviewer suggests rearranging Equation 3-1 to provide the annual datum since it is needed in Screen 2.

4.3 Method for Estimating Surface Water Concentrations

Are the mathematical equations used to estimate surface water concentrations adequately explained? Specifically note any areas of concern, areas for improvement, or alternate calculation methodologies.

All of the reviewers indicate that the equation for estimating surface water concentrations is adequately explained. One reviewer notes that the Documentation Manual does not instruct the user that only the lowest wastewater treatment removal value will be used by the model. The reviewer states that the explanation for derivation of the stream dilution factor has just the right amount of detail for the user who may not be familiar with the nuances of the Needs and Industrial Facilities Discharge databases.

One reviewer comments that the surface water estimation equation is designed to consider only one wastewater treatment removal scenario. The reviewer suggests that in order to significantly increase the accuracy of the model, an optimal design for the program might incorporate multiple removal scenarios (e.g., Primary, Trickling Filter, Lagoon, Activated Sludge, Oxidation Ditch removals). The reviewer recommends that in the very least, the program could consider only Activated Sludge and Lagoon facilities, which comprise approximately 75% of all facilities discharging to inland surface waters (1996 Clean Water Needs Survey). The reviewer suggests that the user would then not be inclined to include in the Disposal Input screen removal for Primary treatment plants, thus being extremely conservative, as these plants comprise much less than 5% of facilities. If the user does not have removal data for different treatment types, as is often the case, the program could estimate removals based on chemical properties selected by the user. For example, the user could enter Activated Sludge removal data, and then click a button indicating that the test chemical behaves similar to biochemical oxygen demand, total suspended solids, or another chemical of choice. Based on average biochemical oxygen demand removal data for various treatment types (available from the Permit Compliance System database), the removal for the new chemical could be determined. This becomes even more important as a user updates the treatment plant data set based on a new Needs Survey. For example, due to funding and new construction occurring in the late

1980's/early 1990's, a significant number of treatment facilities upgraded to activated sludge/oxidation ditch, or added tertiary treatment.

4.4 Household Wastewater Data

Please comment on the appropriateness of the household wastewater daily release volume data obtained from the 1990 Needs data base. Is the methodology used to arrive at the household wastewater flow per person appropriate? Is this an appropriate resource for this information? Please provide your rationale or note any other sources you believe are appropriate.

Two reviewers indicate that the methodology is appropriate. One reviewer suggests that the data be updated when possible.

One reviewer comments that the derivation of the household wastewater daily release volume data is clearly explained. The reviewer questions why the equation considers only domestic flow instead of the total flow at the treatment facility. The reviewer notes that any chemical in wastewater treatment plant influent after consumer disposal will be diluted by the TOTAL flow to the plant, not just the domestic flow. Although most treatment facilities have low industrial flows, the total flow at the facility should be divided by the number of residents served to obtain a per capita flow that reflects true influent conditions. After performing this calculation for all facilities, a new median value (that should be increased somewhat) can be calculated.

This reviewer notes that the latest Needs database could be used to update the daily release volume data; however, it is reasonable to expect that this value has not changed significantly over the last 6 years.

4.5 Stream Dilution Factor

Please comment on the appropriateness of the use of the stream dilution factor (SDF). Are data obtained from the EPA STORET Industrial Facilities Discharge file and the Stream Dilution Factor Program appropriate for estimating mean SDFs for wastewater treatment facilities? Please provide your rationale for determining the appropriateness of this source of information and data. Note any other sources you believe are appropriate.

One reviewer notes that since the focus of this release is on wastewater treatment plants, it is obvious that it requires a different procedure than the industrial effluent discharges assumed in the other components of E-FAST. The reviewer comments that the methodology seems reasonable.

Another reviewer indicates that using 10th and 50th percentiles is the accepted practice. The reviewer believes that the use of the STORET file is appropriate for conservative purposes if only values above the least quantifiable limit (LQL) are used. The reviewer notes that if trace values are set at half-way between the detection limit and the LQL, and the square root of the detection limit is used for all data below or at the detection limit, median values will be lowered significantly.

One reviewer comments that the derivation of the stream dilution factors for all facilities makes sense (e.g., Industrial Facilities Discharge Reach numbers are much more accurate than those from Needs), and Industrial Facilities Discharge flow is generally accurate. The reviewer notes, however, that the set of treatment plants used to derive the stream dilution factor curves is now over 10 years old. The reviewer suggests that because the Industrial Facilities Discharge database is no longer actively updated, a new matrix based on 1996 Clean Water Needs Survey data, or Permit Compliance System data (which appears to have fairly reliable reach number data) could easily be developed.

This reviewer notes that the reasoning behind the use of more than 9,000 POTWs in the stream dilution factor calculation, and the use of only 8,873 POTWs in Probabilistic Dilution Model calculations is not clear. The reviewer suggests providing an explanation as to why some of the POTWs used for stream dilution factor calculations cannot be used in Probabilistic Dilution Model calculations.

4.6 Method for Estimating Exposures from Ingestion of Drinking Water and Fish

Are the mathematical equations used to estimate exposures from ingestion of drinking water and fish adequately explained? Specifically note any areas of concern, areas for improvement, or alternate calculation methodologies.

All three reviewers note that the mathematical equations used to estimate exposures from ingestion of drinking water and fish are adequately explained.

4.7 Drinking Water Potential Dose Rate with 10th% Surface Water Concentrations Estimates

Is the surface water concentration estimation calculation for 10th percentile facility adequately explained and appropriate? Please comment on the appropriateness of ADR_{POT}, ADD_{POT}, $LADD_{POT}$, ADC, and LADC equations. Please provide your rationale and alternate estimation approaches if appropriate.

One reviewer indicates that the surface water concentration calculation is adequately explained and appropriate. The reviewer notes that the use of 365 days per year for the chronic scenario is overly conservative, since most adults take some vacation away from the residence, and suggests that 350 days would be an appropriate alternative value.

One reviewer notes that the ADR_{POT} equation assumes the 10th percentile surface water concentration and questions whether there is a more accurate way to reflect surface water

concentrations at drinking water intakes, knowing that a municipality would not intentionally locate an intake in the vicinity of a POTW. The reviewer suggests examining the average distance between a POTW discharge and the nearest intake, whether a loss term be incorporated, and assessing whether the source water for the POTWs in the 10th percentile is primarily surface or ground water.

4.8 Drinking Water Potential Dose Rate with 50th% Surface Water Concentrations Estimates

Is the surface water concentration estimation calculation for 50th percentile facility adequately explained and appropriate? Please comment on the appropriateness of ADR_{POT}, ADD_{POT}, $LADD_{POT}$, ADC, and LADC equations. Please provide your rationale and alternate estimation approaches if appropriate.

All three reviewers comment that the surface water concentration estimation calculation is adequately explained.

See previous comments regarding surface water concentration estimation calculation for 10th percentile facility in Section 4.7.

4.9 Drinking Water Potential Dose Rate - Defaults

Are the default median volume of water consumed daily per person, years of product usage, body weight, and averaging times appropriate? Please provide your rationale for determining the appropriateness of the default values. Note any defaults that you feel are inappropriate and suggest alternate values.

One reviewer suggests that a distributional approach for the years of product usage would be more appropriate. The value for this parameter requires more justification.

Another reviewer believes the defaults are standard.

This is not one reviewer's area of expertise, and no comment was offered.

4.10 10th% Surface Water Concentrations Estimates

Is the surface water concentration estimation calculation for 10th percentile facility adequately explained and appropriate? Please comment on the appropriateness of ADR_{POT}, ADD_{POT}, $LADD_{POT}$, ADC, and LADC equations. Please provide your rationale and alternate estimation approaches if appropriate.

All three reviewers indicate that the estimation calculation is appropriate.

4.11 50th% Surface Water Concentrations Estimates

Is the surface water concentration estimation calculation for 50th percentile facility adequately explained and appropriate? Please comment on the appropriateness of ADR_{POT}, ADD_{POT}, $LADD_{POT}$, ADC, and LADC equations. Please provide your rationale and alternate estimation approaches if appropriate.

All three reviewers comment that the estimation calculation is appropriate.

4.12 Surface Water Concentrations Estimates - Defaults

Are the default median fish ingestion rate, bioconcentration factor, years of product usage, body weight, and averaging times appropriate? Please provide your rationale for determining the appropriateness of the default values. Note any defaults that you feel are inappropriate and suggest alternate values.

Two reviewers indicate that the defaults are standard. One reviewer states that bioconcentration has no default value, and that a rationale for years of product usage is not provided.

4.13 Estimating Probability of Exceeding Concentrations of Concern

Is the method used to estimate the probability of exceeding concentrations of concern adequately explained? Specifically note any areas of concern, areas for improvement, or alternate calculation methodologies.

Two reviewers note that the method appears to be explained adequately.

Another reviewer states that the method used to estimate the probability of exceeding concentrations of concern is not addressed adequately. The reviewer indicates that the Documentation Manual goes to great lengths to explain the data set used to derive the modified version of the Probabilistic Dilution Model, but does not explain the function of the model. The reviewer questions what prior knowledge of Probabilistic Dilution Model is expected of users before execution of the model. The average user would probably prefer to better understand the objective of the model and the function of the probability matrix rather than the nuances of the merge of the GAGE files to POTWs. The reviewer suggests removing this information entirely from the documentation, and adding excerpts from the Probabilistic Dilution Model user manual describing the model purpose, the principles of the probability matrix, a very general description of the data sets used by the model, and how these data sets were merged.

This reviewer notes that the online help does contain some of this information in the Aquatic Environment Exposure/Risk page, but suggests that a user executing the Down the Drain module would not intuitively look for Probabilistic Dilution Model information in another program module (e.g., because they would not necessarily know that it also applies to the Down the Drain module).

4.14 Modified Version of the Probabilistic Dilution Model

Please comment on the appropriateness of the modified version of the Probabilistic Dilution Model to calculate the number of days of exceedance of a surface

water concentration. Please provide your rationale for determining the appropriateness of this model.

One reviewer indicates that an evaluation of the appropriateness of this modified version cannot be provided with the limited description provided in the Documentation Manual.

One reviewer notes that the model does not consider natural or upstream background contributions, and suggests that this be described explicitly in the Help for these equations.

Another reviewer agrees with the methodology the authors used to create the probability matrix, but suggests that an update is required, as the base data are now more than 10 years old. In addition, the reviewer agrees with the derivation of the matrix base data sets (e.g., eliminating those POTWs having no population data), but recognizes that stream reaches with W. E. Gates background flows of zero do exist (e.g., Austin, TX, Odessa, TX).

This reviewer also notes that the Probabilistic Dilution Model probability matrix methodology is not an easy concept to grasp. The reviewer suggests that results from this model can "make or break" a new chemical, yet its inner workings are difficult to explain, and are not at all transparent to the user.

4.15 Use of 1990 Needs Data

Please comment on the appropriateness of the use of 1990 Needs data to obtain reach numbers, POTW flows, and populations served. Is this an appropriate resource for this information? Please provide your rationale for determining the appropriateness of this source of information. Note any other sources you believe are appropriate.

One reviewer suggests updating the data if possible.

Another reviewer suggests the authors consider updating the model probability matrix to incorporate more recent treatment plant data (e.g. 1996 Clean Water Needs Survey). In addition, the reviewer notes that it may be confusing to the user that different numbers of POTWs (i.e., data sets) were used in this Probabilistic Dilution Model calculation versus creation of the stream dilution factors. The reviewer suggests that the authors could use the Permit Compliance System (PCS) or another database to extract Reach numbers and improve the accuracy of the probability matrix. The reviewer is very comfortable with the use of effluent and population data from Needs (e.g., flow data correlates very well to Permit Compliance System DMR flow data). The reviewer addresses the GAGE database and notes the data are not optimal, but are the best compiled data set currently available.

This is not one reviewer's area of expertise, and no comment was offered.

4.16 Incorporation of Population Data in the Probabilistic Dilution Model

Please comment on the appropriateness of the incorporation of population data into the Probabilistic Dilution Model. Specifically is the use of a typical per capita loading instead of discharge loading to generate probabilities appropriate? Please provide your rationale for determining the appropriateness of this data. Note any suggestions or alternatives.

One reviewer comments that the use of per capita loading seems unusual, but the reviewer does not have the Needs Survey to evaluate this approach further. The reviewer states that the two approaches appear equivalent, if treatment efficiencies are used to obtain an equivalent discharge loading.

Another reviewer notes that the per capita loading is not necessarily the same as a per capita discharge, but provides a conservative estimate.

One reviewer indicates that a per capita loading is more appropriate than a discharge loading because the down the drain volume of a consumer product chemical depends

on the number of people using that chemical, which is directly proportional to the population served by the treatment facility.

4.17 POTW Loadings and Releases

Please comment on the estimates of population served and estimates of per capita household releases to account for POTW loadings and releases. Provide your rationale for determining the appropriateness of these approaches, and provide suggestions for alternate approaches if appropriate.

One reviewer is not familiar with the data used in this portion of the model and cannot comment on its appropriateness, except to say that it sounds reasonable.

Another reviewer comments that the POTW release data are the most uncertain since efficiencies are dependent on the chemical and the POTW processes. The reviewer suggests that a link to chemical-specific data for "representative" POTWs should be provided.

This is not one reviewer's area of expertise, and no comment was offered.

4.18 Disposal Results Screen

Is the Disposal Results screen easy to understand and navigate, including the Probabilistic Dilution Model Information, Drinking Water Information, and Fish Ingestion Information tabs? Please provide recommendations for refinement and enhancement.

One reviewer notes that the drinking water concentration estimates on the Disposal Results screen are presented in units of mg/kg, and suggests that these be changed to mg/L.

Another reviewer suggests that the model include a link describing each term and the equation used rather than requiring users to consult the Handbook for each term.

One reviewer indicated that the tabs are easy to negotiate.

4.19 Down the Drain Results

Is the ability to access and print the Down the Drain results data clear and easy to use? Please provide recommendations for refinement and enhancement.

One reviewer states that it is not clear that a printable file is saved to disk after each run. The reviewer suggests that the user should have an option to save this to a hard disk, not just a floppy, and notes that laptop users without built-in floppy drives cannot run the model. The reviewer also recommends that if printable files are generated, they should be given file names and extensions that are intuitive, and users should be allowed to print the files directly by highlighting them in Windows Explorer.

Another reviewer did not notice that the files are saved to disk, comments that there was no option to save the data to disk, and suggests that there should be.

One reviewer notes that after the user has entered all the data and presses a button for calculation in the General Population Exposure module, the program runs the calculation and then informs the user of the name of the file containing the output report. The reviewer suggests that this would be a beneficial feature to add to the Down the Drain module.

4.20 References

Are references identified appropriately? Would any additional reference citations be helpful? Please note any additional references that should be cited.

Two reviewers indicate references are identified appropriately.

Another reviewer notes that the only references that have not been included are for STORET, and any publications that might briefly describe the GAGE and Industrial Facilities

Discharge data sets (sample: "STORET/BIOS/ODES/WQAS Tools Inventory", Tetra Tech, September 20, 1994).

5.0 AQUATIC ENVIRONMENT EXPOSURE/RISK

This section presents comments specific to the Aquatic Environment Exposure/Risk module of E-FAST, submitted by peer review experts.

5.1 PDM Site Screen

Is the PDM Site screen easy to understand and use, including the option to find and select an National Pollutant Discharge Elimination System number, and to submit data for calculation? Please provide recommendations for refinement and enhancement.

Are the parameters required to be entered before PDM Site Specific Estimates can be calculated apparent? Please provide recommendations for refinement and enhancement.

Two reviewers indicate that the PDM screens were quite clear and easy to use. One of those reviewers recommended no changes. The other reviewer provided specific comments, which can be found in Appendix E.

The third reviewer recommends indicating on the screen that the National Pollutant Discharge Elimination System number is selected on the "release information" screen under the General Population Exposure from Industrial Release module. This reviewer comments that inputting the remainder of the information is clear.

This reviewer also noted that the required parameters are not apparent, and that the correct sequence of input screens was learned only by trial and error. The reviewer suggests including a flowchart showing the sequence of input steps.

5.2 PDM SIC Screen

Is the PDM SIC screen easy to understand and use, including the option to choose an Standard Industrial Classification description? Please provide recommendations for refinement and enhancement.

Are the parameters required to be entered before PDM Standard Industrial Classification Code Estimates can be calculated apparent? Please provide recommendations for refinement and enhancement.

Two reviewers note that the PDM SIC screen was clear and easy to use. One of these reviewers recommended no changes. The other reviewer comments that the user can easily retrieve an industrial discharger category and view the associated data, and that model endpoints are fairly easy to determine. This reviewer questions whether a "high end" or an "average case" scenario will be used. Recent discussions between OPPT personnel and the reviewer regarding this module have indicated that the "average case" scenario generally has not and will no longer be an option for comparison versus the concentration of concern, rather the "high end" scenario (although not labeled as such) will be used.

One reviewer recommends that the documentation and help screens describe which screen and input boxes should be filled out first. The option to choose a Standard Industrial Classification description apparently must be entered by hand, since it is not carried forward from the initial release screen. The help screen does not exactly indicate that this has to be entered manually, and some additional instructions are needed.

This reviewer notes that it is not apparent that these inputs need to be entered on the fate input screen. Input boxes that are filled in on another screen could be shaded differently, or the actual input screen identified.

5.3 The Probabilistic Dilution Model (PDM)

Is the use of the Probabilistic Dilution Model to account for the natural variability of stream flows and effluent flows when comparing concentration values to concern levels appropriate? Specifically note any areas of concern, areas for improvement, or alternate calculation methodologies.

One reviewer is comfortable with the Probabilistic Dilution Model approach for a 'screening-level analysis'; however, the reviewer is concerned that many users will assign greater accuracy and confidence to the results than is appropriate for a screening analysis. The reviewer suggests consistently describing the uncertainty inherent in these types of analyses on the results screen by adding a warning or caveat to ensure that the user clearly understands the limitations of the approach. The same warnings and caveats should be printed on ALL model results.

One reviewer states that the general approach seems adequate and is more realistic than a single point estimate of flow.

The third reviewer indicates that the method used to estimate the probability of exceeding concentrations of concern is not addressed adequately in the user manual and online help. If the authors expect users of E-FAST to have knowledge of Probabilistic Dilution Model prior to model execution, then the amount of detail included is about right. If not, significant additional information must be added for the user. The reviewer suggests that the average user would prefer to better understand the objective of the model, and the development and function of the probability matrix before getting a "black box" number displaying days exceeded.

In addition, the user manual cites the processor speed constraints in the development of the first probability matrix in the late 1980s. Since that time, numerous changes in the industry data set (number, location, discharge, etc), as well as processing capabilities have occurred. Given the processing power available to the average model end-user, the reviewer believes that now is the time to develop a solution that is more transparent to the user than a probability/ratio/interpolation program, while not significantly sacrificing model performance.

5.4 Probabilistic Dilution Model - Analysis of Reaches with USGS Gaging Stations

5.4.1 USGS Flow Data

Please comment on the use of flow data from USGS gaging stations, specifically the criteria of gaging stations having at least 100 daily flow values for inclusion. Is this an appropriate resource for this information? Please provide your rationale for determining the appropriateness of this source of information. Note any other sources you believe are appropriate.

Two reviewers note that USGS data are the best available. However, both reviewers question the minimum criteria of 100 daily flow values. One reviewer states that a data set of only 100 values could give a very different frequency, or flow-duration curve, than a complete set of two, three, or more years of data, and this would have a significant impact on the 10% and 50% flow values. As a minimum, the reviewer recommends three years, or at least advise model users when the flow record is short or limited, with a corresponding increase in the uncertainty of the results.

This reviewer also suggests allowing users to import their own flow records if available. Many state and local agencies have long flow records available for their sites.

One reviewer questions if these values are consecutive or seasonal, and whether they capture the seasonal variability of the river reach. The reviewer also questions whether a 100-day period can truly represent 7Q10 conditions. The reviewer questions whether a study was conducted to compare the accuracy of a 100 day stream flow with modeled flow conditions.

The third reviewer suggests that more detail could be provided on the significance of the 100 daily flow values. Some bias could be introduced if all 100 values were recorded

during high flow or low flow conditions. The number of values and period of record should be provided so the extent of bias can be assessed.

5.4.2 Methodology of Calculating the Percent of Year Exceeded and Days Per Year Exceeded

Please comment on the appropriateness of the methodology used to arrive at the percent of year exceeded and days per year exceeded. Provide your rationale for determining the appropriateness of this approach, and provide suggestions for alternate approaches if appropriate.

Based on one reviewer's understanding of the Probabilistic Dilution Model approach, the "percent" and "days per year" values are entirely a function of the assumption in Probabilistic Dilution Model that the flow exceedance frequency is the same as the concentration exceedance frequency. A constant load is divided by a flow volume to get a concentration, and the "percent exceeded" is assumed to be the same as the exceedance value of the flow. In reality, the reviewer does not agree that the flow and concentration exceedance frequencies will be the same (unless the load is the same over all flow values - highly unlikely). However, for a "screening-level" assessment with minimal site-specific data, this approach is necessary and may be appropriate and warranted.

One reviewer states that the methodology is not presented in the Documentation Manual, and suggests adding equations that explain how these two parameters are calculated, since they should be influenced by the number of release days per year,.

One reviewer comments that determination of the number of days exceeded is very straightforward and appropriate for one facility on one reach.

5.4.3 Mean and Low (7Q10) Flows

Please comment on the appropriateness of the use of the mean and low (7Q10) flows estimated br EPA's Office of Water, and the calculated coefficient of variation of stream flow. Provide your rationale for determining the appropriateness of this approach, and provide suggestions for alternate approaches if appropriate.

One reviewer believes that the description of the calculations in the E-FAST documentation is not adequate to judge the appropriateness and reliability of the resulting values, and suggests an alternative reference (see Appendix A for the specific citation).

Another reviewer also notes that insufficient information is provided in the Documentation Manual to evaluate the appropriateness of this approach, and an example calculation should be provided.

The third reviewer states that determination of the coefficient of variation using a regression equation for a reach's subwatershed is an interesting and seemingly sensible approach. The reviewer believes the USGS/OW 7Q10 flows represent the best surface water data available. In addition, determination of the coefficient of variation via subbasin diminishes variability in the analysis.

5.5 Standard Industrial Classification Code Category, Reasonable Worst Case Analysis

5.5.1 Matrix Files from Predetermined Values of Concern Concentration and Amount of Chemical Released

Please comment on the appropriateness of the use of matrix files created from predetermined values of concern concentration and amount of chemical released, specifically the use of the average of the sum of the highest 10th percentile probabilities for a particular concern concentration to loading ratio. Provide your rationale for

determining the appropriateness of this approach, and provide suggestions for alternate approaches if appropriate.

One reviewer indicates that for a national-level screening analysis, the use of the matrix files would appear to be appropriate primarily because of the 'screening' nature of the assessment. However, the justification in the Documentation Manual refers to the excessive computer time, circa late 1980s, that would have been required to perform the calculations for all Standard Industrial Classification facilities and relevant reaches. The reviewer questions whether this is still a valid justification, considering the advanced computing power of current machines. If the computations can be performed within a reasonable time for interactive computing sessions (e.g. a few minutes, at most), the reviewer suggests that the range and distribution of probabilities produced from all relevant facilities would be a better means of assessing exposure concentrations. If the computing time is still excessive, the reviewer agrees that the matrix approach is a reasonable alternative.

In addition, this reviewer notes that the use of the top 10^{th} percentile probabilities appears to be a policy or design consideration or issue; potential alternatives would be the top 1^{st} or 5^{th} percentile values. Considering the other conservative assumptions in the analysis, the reviewer indicates that either the 5^{th} or 10^{th} percentile levels would be appropriate.

One reviewer comments that insufficient information was provided in the Documentation Manual to evaluate the appropriateness of this approach. No rationale was provided for the selection of the highest 10^{th} percentile probabilities.

The third reviewer states that the method generally makes sense, but is not intuitive to the user. The 10^{th} percentile of facilities is a commonly-used benchmark. However, the confusion arises when the model mixes the dimensions of number of facilities and time. The reviewer suggests that users are much more inclined to think on a facility basis a straightforward question of 'is the facility out of compliance for low flow situations or not'.

5.5.2 Interpolation Program

Please comment on the appropriateness of the use of an interpolation program to estimate concern level/loading rate ratios that are not represented in the matrix. Provide your rationale for determining the appropriateness of this approach, and provide suggestions for alternate approaches if appropriate.

One reviewer indicates that interpolation is a common practice for this type of approach. The earlier documentation (i.e., 1988) performed some evaluation of the interpolation procedure, and the results are satisfactory.

One reviewer was unable to evaluate the appropriateness of this approach.

One reviewer is uncomfortable with the interpolation method and believes an "on-the-fly" alternative could be created that could take into account any loading suggested by the user.

5.6 Standard Industrial Classification Code Category, Average Case Analysis

5.6.1 Probabilities of Exceedance

Please comment on the appropriateness of using the probabilities of exceedance for all facilities to represent an average case analysis. Provide your rationale for determining the appropriateness of this approach, and provide suggestions for alternate approaches if appropriate.

One reviewer comments that the use of all probabilities is reasonable, but that the range of probabilities should also be evaluated, along with the mean or average, and perhaps additional statistics such as the median and standard deviation. The reviewer does not believe that the mean by itself is an adequate representation of the probabilities for all conditions, such as

situations where one has many high and low probabilities whose average is acceptable, but the average may not occur very often (i.e., the average may have a low probability of occurrence).

One reviewer was unable to evaluate the appropriateness of this approach.

The third reviewer indicates that the approach seems to be intuitive and appropriate.

5.6.2 Aquatic Environmental Exposure/Risk Data

Is the ability to access and print the Aquatic Environmental Exposure/Risk data clear and easy to use? Please provide recommendations for refinement and enhancement.

Three reviewers did not find the ability to access and print the data clear. One reviewer suggests adding a 'Print' button to allow direct printing from E-FAST without having to open a word processor.

The second reviewer could not find information about printing the data in the Documentation Manual. An explanation that the program saves the printable output to disk should be added to the manual. A key to file names should be provided, along with instructions that the files need to be opened by a word processing program for printing.

The third reviewer suggests allowing users to print out each output screen, or to print the report summary from the Site Specific or SIC Code screens. This would eliminate the need to access MS Word and open the *.psw file. In addition, the output report for the Probabilistic Dilution Model Site Specific analysis is not intuitively named.

The output report for the Site Specific analysis contains fields labeled #Observations, Period of Record, StationID, etc. This reviewer suggests that listing that these fields relate to river rather than discharge characteristics on this report. This is more intuitive on

the screen display, because they are listed under river gauge information. The reviewer was also unable to save or print an output report for a Standard Industrial Classification Code-based analysis (no button is available on the screen and a separate file is not written).

5.6.3 References

Are references identified appropriately? Would any additional reference citations be helpful? Please note any additional references that should be cited.

One reviewer notes that the Probabilistic Dilution Model documents provided (i.e., 1988 and 1991 reports/manuals) were not cited in the E-FAST documentation. Some of the material in the earlier reports should be included, if not in the text than possibly as appendices. Probabilistic Dilution Model seems to be such a key element of E-FAST that it is an oversight to not include the information.

The second reviewer comments that the references are identified appropriately; however, the reviewer suggests including a reference to PDM3 from the 1991 User's Guide.

One reviewer states that the only references that have not been included are publications that might briefly describe the GAGE, Industrial Facilities Discharge, and REACH data sets (e.g., "STORET/BIOS/ODES/WQAS Tools Inventory", Tetra Tech, September 20, 1994).

6.0 SUMMARY COMMENTS

This section presents summary comments about E-FAST submitted by the peer review experts, including comments regarding the documentation available for the model. This section includes comments from all five reviewers for each of the three modules.

Please summarize your comments in order of importance in the following areas. In addition, please summarize any suggestions for improvement or alternate estimation methodologies.

a. What is your overall level of confidence in E-FAST's screening level estimates? Please provide your rationale for assessing level of confidence.

One reviewer has a fairly high level of confidence in the ability of E-FAST to provide accurate, conservative screening level concentration estimates. However, due to functions of the interface design and Documentation Manual content, the reviewer has less confidence that the model will be used correctly (e.g., users selecting appropriate endpoints).

One reviewer would have a moderate level of confidence in the results if the reviewer was using E-FAST for estimating exposures. The reviewer believes it would be necessary to perform considerable sensitivity analyses on the input parameters to evaluate and improve the level of confidence. The reviewer recommends that all users should perform such sensitivity analyses. The reviewer states that there was no indication of testing results in the documentation, using real data on current chemicals on real sites, to assist the user in assessing the general level of accuracy that might be expected.

One reviewer's level of confidence in E-FAST's estimates is low to moderate. The reviewer bases this primarily on the lack of comfort resulting from not being able to access and check the model calculations. The reviewer is uncomfortable with the "black box" approach of inserting a few parameters and then having the model provide a few numbers as the output.

One reviewer notes a major problem with the General Population Exposure module if the exposure days are consecutive or interspersed, and whether acute or chronic effects are therefore preferred. The reviewer suggests that the two approaches should give a range of possible outcomes depending on the toxicity parameter employed. The reviewer comments that answers will be conservative and not realistic for wind speeds greater than 5.5 m/sec. Areas that experience frequent climatic temperature inversions should be modeled as special worst cases.

This reviewer suggests that the program should feature links to each term that describe the term, the units, and how to calculate the term. The reviewer believes the answers are unrealistically high, leading to questions of usefulness.

Another reviewer has an overall low level of confidence in the exposure estimates. Specifically for the General Population Exposure module, the reviewer states that incineration exposures are based on maximum annual air concentrations, and no consideration is given to fate processes in any media, except bioconcentration in water. The reviewer notes that the factors used to develop the algorithms for estimating groundwater and air concentrations are not adequately documented. In addition, the reviewer suggests that it would be helpful to provide documentation of calibration/validation examples in the manual.

This reviewer indicates that the estimates are probably adequate for screening purposes. The reviewer suggests that more attention be paid to characterizing uncertainty in the values selected for parameters other than receiving stream flow. The reviewer states that there is a clear imbalance in the development of values for the various parameters in the model, and that the information needed to develop confidence in most model input parameters is not provided in the documentation.

b. What is your overall assessment of the appropriateness of using E-FAST to perform screening level exposure estimations to support risk assessment, considering E-FAST assumptions and methodologies?

One reviewer comments that E-FAST is an appropriate model for conducting screening level assessments, providing that the conservative nature of the model is conveyed to the user. The reviewer notes that E-FAST base data reflect that which are readily available, and the algorithms incorporate standard, clearly understandable methodologies.

One reviewer indicates that the current version of E-FAST is still a Beta Version, and additional beta testing is required before general release. In addition, the reviewer agrees that the overall methodology and assumptions are reasonable and appropriate, but recommends performing additional testing with real data to confirm and demonstrate the validity of the approach. The reviewer also notes that additional beta testing will identify further software issues, which will help the overall usability of the code. The reviewer also recommends improving the documentation.

One reviewer comments that the model is minimally useful because it does not adequately consider chemical fate processes and overestimates air exposures, which will reduce its usefulness for evaluating new chemicals. The reviewer suggests that confidence could be increased if calibration/validation runs are provided with the documentation.

This reviewer feels that the E-FAST Aquatic Environment Exposure/Risk module appears only to be valuable as a tool to evaluate Toxic Substances Control Act submittals. The reviewer notes that it does not take into consideration most chemical-specific fate processes, sediment loading, and other chemical and environmental characteristics that influence instream concentrations.

One reviewer likes the concept of E-FAST, but would like to be able to obtain much more detailed back-up information and data on the derivation of certain equations, relationships, and default values used in the models. The reviewer notes the use of stream flow data for facilities within certain Standard Industrial Classification codes in the General Population Exposure module is questionable. The reviewer suggests allowing the user to describe the specific receiving stream/body of water rather than the model assigning it for the user based on some questionable assumptions. The reviewer comments that this would also

greatly expand the potential user population of the model, since all manner of screening risk assessments can then be performed with E-FAST, rather than just the targeted Toxic Substances Control Act (Toxic Substances Control Act) applications.

This reviewer also suggests including several other exposure pathways in E-FAST. The reviewer notes that the model currently assesses the fish ingestion pathway, and recommends adding a shellfish ingestion calculation. The reviewer recommends that E-FAST consider exposures from bathing (inhalation and skin absorption) and swimming (skin absorption) in impacted waters. These pathways can be just as important as ingestion of drinking water.

Another reviewer comments that E-FAST is appropriate for a high "ballpark" estimate. For the General Population Exposure module, in particular, the reviewer notes that E-FAST should provide a ballpark figure within an order of magnitude of the worst case except for temperature inversion areas, and distinguish between consecutive and interspersed day exposures.

Appendix A

PEER REVIEWER IDENTITY AND AFFILIATION

Anthony Donigian	President and Principal Engineer, Aqua Terra Consultants
Bruce Jacobs	President, Jacobs Environmental, Inc.
Michael Kangas	Senior Risk Assessment Specialist, CH2M Hill
Shane Que Hee	Professor, University of California Department of Environmental Health Sciences
Charlotte White-Hull	Principal Researcher, Procter & Gamble Company Environmental Science Department