SafeWater Multi-Contaminant Benefit Cost User Guide and Description of Source Code

This document describes how to install and use SafeWater Multi-Contaminant Benefit Cost (MCBC) to run the different cost and benefit models for each regulatory alternative and the final rule. This document also describes the pdf versions of the source code used for SafeWater MCBC, which is available in the PFAS National Primary Drinking Water Regulation docket (EPA-HQ-OW--2022-0114) and on the EPA website at www.epa.gov/sdwa/safewater-multi-contaminant-benefit-cost-mcbc-model-and-associated-files-final-rule.

Installing and Using SafeWater MCBC

The SafeWater MCBC executable program and all required data have been provided as a zip file titled *SafeWaterMCBC_Executable.zip* (available on the EPA website at the address above). SafeWater does not use an installer. Unzip the zip file in any directory where you have read/write access.

The steps to use SafeWater MCBC are as follows:

After starting the SafeWater executable (SafeWaterRun.exe), the options listed below can be selected. Note that when you start the executable the first time, the options necessary to run the analysis for the final rule are already selected (with the exception of the Occurrence file, which is set to the smaller example occurrence file).

Occurrence File: Select a csv file. Two examples are available in the data directory:

- PFAS_0923.csv is the file that is run for the full analysis (final rule) with 4000 iterations.
- PFAS_0923_random40.csv is a smaller file that contains 40 random iterations of all PWSs from the 4,000 iteration file.

Any file can be used provided it adheres to the format of these two example files.

PWS Subpop File: File defining the proportion of the population in each sex, race ethnicity, and age group for individual PWSs.

County Subpop File: File defining the proportion of the population in each sex, race ethnicity, and age group for all counties.

SDWIS File: SDWIS (PWS) inventory file.

Cost Options: Choice of what cost options to run. Option 2 is the final rule option.

Benefit Options: Choice of what benefit options to run.

Discount Rates: Comma separated list of discount rates to run (in % format, i.e., use 2 and not 0.02 for 2 percent). The 0% percent discount rate is always run and should not be part of this list.

Uncertainty: Check to run with cost/benefit uncertainty. Unchecking will run all iterations with point values for uncertain benefit/cost parameters.

Use Uncertainty File: File to use instead of creating a new stream of uncertain parameter values. If blank, a new stream is created.

Tech Forecast: File that defines the technology forecasts used in conjunction with WBS curves.

Yearly Output: When checked, output is generated for costs and benefits for each year in the analysis period in addition to annualized values.

Yearly 0% Only: When Yearly Output is checked, this checkbox limits yearly output to just the 0% discount rate.

Period Adjust: Determines the period when discounting applies. A value of 1 ensures that any cost or benefit is discounted at least 1 year. A value of 0 allows no discounting to take place in the initial year.

Use All Categories: When checked, all combinations of Source Water, System Size, Ownership, and System Type are output. When unchecked, only the national totals across all PWSs are output.

Add Additional Small/Large Size Category: When outputting categories, this option adds an additional category to the output that is a split between Large (>10000 pop) and Small (<10000 pop) systems

Single Size Cat: Limits the run to a single size category (1-9). Use 0 for all categories.

Cohort Follow: When checked, the life table approach is used to remove and add people to cohorts through time.

Workers: Sets the maximum number of logical processors to use during a run. Set to 0 to use all available.

CPU Mult: Factor to multiply workers by the number of working threads. Leave at 1.

Censor: Turns on 0 value censor for CVD beta parameters. Default is not censoring.

VLS Force Conc: Use PWS-specific post-rule concentrations instead of values calculated from the occurrence file and treatment process.

PBPK Time Step: Sets the timestep of the PBPK model in days.

HazWaste Cost: When checked, uses the WBS curves that include hazardous waste disposal costs.

EJ Output: In addition to regular output, also output EJ specific data (by race, ethnicity, and income) for costs and benefits.

Start, End, Change Year: Set the start year, end year, and implementation year for the analysis.

Output Options: Select for outputs that support additional analysis (DBP, GHG, etc.).

When options are selected, hit the Run button to start the analysis. You will be asked for a name, which will be used to create a directory in the output folder where all output files will be placed.

SafeWater MCBC Source Code

In addition to the SafeWater MCBC executables and user guide, the EPA is providing pdf files of the Delphi code used for SafeWater MCBC in the file titled *SafeWaterMCBC_sourcecode.pdf*, which is available in the MCBC docket (EPA-HQ-OW-2022-0114) and on the EPA website at www.epa.gov/sdwa/safewater-multi-contaminant-benefit-cost-mcbc-model-and-associated-files-final-rule.

SafeWater MCBC File Listing

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SAFEWATERMCBC
|   config.ini
|   SafeWaterRun.exe
|   UncertainVarsTrials_Static1023.csv
+---configs
+---data
|   |   PFAS_092023.bin
|   |   PFAS_092023.csv
|   |   PFAS_0923_random40.bin
|   |   PFAS_0923_random40.csv
|   |   PFAS_VLS_occurrence_OptionConc.csv
|   |   SDWISUCMR3.txt
|   |   SDWIS_Amended_Inventory_2022-07-07.csv
|   |   SDWIS_VLS_PFAS_Inventory_2022-07-28.csv
|   |
|   +---CohortData
|   |   |   BodyWeights.csv
|   |   |   Consumption.csv
|   |   |   FIPS_PopAvg.csv
|   |   |   FIPS_PopProp.csv
|   |   |   FIPS_PopPropAvg.bin
|   |   |   FIPS_PopPropAvg.csv
|   |   |   NationalPopProportions.csv
|   |   |   NationalPopProportionsAvg.csv
|   |   |   NationalPopProportionsICF.csv
```

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|   |   |   PWS_EJProportions.csv
|   |   |   PWS_PopPropAvg.bin
|   |   |   PWS_PopPropAvg.csv
|   |   |   PWS_PopPropAvgList.csv
|   |   |   q_gen.csv
|   |   |
|   |   +---CVD
|   |   |       age_hdlc_ht.csv
|   |   |       age_sbp_ht.csv
|   |   |       age_tc_ht.csv
|   |   |       beta.csv
|   |   |       first_hard_proportions.csv
|   |   |       HDLC.csv
|   |   |       ln_hdlc_ht.csv
|   |   |       ln_sbp_ht.csv
|   |   |       ln_tc_ht.csv
|   |   |       postacute_IS.csv
|   |   |       postacute_MI.csv
|   |   |       prevalence_cvd.csv
|   |   |       prob_ht_treatment.csv
|   |   |       q_cvd.csv
|   |   |       SBP_ht.csv
|   |   |       S_Sr.csv
|   |   |       TC.csv
|   |   |       xprime_beta.csv
|   |   |
|   |   +---DBP
|   |   |       benefits_annual_uncertainty-Present COI-based value of benefits (dollars $2022, 0%).csv
|   |   |       benefits_annual_uncertainty-Present WTP-based value of benefits (dollars $2022, 0%).csv
|   |   |       benefits_annual_uncertainty-Total cancer-related deaths avoided.csv
|   |   |       benefits_annual_uncertainty-Total non-fatal cancer cases avoided.csv
|   |   |       benefits_uncertainty-Annualized COI-based benefits (dollars $2022, 0%).csv
|   |   |       benefits_uncertainty-Annualized COI-based benefits (dollars $2022, 2%).csv
|   |   |       benefits_uncertainty-Annualized COI-based benefits (dollars $2022, 3%).csv
|   |   |       benefits_uncertainty-Annualized COI-based benefits (dollars $2022, 7%).csv
|   |   |       benefits_uncertainty-Annualized WTP-based benefits (dollars $2022, 0%).csv
|   |   |       benefits_uncertainty-Annualized WTP-based benefits (dollars $2022, 2%).csv
|   |   |       benefits_uncertainty-Annualized WTP-based benefits (dollars $2022, 3%).csv
|   |   |       benefits_uncertainty-Annualized WTP-based benefits (dollars $2022, 7%).csv
|   |   |       benefits_uncertainty-Total cancer-related deaths avoided.csv
|   |   |       benefits_uncertainty-Total non-fatal cancer cases avoided.csv
|   |   |       Last.zip
|   |   |       README.TXT
|   |   |
|   |   +---KidneyCancer
|   |   |       cumsum_p_cancer_survival_through_age.csv
|   |   |       distant_cancer.csv
|   |   |       gen_prob_mortality.csv
|   |   |       kidney_cancer_mortality_share.csv
|   |   |       localized_cancer.csv
|   |   |       prob_survival_distant_0_11.csv
|   |   |       prob_survival_localized_0_11.csv
|   |   |       prob_survival_regional_0_11.csv
|   |   |       prob_survival_unstaged_0_11.csv
|   |   |       p_cancer_survival_through_age.csv
|   |   |       regional_cancer.csv
|   |   |       unstaged_cancer.csv
|   |   |
|   |   +---LBW
|   |   |       20220519_LBW_InputData.csv
|   |   |       LBW_COI.csv
|   |   |
|   |   \---LiverCancer
|   |           cumsum_p_cancer_survival_through_age.csv
|   |           distant_cancer.csv
|   |           gen_prob_mortality.csv
|   |           liver_cancer_mortality_share.csv
|   |           localized_cancer.csv
|   |           prob_survival_distant_0_11.csv
|   |           prob_survival_localized_0_11.csv
|   |           prob_survival_regional_0_11.csv
|   |           prob_survival_unstaged_0_11.csv
|   |           p_cancer_survival_through_age.csv
|   |           regional_cancer.csv
|   |           unstaged_cancer.csv
|   |
|   +---CostWorkbook
|   |       PFAS_AdminCosts_v17_11-2-2023_new.xlsx
|   |       PFAS_AdminCosts_v17_DataNeeds.csv
```

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|   |       PFAS_AdminCosts_v17_Expressions.csv
|   |
|   \---WBSCostCurves
|           gac.csv
|           gac_hw.csv
|           ix.csv
|           ix_hw.csv
|           non.csv
|           non_hw.csv
|           PFAS Treatment Cost Curves Haz Waste September 2023.xlsx
|           PFAS Treatment Cost Curves September 2023.xlsx
|           ro.csv
|           ro_hw.csv
|           TechForecast.csv
|
+---output
+---work
```