**SafeWater LCR User Guide and Description of Source Code**

This memo describes how to install and use SafeWater LCR to 1) create a sample population of public water systems and 2) run the different cost models for the previous rule and final rule. The memo describes the pdf versions of the source code used for SafeWater LCR.

1. **Installing and Using SafeWater LCR**

The SafeWater LCR executable program and most of the associated data has been provided as a zip file titled *SafeWaterLCR\_Executables&DataFiles*. The zip file contains the SafeWater LCR executable (SafeWaterRun.exe), the configuration settings (config.ini), and a folder containing the following required data files:

* “Data”
  + High bound estimate access databases for LCR, LCRR, and proposed LCRI in a “High\_Database” folder
    - *LCR\_DataRequest\_high.accdb*
    - *LCR\_DataRequest\_high.xlsm*
    - *LCRR\_DataRequest\_high.accdb*
    - *LCRR\_DataRequest\_high.xlsm*
    - *LCRI\_DataRequest\_high.accdb*
    - *LCRI\_DataRequest\_high.xlsm*
  + Low bound estimate access databases for LCR, LCRR, and proposed LCRI in a “Low\_Database” folder
    - *LCR\_DataRequest\_low.accdb*
    - *LCR\_DataRequest\_low.xlsm*
    - *LCRR\_DataRequest\_low.accdb*
    - *LCRR\_DataRequest\_low.xlsm*
    - *LCRI\_DataRequest\_low.accdb*
    - *LCRI\_DataRequest\_low.xlsm*
  + the cost equations spreadsheets for the LCR, LCRR, and proposed LCRI
    - *LCR\_Baseline.xlsx (LCR\_Baseline\_v8.xlsx)*
    - *LCRR\_Baseline.xlsx (LCRR\_Baseline\_v17.xlsx)*
    - *LCRI\_Option.xlsx (Working\_Option\_v22.xlsx)*
  + SDWIS Inventory
    - *sdwis\_2023.xlsx*
  + Unique data variables for the school sampling program
    - *state\_school\_samp\_data.xlsx*
  + Unique data for systems service greater than 1M customers
    - *VLSEntryPointValues.xlsx*
    - *VLSSystemData.xlsx*

The steps to install SafeWater LCR are as follows:

1. Extract the files from the zip file titled *SafeWaterLCR\_Executables&DataFiles* and save in a folder named “SafeWaterLCR.”

The steps to use SafeWater LCR are as follows:

1. Create the sample: This creates the CSV files of the public water system variables that SafeWater LCR reads based on SDWIS variables and the database variables. A sample must be created for each previous rule and final rule option the user wishes to generate.
   1. Open the executable *LCRSample* in the “SafeWaterLCR” folder; this will pull up a prompt that allows the user to create the sample files.
   2. In the “Excel Input” field, load the *SDWIS\_CWS\_2016\_Q3 (sdwis\_2023.xlsx)* file saved in the “Data” folder.
   3. Select LCRR in the “Baseline” dropdown. This selection is currently ignored since the sample creation run will create all the necessary sample input files.
   4. Select LCRI in “Option Name” dropdown.
   5. Enter a value in “Sample Name” (5-6 characters).
   6. In the “LCR Baseline Costing Logic Workbook” field load LCR\_Baseline\_v8.xlsx.
   7. In the “LCR Baseline Variable Database” field, load the LCR\_DataRequest\_High.accdbfile to create the High LSLs sample files.
   8. In the “LCRR Baseline Costing Logic Workbook” field, load LCRR\_Baseline\_v17.xlsx.
   9. In the “LCRR Baseline Variable Database” field, load LCRR\_DataRequest\_High.accdb.
   10. In the “Option Costing Logic Workbook” field, load Working\_Option\_v22.xlsx.
   11. In the “Option Variable Database” field, load LCRI\_DataRequest\_High.accdb.
   12. In the “Minimum # of PWS per Size/SW category” to run a replicated sample, which is necessary to capture the variability contained in the database variables, enter the minimum number of replicated systems desired and uncheck the “Do not replicate” field (the results presented in the final rule economic analysis relied on 5,000 as the minimum number of systems per size and source water category).
   13. In the “Create Proxy PWS Records” field, check the box to create the proxy records necessary to examine the cost of the small system and non-transient noncommunity water system (NTNCWS) flexibility final rule requirement.
   14. In the “Small Proxy Cutoff Population” field, enter the appropriate desired population threshold below which the small system flexibilities will be applied. The appropriate value should be 10000.
   15. Ensure that the “Make LCR Baseline”, “Make LCRR Baseline” and “Make Option” fields are selected in order to generate a sample for the previous rule and the final rule.
   16. Select the “LSL Level” dropdown to High
   17. Ensure that the “PWS90Pct Bp1” and the “PWS90Pct Bp2” fields contain 10 and 15, respectively. These fields are currently not used.
   18. Ensure that the “Create Profile Sample” field is unchecked unless the user requires a sample of the sample output to be generated.
   19. Click “Make Sample” to create PWS samples for the previous and final rule.
       1. The generated PWS samples for the previous rule and the final rule option will be saved in the “Data” folder.

Note to create the Low LSLs sample files, choose the \*\_DataRequest\_Low.accdb files for the “LCR Baseline Variable Database”, “LCRR Baseline Variable Database” and “Option Variable Database” inputs.

1. Generate the cost and benefit results for the preferred option run:
   1. Open the executable *SafeWaterLCR* in the “SafeWaterLCR” folder; this will pull up a prompt that allows the user to tailor the SafeWater LCR run.
      1. If a pop-up appears requesting confirmation that the user wants to load a saved configuration, select “No.”
   2. In the “Run Name” field, give the run a name.
   3. For the “Baseline Name” dropdown, select LCRR. For the “Option Name” dropdown, select LCRI.
   4. Ensure that the “CodeSite logging” and “DELAWARE” fields are unchecked. These fields and the “Test Parser” button above are used for debugging. Ensure the “Use Compiled Cost” is checked.
   5. In the “Run Description” field, provide an optional description, which will be saved in the log file generated by that run of the SafeWaterLCR program.
   6. In the “CVDDR,” “IQVal,” “IQDR,” and “Child BL” fields enter the appropriate values for the desired benefit options, with 0 for normal.
   7. Ensure that the “No BL Averaging” field is unchecked, unless the user requires a run with averaged blood levels.
   8. For the “LCR Baseline Database” field, load LCR\_DataRequest\_High.accdb.
   9. Ensure “Use LCR Baseline” is checked.
   10. For the “Baseline SDWIS Sample File” field, load LCRRBaseline\_Rep5K\_high.csv.
   11. For the “Option SDWIS Sample File” field, load LCRIRep5K\_high.csv.
   12. For the “Baseline Costing Logic Workbook” field, load LCRR\_Baseline\_v17.xlsx.
   13. For the “Baseline Variable Database” field, load LCRR\_DataRequest\_High.accdb.
   14. For the “Option Costing Logic Workbook” field, load Working\_Option\_v22.xlsx.
   15. For the “Option Variable Database” field, load LCRI\_DataRequest\_High.accdb.
   16. For the “Population” field, select the desired public water system option (Both).
   17. In the “Discount” field, select the desired discount rate (i.e., 3% or 7%).
   18. In the “Small Proxy Cutoff Population” field, enter the appropriate desired population threshold below which the small system flexibilities will be applied (3300).
   19. For the “LCRI Option ALE” dropdown, select the appropriate value. (10)
   20. For the “WQP Monitoring Size Cutoff” dropdown, select nothing. I don’t think this is used.
   21. For the “LCRI LSL Option” dropdown, select the appropriate value. (1)
   22. For the “Temp POU Option” dropdown, select the appropriate value. (3)
   23. For the “LSLR Rate” dropdown, select the appropriate value. (0.10)
   24. Select Filters for LSL/Uknown appropriately.
   25. Select Low / High radio buttons to match LSLs option.
   26. For the “LSLR Deferral Cap” dropdown, select the appropriate value. (10000)
   27. In the “School option” field, select the desired school option. (school\_3a)
   28. Ensure that the “No Random,” “Output Lead Bins,” “DebugOut,” and “CCT Partial to Full” fields are unchecked. These are used for debugging.
   29. Ensure that the “Small System Flexibility” field is checked.
   30. In the “CCT Cost Equations” field, select the desired CCT cost equations. (High)
   31. Select either “Full Run” to generate the results for the incremental run, “Baseline Only” to generate the results for the previous rule, or “Option Only” to generate the results for the final rule.
   32. Ensure that the “Micro Output” and “Undiscounted Ben by Year” fields are unchecked. These are used for debugging.
   33. Ensure Run Adult Benefits is checked.
   34. Click “Run Model” to begin the SafeWater LCR run.
       1. The results will be saved in the “User” folder within the “SafeWaterLCR” parent folder.
       2. Multiple runs can occur at once. To do so, minimize the existing SafeWater LCR window and repeat the above steps.

**SafeWater LCR Source Code**

In addition to the SafeWater LCR executables and user guide, the EPA is providing pdfs of the Delphi code used for SafeWater LCR in the zip file titled *SafeWaterLCR\_sourcecode*, which is available in the LCRR docket (EPA-HQ-OW-2017\_0300) and on the EPA website at <https://www.epa.gov/ground-water-and-drinking-water/final-revisions-lead-and-copper-rule>.

In addition to Delphi 11.2 source code, the following third party components are required to compile the code:

• HtmlViewer-HtmlViewer-11.7

• CodeSite\_5\_Express\_RX101

Links to the third party vendors are provided at the end of this memo.

The file structure for the zip drive *SafeWaterLCR\_sourcecode* is as follows:

* The code used for the SafeWater LCR program is contained in the folders “Code,” “codeLCRR,” and “uiLCRR.”
* The code used for the SafeWater LCR sample creation is contained in the folders “LCRISample,” “Code,” and “codeLCRR.”

**Third Party Links**

HtmlViewer-HtmlViewer-11.7: https://github.com/BerndGabriel/HtmlViewer

CodeSite\_5\_Express\_RX101: https://www.embarcadero.com/products/delphi