

## **Quantitative Microbial Risk Assessment Tutorial**

### **Installation of Software for Watershed Modeling in Support of QMRA**

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## Summary

This tutorial provides instructions for accessing, retrieving, and downloading the following software to install on a host computer in support of Quantitative Microbial Risk Assessment (QMRA) modeling:

- SDMPProjectBuilder (which includes the Microbial Source Module as part of the installation)
- BASINS (including WinHSPF and WinHSPFit)
- SARA Timeseries Utility
- HSPF\_PEST\_flow and HSPF\_PEST\_microbe
- FORTRAN Library
- PEST

## Installation of Software for Watershed Modeling in Support of QMRA

### PURPOSE

Consolidate information for gaining access to software used in support of Quantitative Microbial Risk Assessment (QMRA) modeling.

### OBJECTIVE

Provide instructions for accessing, retrieving, and downloading software in support of Quantitative Microbial Risk Assessment modeling to install on a host computer.

### DEMONSTRATION

This tutorial provides instructions on how to access, retrieve, download, and install the following software:

- SDMPProjectBuilder (which includes the Microbial Source Module as part of the installation)
- BASINS (including WinHSPF and WinHSPFlt)
- SARA Timeseries Utility
- HSPF\_PEST\_flow and HSPF\_PEST\_microbe
- FORTRAN Library
- PEST

### SOFTWARE ACCESS, RETRIEVAL, DOWNLOAD, AND INSTALLATION

Users should execute installation instructions on only those software products that

- have not been previously installed or
- have been previously installed, but require an updated version.

The software should be removed using the Microsoft Windows Add/Remove feature, except “HSPF\_PEST\_flow.exe”, “Input\_flow.in”, “HSPF\_PEST\_microbe.exe”, and “Input\_microbe.in”. “HSPF\_PEST\_flow.exe”, “Input\_flow.in”, “HSPF\_PEST\_microbe.exe”, and “Input\_microbe.in” can be removed by simply deleting them. If software does NOT need to be installed again, skip to the appropriate point in the installation instructions.

## SDMProjectBuilder

The SDMProjectBuilder installation also includes installation of the Microbial Source Module (MSM), even though they are separate software products. Documentation on the MSM is by [Whelan et al., \(2015a\)](#). If users have already downloaded SDMProjectBuilder, skip this step; otherwise, proceed with installation.

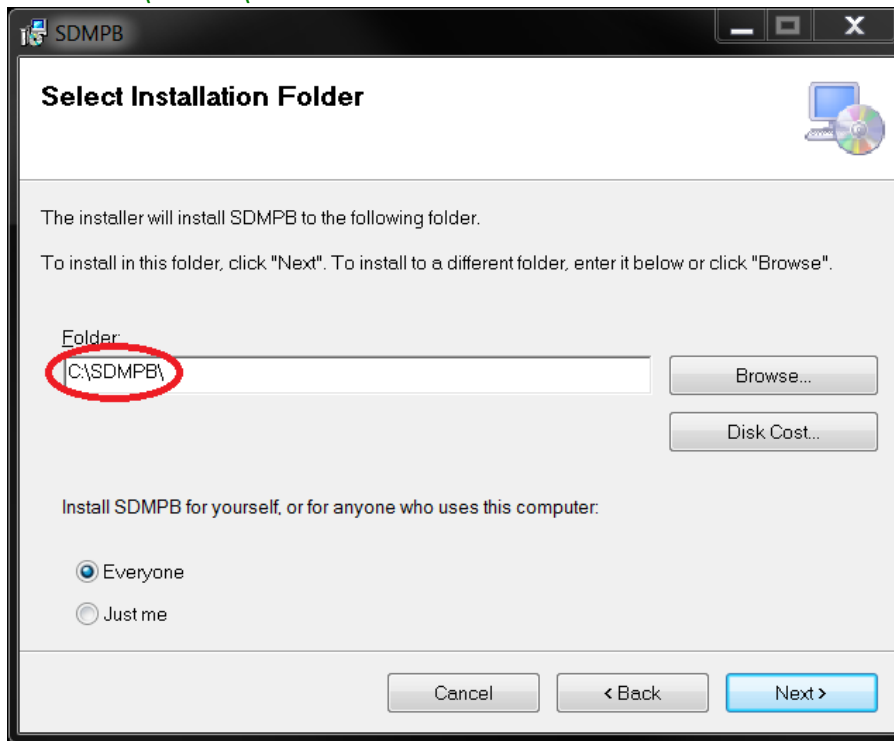
1. The SDMProjectBuilder software contained in the zip file and titled “SDMPB.zip” can be retrieved at:

[O:\Public\QMRA\Software for Download\SDMPB](#)

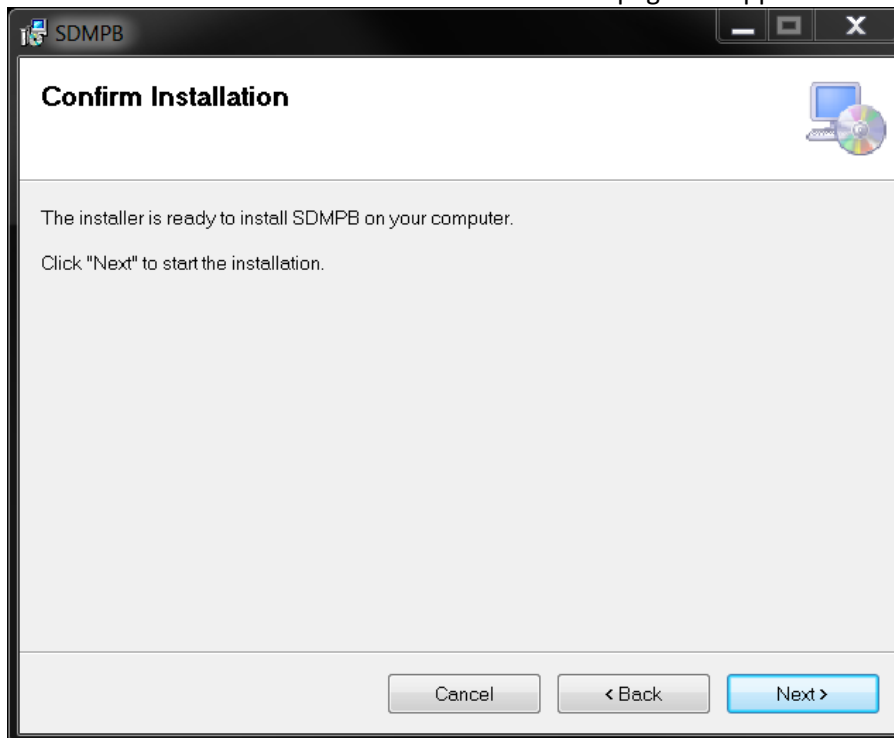
2. Download “SDMPB.zip”.  
The zip file contains Setup.exe and InstallSDMPB.msi. Setup.exe is the InstallShield installation executable and InstallSDMPB.msi is the SDMPB Windows installer package. Unzip the files to your computer. *It is recommended to locate the files in a folder where you have administrative privileges such as your user’s folder (C:\Users\<your name>).*
3. After downloading, run Setup.exe, and follow the installation instructions.
4. A Setup window will appear.



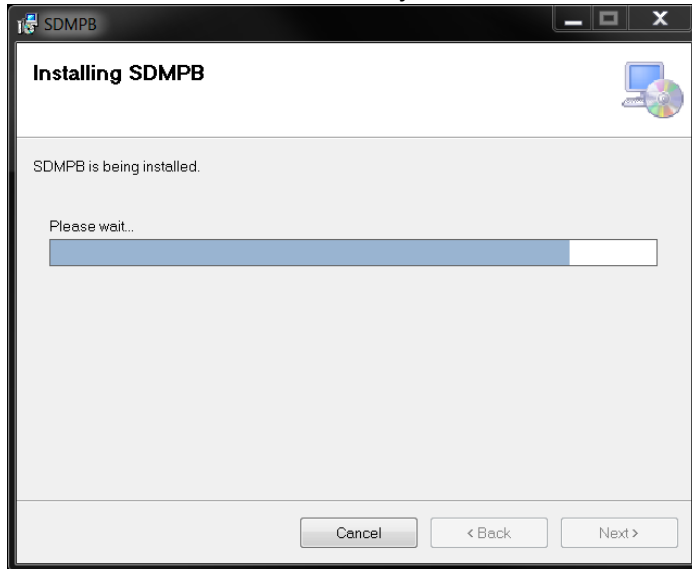
- Click "Next", and the "Select Installation Folder" window will appear. Select the folder path with administrative privileges where you will install SDMPProjectBuilder, such as the user's folder (C:\Users\<your name>). In the example below, SDMPProjectBuilder will be installed in "C:\SDMPB\".



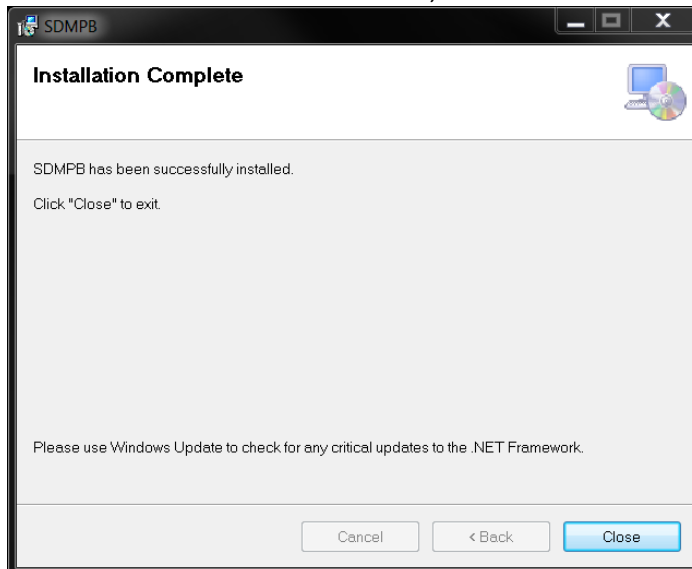
- Click "Next" and the "Confirm Installation" page will appear.



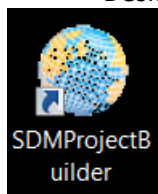
7. Click “Next” and SDMPProjectBuilder will be installed.



8. Once installation is finished, the “Installation Complete” page will appear.

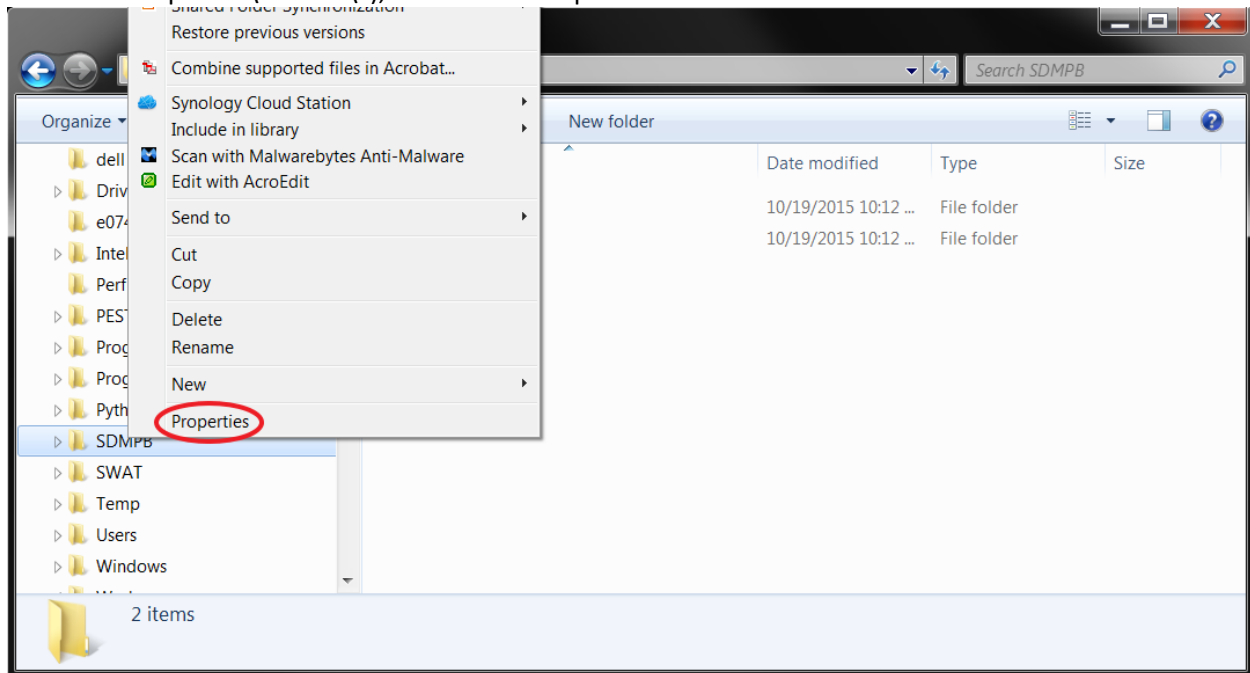


9. Click “Close”, and you will now find a shortcut icon for SDMPProjectBuilder on your computer’s Desktop.

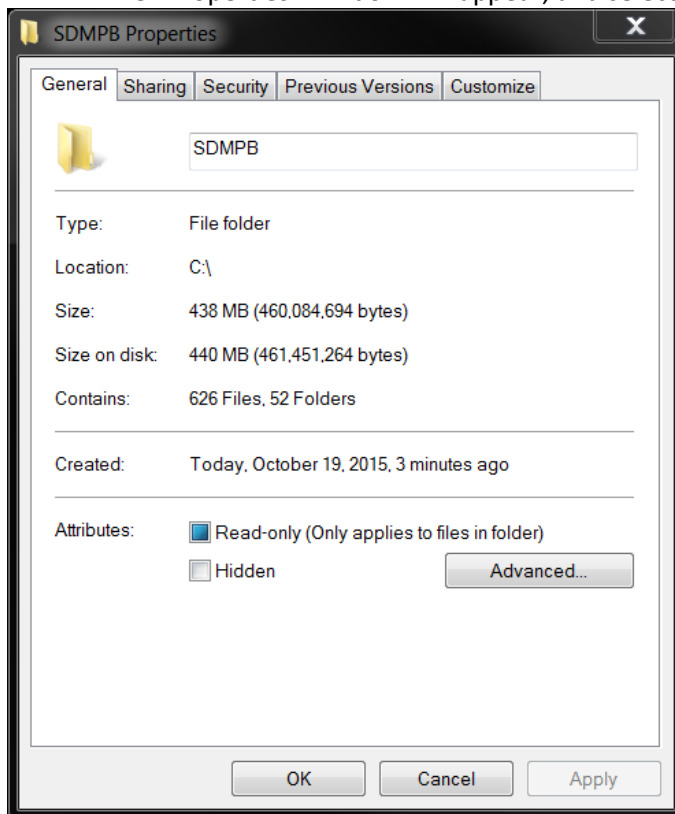


10. If the shortcut icon cannot be found on the Desktop screen, locate the executables on the hard drive (i.e., SDMPProjectBuilder.exe), typically in `\SDMPB\bin\`.

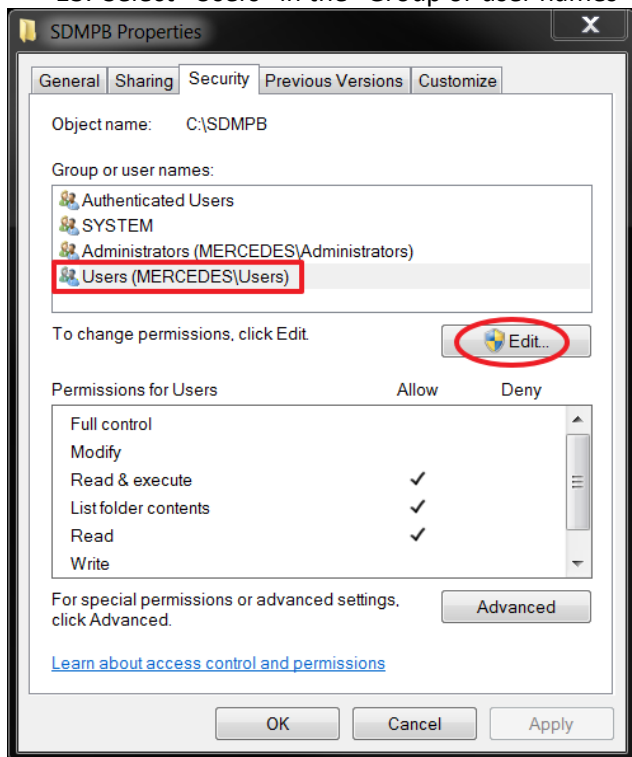
11. The user will need to have “Full control” on the folder where SDMPProjectBuilder is installed. To confirm user control, right-click on the folder where SDMPProjectBuilder was installed (in this example “C:\SDMPB\”), and select “Properties”.



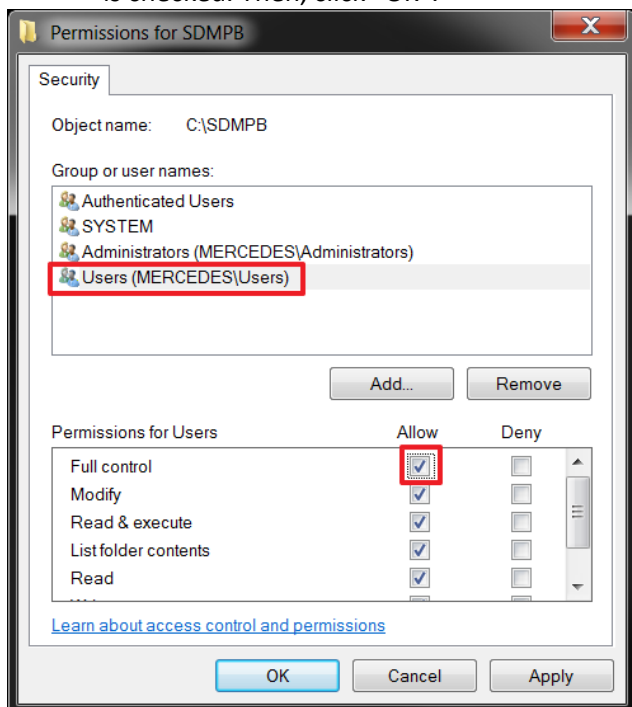
12. The “Properties” window will appear, and select the “Security” tab.



13. Select “Users” in the “Group or user names” section, and click “Edit”.



14. The “Permissions” for SDMPB folder will appear. In the window, select “Users” in “Group or user names” section, and ensure “Allow” for “Full control” under the “Permissions for Users” section is checked. Then, click “OK”.





## BASINS, WinHSPF3.0, and WinHSPFlt

If BASINS, WinHSPF3.0, and WinHSPFlt have already been downloaded to the computer, skip this step; otherwise, proceed with the installation.

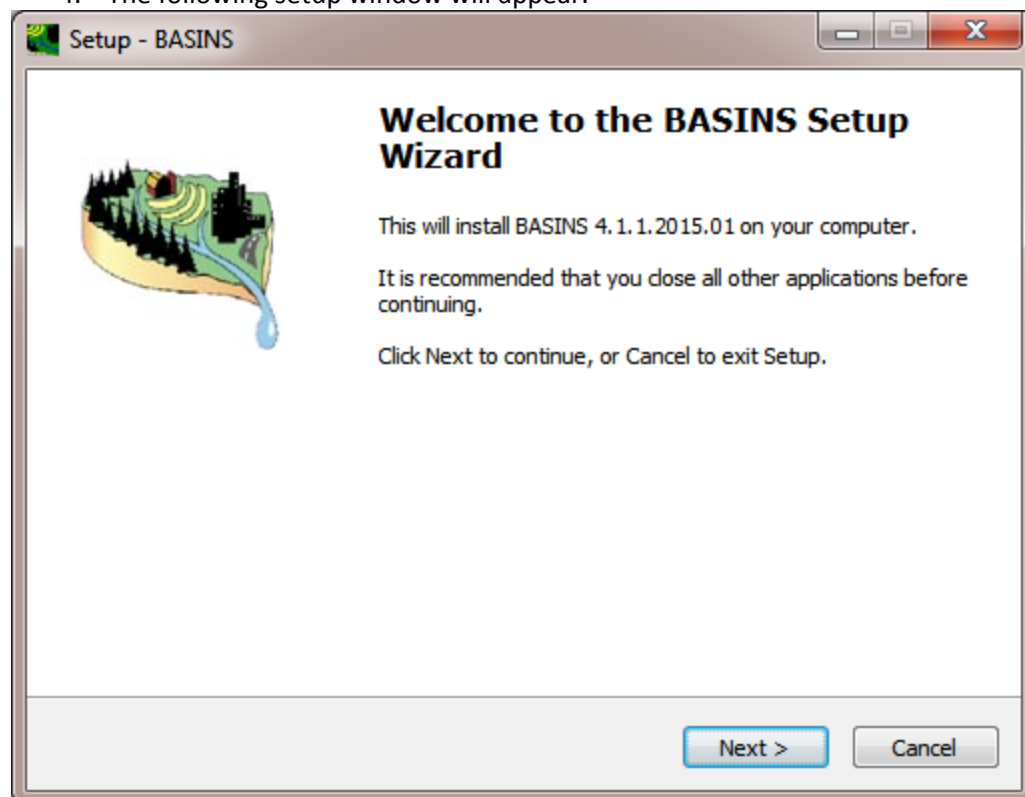
The BASINS installation package includes both forms of the HSPF model: WinHSPF3.0, the Windows version with a user-friendly, user interface and WinHSPFlt, the “lite” version associated with batch simulation for model calibration.

The version of BASINS being used with this workflow is one that has **NOT** been released through the BASINS download web site (i.e., <http://water.epa.gov/scitech/datait/models/basins/download.cfm>), as of yet. Hence, a beta version of the latest updates is available as an executable version, located at <O:\Public\QMRA\Software for Download\BASINS-WinHSPF-HSPFlt>.

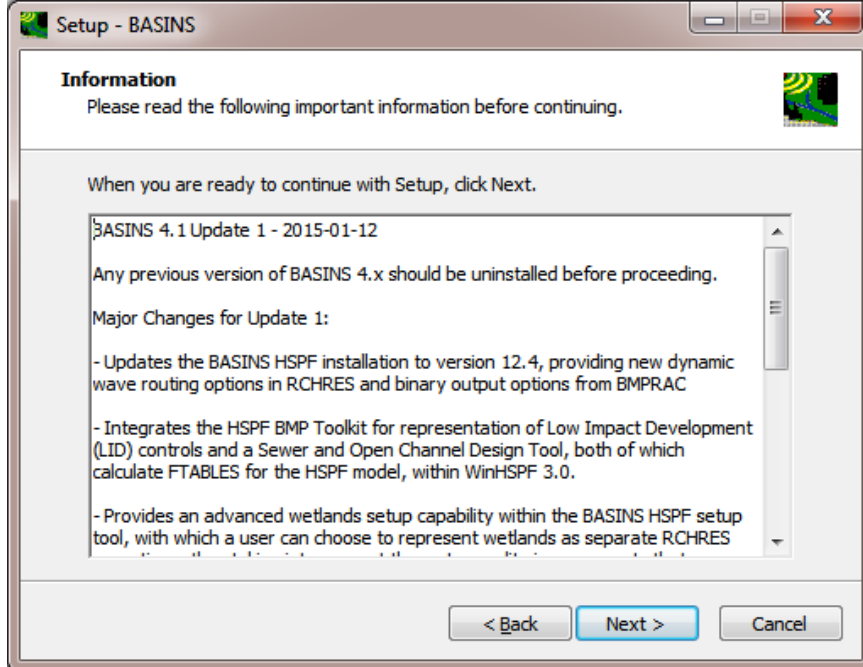
1. The BASINS, WinHSPF3.0, and WinHSPFlt software can be retrieved at:

<O:\Public\QMRA\Software for Download\BASINS-WinHSPF-HSPFlt>

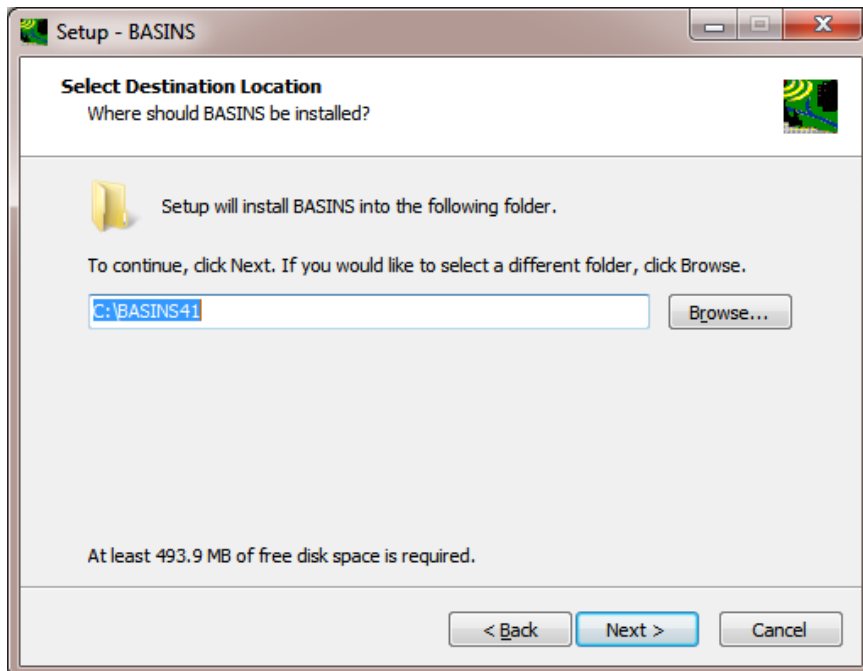
2. Download “BASINS4.1.Update1a.2015.01.exe” to your computer, locating the file in a folder where you have administrative privileges, such as your user’s folder (<C:\Users\<your name>>). BASINS4.1.Update1a.2015.01.exe is the InstallShield installation executable.
3. After downloading, run “BASINS4.1.Update1a.2015.01.exe”, and follow the installation instructions.
4. The following setup window will appear.



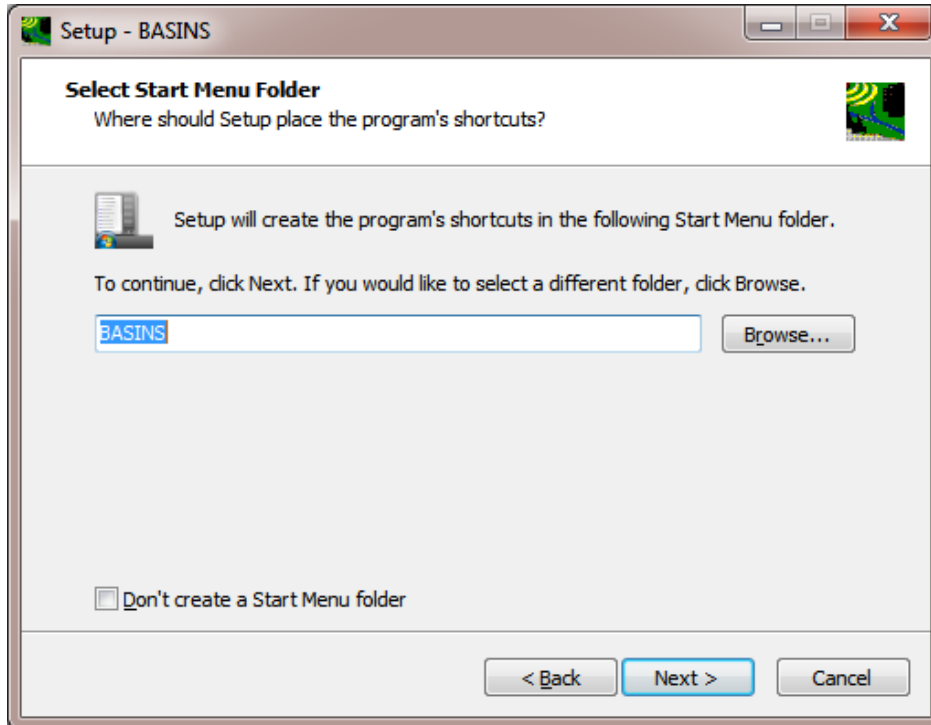
5. Click “Next” and the following information page will appear.



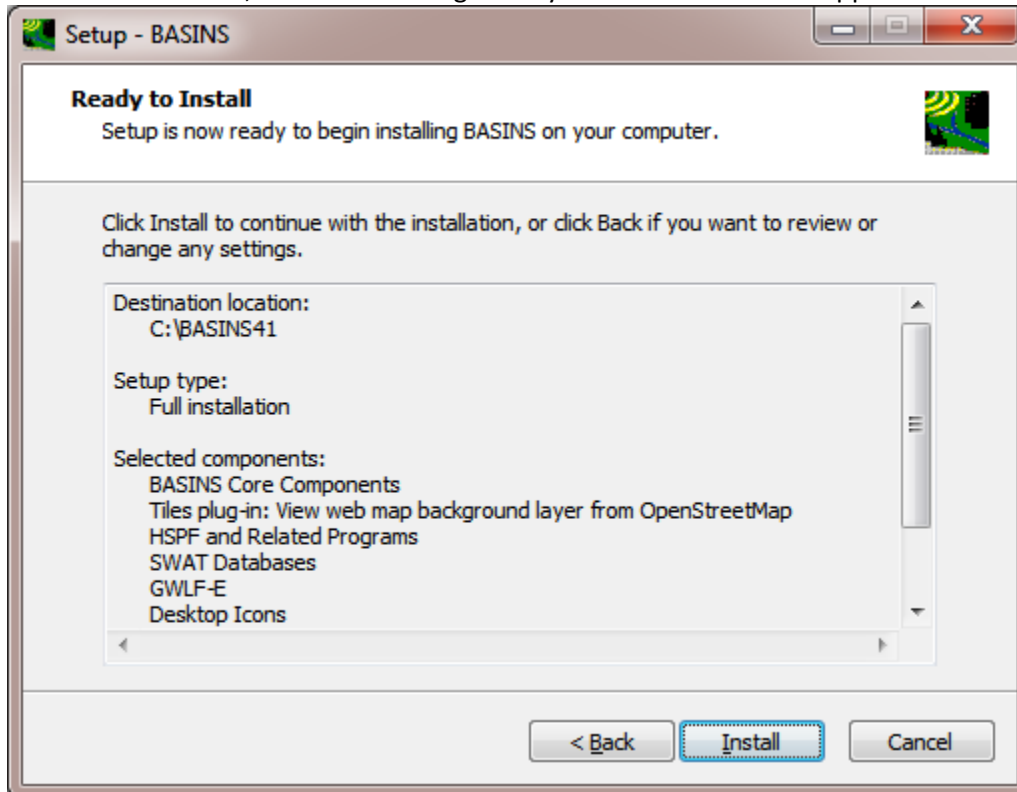
6. Click “Next”, and the “Select Destination Location” window will appear.
7. Choose the folder location where you would like BASINS to be installed. It is typically installed in in “C:\BASINS41”, as illustrated in the example below. If you only have administrative privileges in special locations on your computer (e.g., C:\Users\<your name>), you may want to install the software there.



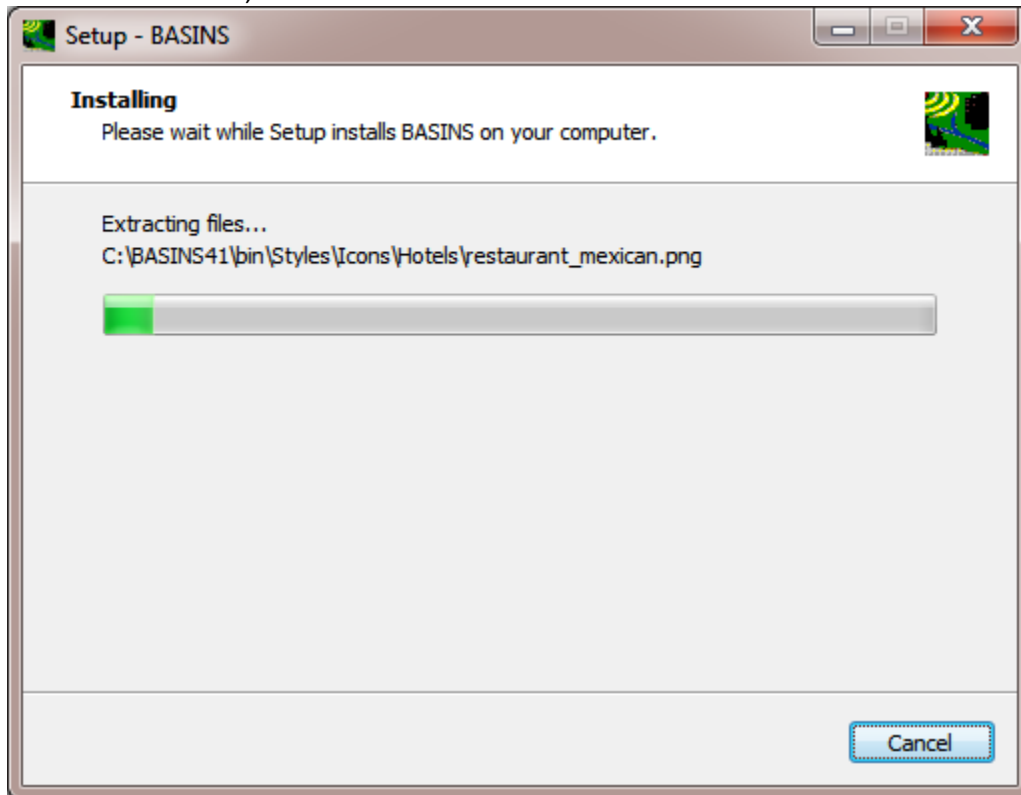
- Click "Next" and you can specify a Start menu folder where the program's shortcuts will be located.



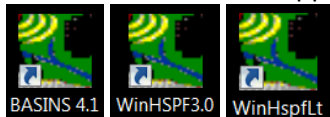
- Click "Next", and the following "Ready to Install" screen will appear:



10. Click “Next”, and then “Install”. BASINS will be installed with HSPF.



11. Once the BASINS installation is finished, shortcut icons for BASINS 4.1, WinHSPF 3.0, and WinHSPFIt will appear on your computer’s Desktop.



WinHSPFIt is a “lite” version of WinHSPF 3.0 and can runs HSPF on a Command window (e.g., batch runs). WinHSPF 3.0 can run HSPF only through a user interface. WinHSPFIt is frequently coupled with other software such as PEST, FRAMES, etc.

If the icons do not appear on the Desktop, locate the following executables – BASINS.exe, WinHSPF.exe, and WinHSPFIt.exe – on the hard drive, where they are typically found in \BASINS41\bin, \BASINS41\models\WinHSPF30\bin, and \BASINS41\models\HSPF\bin, respectively.

## SARA Timeseries Utility

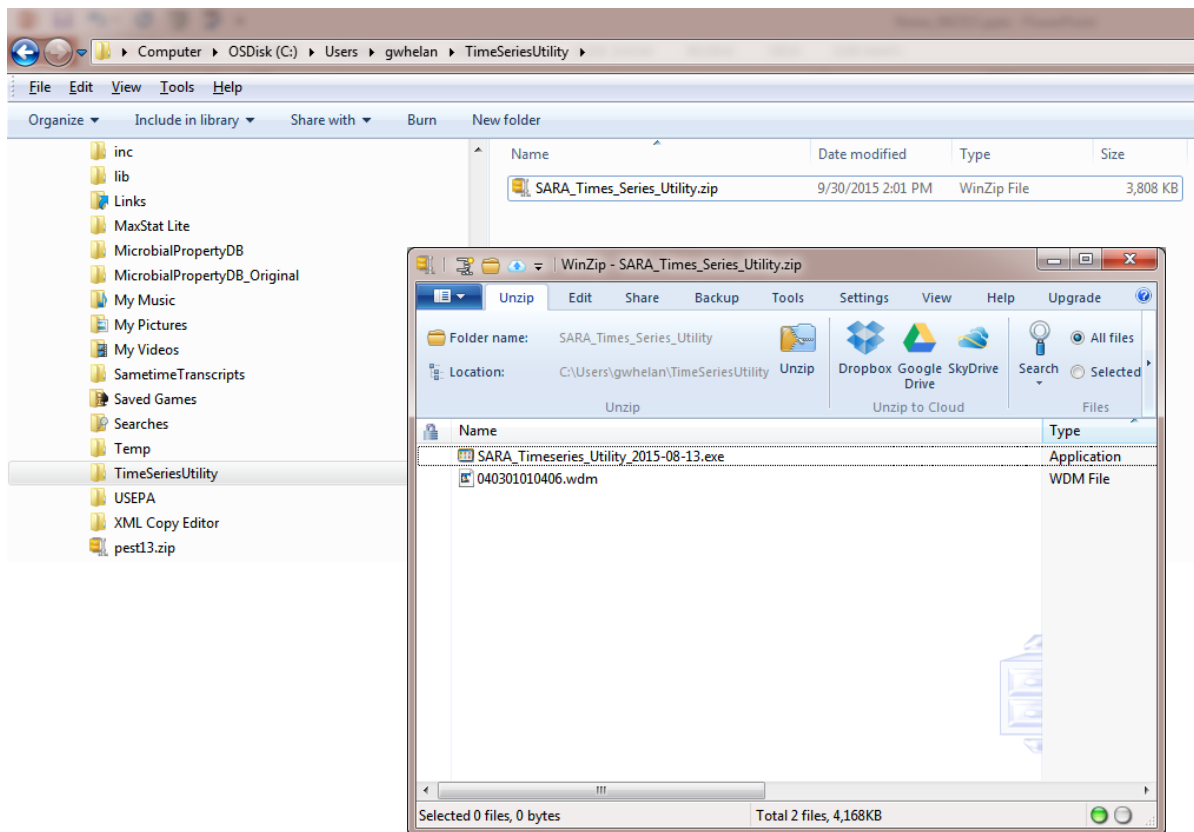
Prior to installation, un-install any prior version of SARA Timeseries Utility tool. If asked whether to remove shared components, answer Yes.

1. The SARA Timeseries Utility software product and an associated WDM file can be retrieved from:

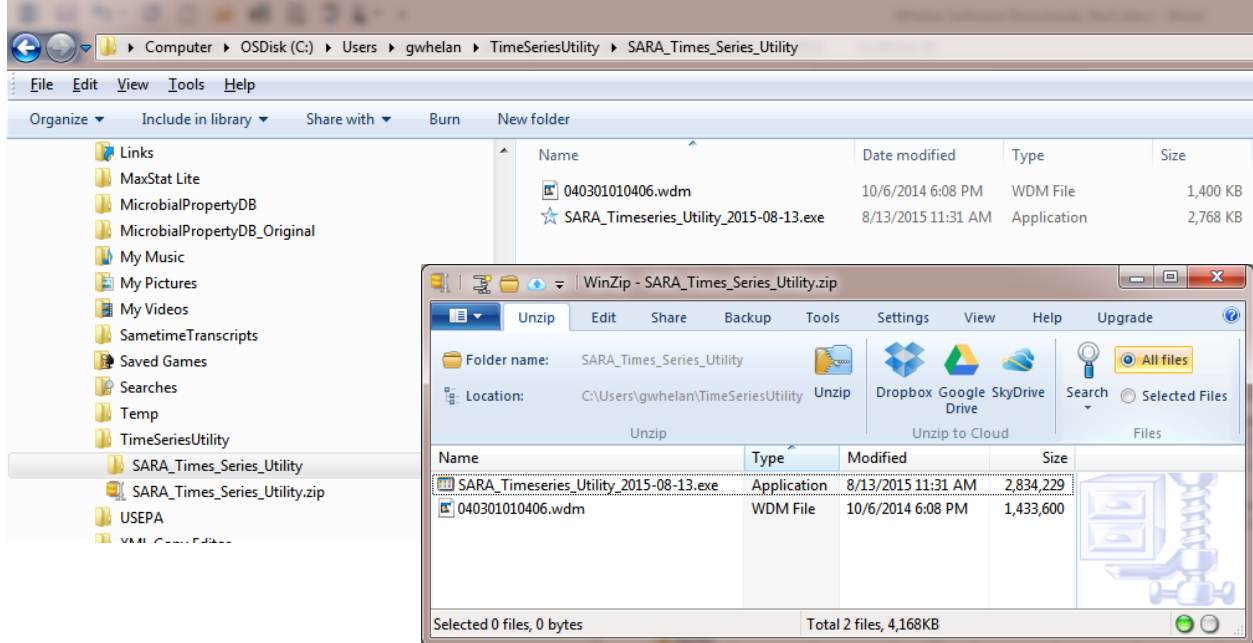
O:\Public\QMRA\Software for Download\SARA Timeseries Utility

2. Download the following zip file to the folder of your choice:
  - SARA\_Timeseries\_Utility.zip.
  - The zip file contains two files:
    - The executable saves text output as UTF-8, omits the Byte Order Marker at the beginning of the file, skips the title line in the file if the title is blank, and skips the date column if all date and time components are hidden.
    - The WDM file, 040301010406.wdm, is used in the tutorial, which demonstrates how a concentration time series is converted to a txt file (Whelan et al., 2015b). Typically, the wdm is located in the HSPF folder within the working folder (e.g., <working folder>\HSPF\).
  - In this example, it was saved to:

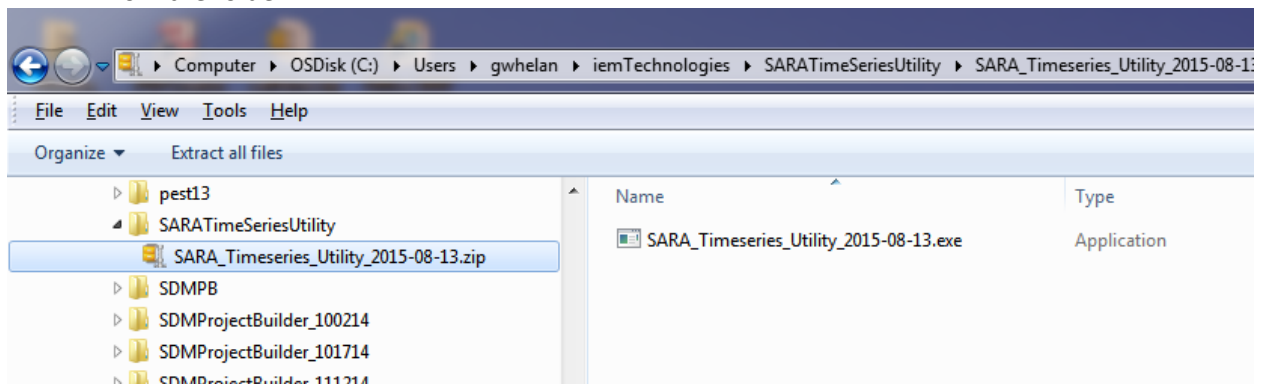
C:\Users\gwhelan\iemTechnologies\SARATimeSeriesUtility



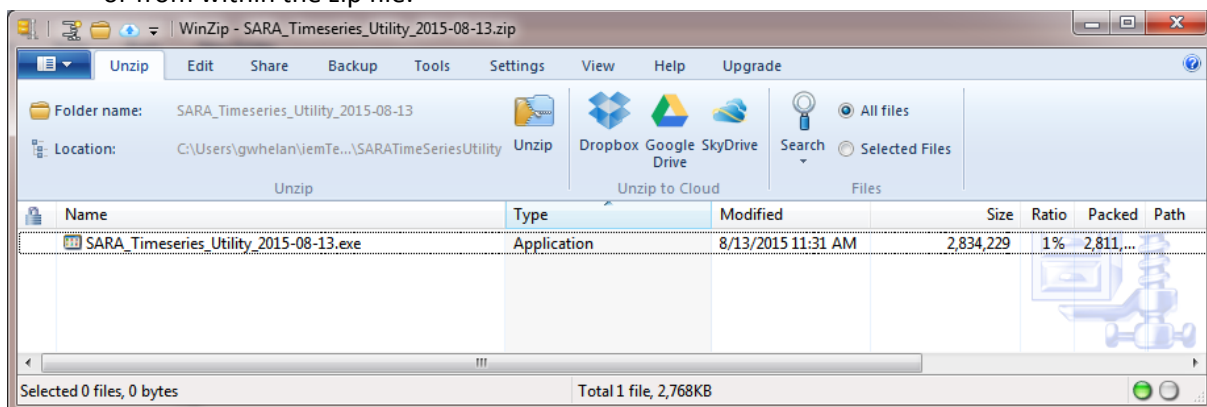
2. Open the SARA\_Timeseries\_Utility.zip file by double-clicking on it, and choose the Unzip button.



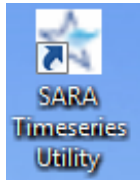
3. Run the installer titled SARA Timeseries Utility2015-08-13.exe by double-clicking on it, either from the folder



or from within the zip file.



4. Running the installer as an Administrator may be required, depending on security settings and the chosen installation location. Place it in the file location you created earlier. A Shortcut icon for SARA Timeseries Utility should now be on your computer screen:



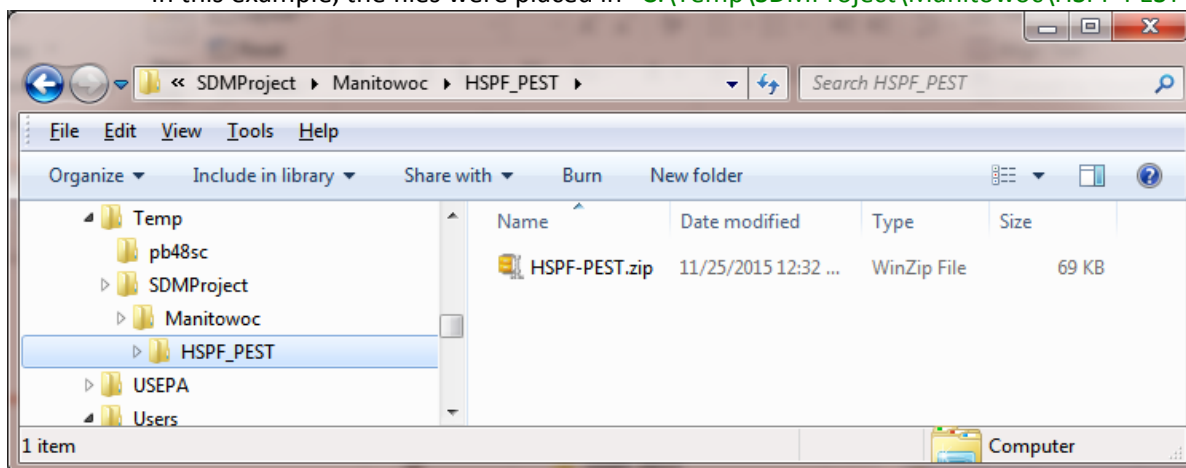
## HSPF-PEST

If the user has already downloaded the correct version of “HSPF\_PEST\_flow.exe”, “Input\_flow.in”, “HSPF\_PEST\_microbe.exe,” and “Input\_microbe.in” to the computer, skip this step; otherwise, proceed with the installation. “HSPF\_PEST\_flow.exe” and “HSPF\_microbe.exe” are executables compiled with FORTRAN that prepares the inverse model PEST input files for HSPF flow and microbial parameter calibrations. “Input\_flow.in” and “Input\_microbe.in” are default input files that contain folder locations of HSPFit [batch (or light) version of HSPF], observed data used in the calibration, and PEST. Users should place these files in a folder where they have administrative privileges.

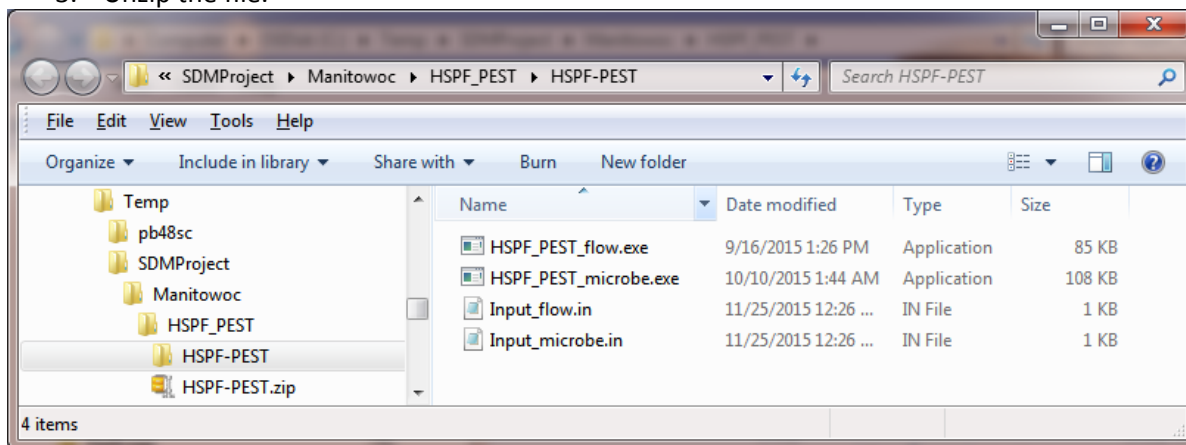
1. “HSPF\_PEST\_flow.exe”, “Input\_flow.in”, “HSPF\_PEST\_microbe.exe,” and “Input\_microbe.in” are located in a zip file, titled “HSPF-PEST.zip”, which can be retrieved from:

O:\Public\QMRA\Software for Download\HSPF-PEST

2. Download “HSPF-PEST.zip” to any folder where the user has administrative privileges.
  - “HSPF\_PEST\_flow.exe” and “Input\_flow.in” **MUST** be in the same folder.
  - “HSPF\_PEST\_microbe.exe,” and “Input\_microbe.in” **MUST** be in the same folder.
  - In this example, the files were placed in “C:\Temp\SDMProject\Manitowoc\HSPF-PEST”.



3. Unzip the file.





## FORTTRAN Library

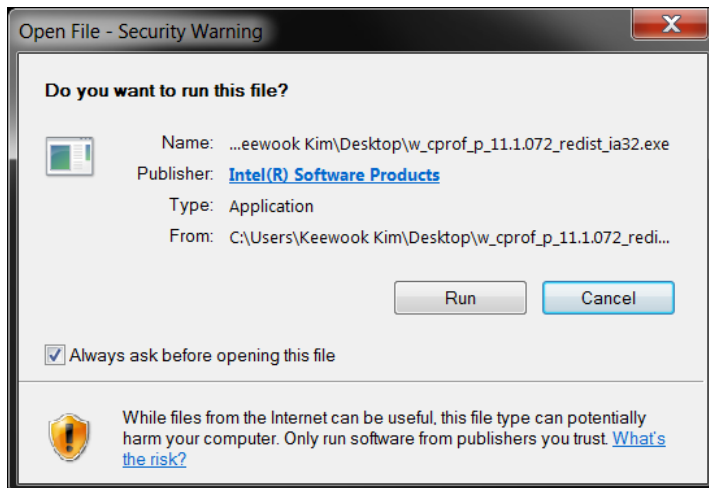
To properly execute PEST input files for HSPF parameter calibration which is an executable, the appropriate FORTRAN Library must be on the user's machine: "Intel® Visual Fortran Redistributables on IA-32". If this software already exists on the machine, skip this install; otherwise, proceed with this download to install.

1. Go to <https://software.intel.com/en-us/articles/redistributable-libraries-of-the-intel-c-and-fortran-compiler-for-windows>.
2. Under "Links to the redistribution packages", download "Intel Visual Fortran Compiler for Windows 11.1 update 9 Redistribution library package for IA32" by clicking on "Redistribution library package for IA32".

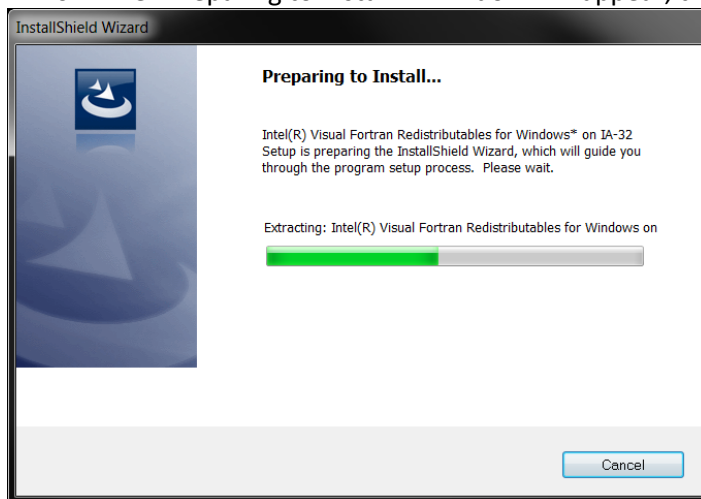
Intel C++ Compiler for Windows 11.1.060 update 5	Intel Visual Fortran Compiler for Windows 11.1.060 update 5
<ul style="list-style-type: none"><li>• Redistributable library package for IA32</li><li>• Redistributable library package for Intel 64</li><li>• Redistributable library package for IA-64</li></ul>	<ul style="list-style-type: none"><li>• Redistributable library package for IA32</li><li>• Redistributable library package for Intel 64</li><li>• Redistributable library package for IA-64</li></ul>
Intel C++ Compiler for Windows 11.1.065 update 6	Intel Visual Fortran Compiler for Windows 11.1.065 update 6
<ul style="list-style-type: none"><li>• Redistributable library package for IA32</li><li>• Redistributable library package for Intel 64</li><li>• Redistributable library package for IA-64</li></ul>	<ul style="list-style-type: none"><li>• Redistributable library package for IA32</li><li>• Redistributable library package for Intel 64</li><li>• Redistributable library package for IA-64</li></ul>
Intel C++ Compiler for Windows 11.1.067 update 7	Intel Visual Fortran Compiler for Windows 11.1.067 update 7
<ul style="list-style-type: none"><li>• Redistributable library package for IA32</li><li>• Redistributable library package for Intel 64</li><li>• Redistributable library package for IA-64</li></ul>	<ul style="list-style-type: none"><li>• Redistributable library package for IA32</li><li>• Redistributable library package for Intel 64</li><li>• Redistributable library package for IA-64</li></ul>
Intel C++ Compiler for Windows 11.1.070 update 8	Intel Visual Fortran Compiler for Windows 11.1.070 update 8
<ul style="list-style-type: none"><li>• Redistributable library package for IA32</li><li>• Redistributable library package for Intel 64</li><li>• Redistributable library package for IA-64</li></ul>	<ul style="list-style-type: none"><li>• Redistributable library package for IA32</li><li>• Redistributable library package for Intel 64</li><li>• Redistributable library package for IA-64</li></ul>
Intel C++ Compiler for Windows 11.1 update 9	Intel Visual Fortran Compiler for Windows 11.1 update 9
<ul style="list-style-type: none"><li>• Redistributable library package for IA32</li><li>• Redistributable library package for Intel 64</li><li>• Redistributable library package for IA-64</li></ul>	<ul style="list-style-type: none"><li>• Redistributable library package for IA32</li><li>• Redistributable library package for Intel 64</li><li>• Redistributable library package for IA-64</li></ul>



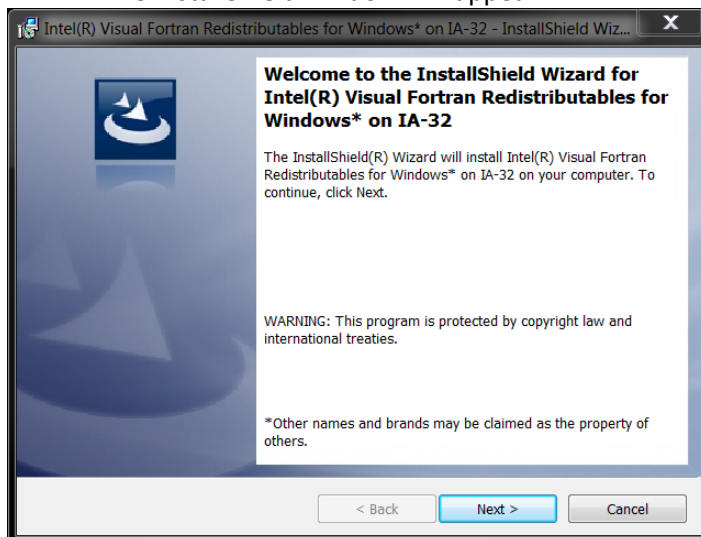
3. Select a folder where you have administrative privileges. In this example, the folder was `C:\Users\gwhelan\DLL download\Library Package IA32\`
4. Execute "w\_cprof\_p\_11.1.072\_redist\_ia32.exe".
5. An "Open File – Security Warning" window may appear. If so, click "Run", and a screen similar to the following may appear.



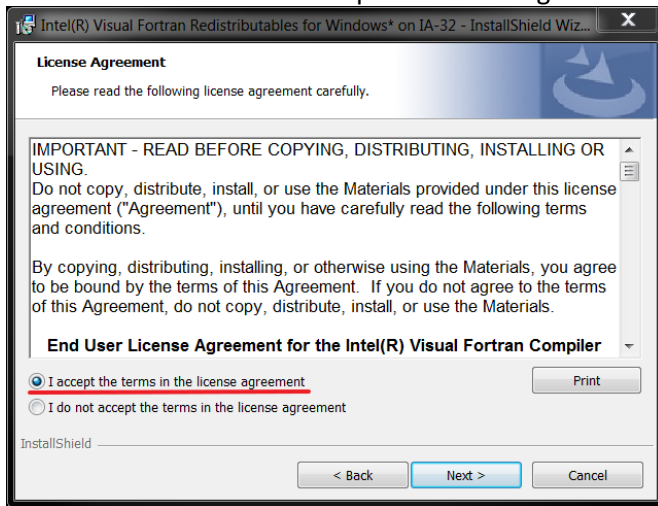
6. The "Preparing to Install..." window will appear, then disappear.



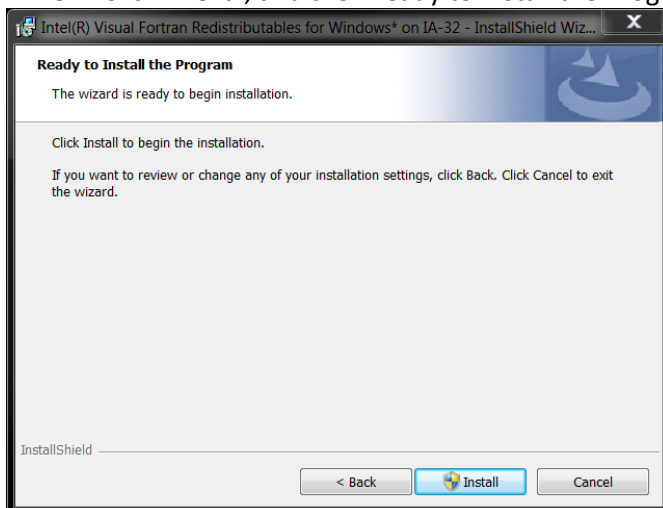
7. The InstallShield window will appear.



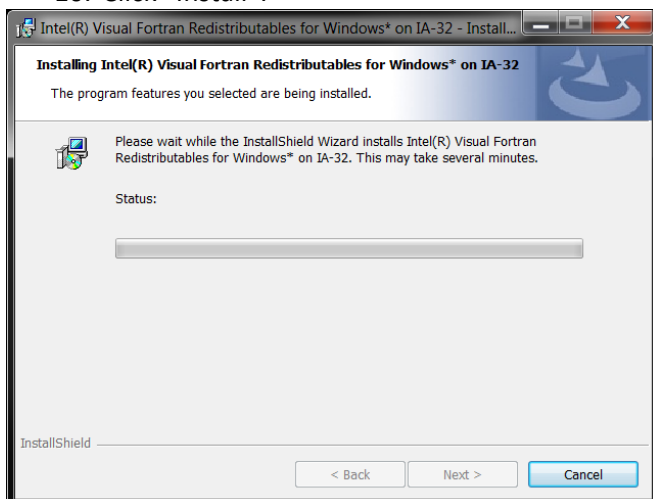
8. Click “Next” and accept the license agreement.



9. Click “Next”, and the “Ready to Install the Program” screen will appear.

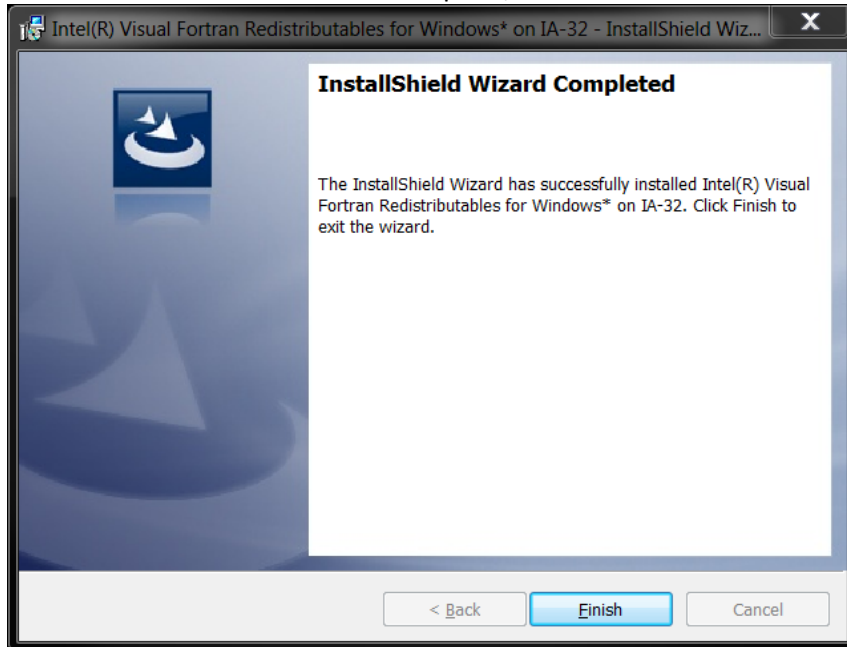


10. Click “Install”.



11. If “User Account Control” window appears during the installation, click “OK”.

12. When the installation is complete, click “Finish”.



13. The FORTRAN Library is now on your machine.

## PEST

If the user has already downloaded PEST to the computer, skip this step; otherwise, proceed with the installation.

1. Go to <http://www.pesthomepage.org/Downloads.php>, and under “PEST version 13.3”, download the zip file titled “pest13.zip” by clicking “PC version of PEST”.

### PEST version 13.3

Download the latest **PC version of PEST**.

Unzip the contents to a directory cited in the PATH environment variable. (This is very important as, when undertaking SVD-assisted parameter estimation, PEST runs the *parcalc.exe* and *picalc.exe* utility programs. It is essential that the operating system knows where to find these).

Make sure that directories holding older versions of PEST are no longer in the PATH string, as old versions of *parcalc.exe* and *picalc.exe* are not compatible with the new PEST.

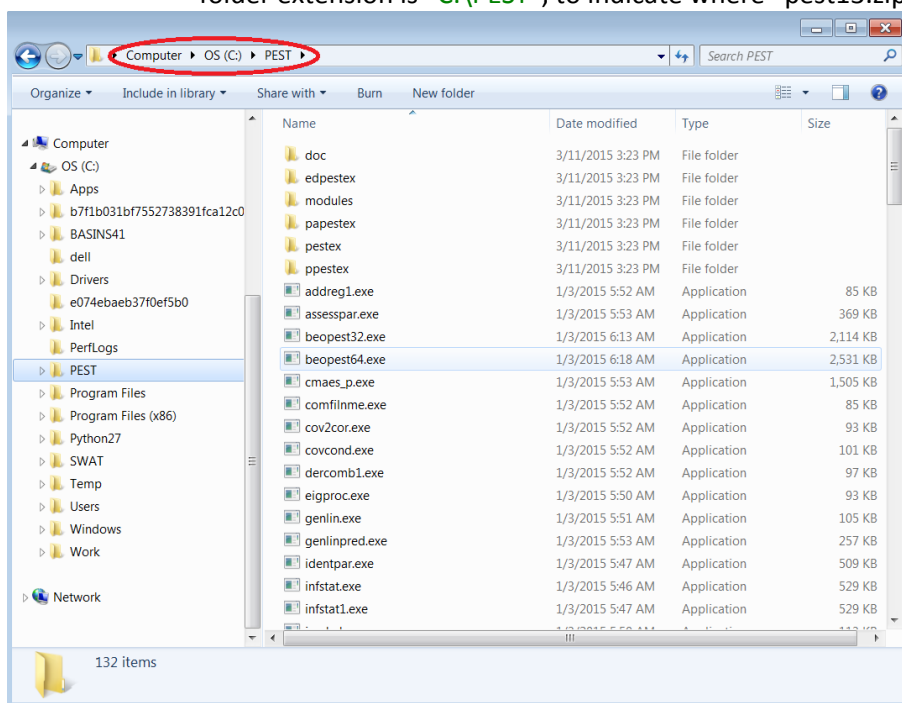
Download 64bit versions of certain programs of the PEST suite compiled using the Intel(R) 64 bit compiler.

Download **BEOPEST** for Windows.

Download the latest **Unix version of PEST**.

Unzip the contents to find a tar file with PEST source code, makefile and examples. Copy the tar file to a suitable directory on your machine, for example a directory named /pest. Then extract its contents using the “-xvf” switch. Follow the instructions provided in the documentation for Unix PEST (see the link in the “Documentation” section above).

2. Unzip “pest13.zip” to a folder where you have administrative privileges, such as your user’s folder (C:\Users\<your name>).
  - In the example below, a folder named “PEST” was created on the C: drive, so the full folder extension is “C:\PEST”, to indicate where “pest13.zip” was unzipped.



There is no required installation process for PEST. The user can copy “pest.exe” from the folder where “pest13.zip” was unzipped and place it in a folder where the user can run “pest.exe” in a Windows Command Window. The PEST manual (“postman.pdf”) can be found in the “doc” folder (see above figure). Running PEST separately will not be necessary, as an executable has been developed (HSPF\_PEST\_flow.exe) to automatically run PEST to calibrate flow parameters associated with an HSPF simulation.

## **DISCLAIMER**

This document has been reviewed in accordance with U.S. Environmental Protection Agency policy and approved for publication.

## **REFERENCES**

Whelan, G., R. Parmar, G.F. Laniak. 2015a. Microbial Source Module (MSM): Documenting the Science and Software for Discovery, Evaluation, and Integration. EPA/600/B-15/315. U.S. Environmental Protection Agency, Athens, GA.

Whelan, G., M. Gray, P. Duda, K. Wolfe, R. Parmar, M. Galvin, M. Molina. 2015b. Quantitative Microbial Risk Assessment Tutorial: Publishing a Microbial Density Time Series as a Txt File. EPA/600/B-15/274. U.S. Environmental Protection Agency, Athens, GA.