**CACIE Tool #18** – **Aqueous Source Averaging Tool**

**aq\_mod\_avg.f**

**Version** **1.0**

**QA**: **QA**

# Description and Purpose

The Aqueous Source Averaging tool averages aqueous source rates for user-specified waste sites and times. Source aqueous rates were high enough at a few waste sites to prevent model convergence for some of the CA vadose zone models. Typically, this occurred for only a single year to a few years. The Aqueous Source Averaging tool was designed to level out these high rates by averaging in adjacent years with lower rates.

Selected sites and times to average are supplied to the tool through an external control file. The format for this file is a single header line followed by up to 25 input lines that include waste site name, the first and last years to average, and the first and last years for the averaged output. Each waste site name in the external control file must match a waste site name in the input source file, which is output from the Source Generation tool (***ca-src2stomp.pl***). The averaged output time can be the same as the input years being averaged or can start earlier or extend to later years if aqueous source input for those additional years is zero. The code requires times be input as integer years. The code assumes that execution will occur in the /sources/ subdirectory of the model directory, where the source file and the control file are located.

The following is an example of the contents of a control file:

Site in\_start\_yr in\_end\_yr out\_start\_yr out\_end\_yr

216-Z-20 1983 1989 1983 1989

216-U-14-SOUTH 1991 1994 1991 1995

216-Z-20 1981 1982 1979 1982

241-U-112 1967 1967 1965 1969

Executing the Aqueous Source Averaging tool using this example control file would result in four averaging calculations:

* For waste site 216-Z-20, values for the years 1983 through 1989 would be averaged over seven years. Aqueous rates for those same years would be replaced by the calculated average rate.
* For waste site 216-U-14-SOUTH, values for the years 1991 through 1994 would be averaged over five years. Aqueous rates for 1991 through 1995 would be replaced by the calculated average rate, assuming the aqueous rate for 1995 was zero. If the aqueous rate for 1995 was not zero, execution would stop with an error printed to the screen.
* For waste site 216-Z-20, values for the years 1981 and 1982 would be averaged over four years. Aqueous rates for 1979 through 1982 would be replaced by the calculated average rate, assuming the aqueous rates for 1979 and 1980 were zero. If the aqueous rate for either 1979 or 1980 was not zero, execution would stop with an error printed to the screen.
* For waste site 241-U-112, the value for the year 1967 would be averaged over five years. Aqueous rates for 1965 through 1969 would be replaced by the calculated average rate, assuming the aqueous rates for 1965, 1966, 1968 and 1969 were zero. If the aqueous rate for any of those years was not zero, execution would stop with an error printed to the screen.

Results from the Aqueous Source Averaging tool should always be verified to ensure that waste site aqueous totals are the same (within reasonable roundoff), that the averaged values are included for the correct years, and that all other source rates are unchanged.

# Functional Requirements

The following are the functional requirements (FR) of the Aqueous Source Averaging Tool:

FR-1: Read the source file (output from ***ca-src2stomp.pl***) name and the control file name as command line inputs.

FR-2: Read the waste sites and years for averaging from the control file.

FR-3: For each input line in the control file, read through the source file until the waste site being modified is found.

FR-4: For each input line in the control file, read the aqueous rates from the source file for the years to be averaged and calculate the average for the output years.

FR-5: For each input line in the control file, write a temporary file with the calculated averages replacing the rates for the output years, with all other rates unchanged.

FR-6: After all source node averages defined in the control file are complete, write a final output source file. The name of this file will be the root name of the input source file (e.g., ***rads1-src.card***, ***rads2-src.card***, or ***buffer-aq-src.card***) with “\_srcavg\_last.card” appended (e.g., ***rads1-src\_srcavg\_last.card***, ***rads2-src\_srcavg\_last.card***, or ***buffer-aq-src\_srcavg\_last.card***).

# Software Requirements Specifications

FORTRAN, Linux Intel(R) Fortran Intel(R) 64 Compiler

Compiler Options: -o OutputFileName

Special Considerations: None

# Software Design Description

Flow:

The Aqueous Source Averaging Tool performs the following steps:

1. Declare variables – Character and array variables are declared.
2. Read command line arguments – Read the source file (output from ***ca-src2stomp.pl***) name and the control file name as command line inputs.
3. Read control file – Read the control file for waste sites/years to be averaged. The code assumes that the first line is a header line (not used by the code). The number of input lines is limited to 25.
4. Loop through the following steps for each averaging line from the control file:

a) If this is the first iteration of the loop, open the source file as input and a temporary output file; else open the temporary output file from the previous iteration of the loop as input and open another temporary file for output.  
b) Read through the input file until the waste site being modified is found.  
c) Read aqueous volumetric rates for each group of nodes defined for the target waste site.  
d) Average aqueous volumetric rates based on years to be averaged and output years for the average values.  
e) Write the revised source information to the temporary output file; all other waste sites/years are unchanged.

1. Copy the final temporary output file to a file with name ending in “srcavg\_last.card” (e.g., ***rads1-src\_srcavg\_last.card***, ***rads2-src\_srcavg\_last.card***, or ***buffer-aq-src\_srcavg\_last.card***).

Arguments:

SourceFile – Name of the source file (output from ***ca-src2stomp.pl***) that will be modified.

ControlFile – Name of the control file that lists waste sites/years to be averaged.

Input Files:

Source file – Source file (output from ***ca-src2stomp.pl***) that will be modified. The file itself is not directly modified, but a modified version of it is produced by the tool.

Control file – File that lists waste sites/years to be averaged. The first line is assumed to be a comment line. The input order for the source averaging lines is 1) waste site, 2) first year to include in the averaging, 3) last year to include in the averaging, 4) first year for averaged output, and 5) last year for averaged output. Format is fixed with field width of 25 for waste site name and 15 for year input (assumed to be integer format). See Section 1 for example of the control file formatting.

Output Files:

Temporary output files – The code writes to and the reads from temporary output files that are created for each input line from the control file. These can be deleted when the source averaging is complete.

Final output file – Copy of the last temporary output file. File name ends with “srcavg\_last.card” (e.g., ***rads1-src\_srcavg\_last.card***, ***rads2-src\_srcavg\_last.card***, or ***buffer-aq-src\_srcavg\_last.card*** ).

Tool Runner:

The following is the shell script configuration that will be passed as an argument to the Tool Runner for qualified runs:

{directory path to repository}\ tools\ca-srcavg\linux\aq\_mod\_avg\_linux-intel-64.exe SourceFile ControlFile

where:

SourceFile = name of source file to be modified  
ControlFile = name of control file with waste sites/years to be averaged

Code Review:

Sara Lindberg performed a code walkthrough on 04/01/2020. No impacts to other repository tools or library dependencies were identified for the Aqueous Source Averaging tool.

# Requirements Traceability Matrix

The requirements traceability matrix for the Aqueous Source Averaging tool is presented in Table 1.

| Table 1  Requirements Traceability Matrix | | |
| --- | --- | --- |
| **Functional Requirement ID** | **Acceptance Test ID** | **Test Case** |
| QA Level | CACIE-aq\_mod\_avg-IT-1 | Installation Test |
| FR-1 to FR-6 | CACIE-aq\_mod\_avg-AT-1 | Set up one or more control files with the following scenarios:   1. Averaging where input years averaged are the same as output years with average values. 2. Averaging where output years with averages continue beyond input years averaged. Following years must have zero aqueous rate. 3. Averaging where output years with averages start before input years averaged. Preceding years must have zero aqueous rate. 4. Averaging with two or more averaging periods for the same waste site.   Run the tool for these scenarios.  Sum the original source file aqueous rates by waste site and year  Sum the modified source file aqueous rates by waste site and year.  Compare the aqueous rates for the original and modified source files by waste site and year:   1. Totals by waste site should be equal (within a reasonable roundoff). 2. Totals by waste site and year should be unchanged for all waste sites that were not averaged. 3. Totals by waste site and year should be unchanged for all averaged waste sites for the years outside the averaging period. 4. Totals over the averaging period should be equal (within a reasonable roundoff) for waste sites with averaging. |

# Installation Test Plan and Acceptance Test Plan Cases

The installation test plan for Aqueous Source Averaging is presented in Table 2 and the acceptance test plan case for Aqueous Source Averaging is presented in Table 3.

| Table 2  **Aqueous Source Averaging Installation Test Plan** | | | |
| --- | --- | --- | --- |
| **Aqueous Source Averaging Installation Testing**  **CACIE-aq\_mod\_avg – IT-1** | | **Date:** | |
| **Tool Runner Log File Location for this test:**  **[PUT LINK TO THE DIRECTORY HERE]** | | **Test Performed By: [FIRST & LAST NAME]** | |
| **Testing Directory: [PROVIDE LINK TO TESTING DIRECTORY]** | | | |
| **Test Step** | **Test Instruction** | **Expected Result** | **Test Result  (Pass/Fail)** |
| Tools Code Repository Directory: | | | |
| Navigate to the testing directory | | | |
| 1 | Invoke Tool runner and test the installation of the tool as follows:  *./* *CACIE\_aq\_mod\_avg\_IT-1.sh* | | |
| 2 | Verify Tool Runner is invoked and executed. | Tool runner log file is generated (***aq\_mod\_avg\_sources\_install\_test.log***) |  |
| 3 | Verify tool is invoked and executed. | ***rads1-src\_srcavg\_last.card*** file and ***avg\_aq\_src\_install\_test\_screen.log*** file are generated |  |

| Table 3  **Aqueous Source Averaging Acceptance Test Plan Case 1** | | | |
| --- | --- | --- | --- |
| **Aqueous Source Averaging Acceptance Testing**  **CACIE-Aqueous Source Averaging – AT-1** | | **Date:** | |
| **Tool Runner Log File Location for this test:**  \CAVE\v4-2Test\mpondSVA\sources\_test | | **Test Performed By:** | |
| **Testing Directory:**\CAVE\v4-2Test\mpondSVA\sources\_test | | | |
| **Test Step** | **Test Instruction** | **Expected Result** | **Test Result  (Pass/Fail)** |
| Navigate to the Testing Directory | | | |
| 1 | Ensure the testing directory contains only the following files:   * ***rads1-src.card*** * ***run\_average\_aqueous\_sources.sh*** * ***src\_node\_aq\_avg-sources.dat*** | The expected files are present, and no other files are present. |  |
| 2 | Ensure ***run\_average\_aqueous\_sources.sh*** has the following text in lines 6-8:  model=mpondSVA  input1="rads1-src.card"  input2="src\_node\_aq\_avg-sources.dat" | The expected text is present. |  |
| 3 | Ensure ***src\_node\_aq\_avg-sources.dat*** indicates the following averaging scheme:   | Site | in\_start\_yr | in\_end\_yr | out\_start\_yr | out\_end\_yr | | --- | --- | --- | --- | --- | | 2101-M POND | 1953 | 1954 | 1950 | 1954 | | 2101-M POND | 1955 | 1956 | 1955 | 1956 | | 2101-M POND | 1959 | 1960 | 1959 | 1963 | | The expected text is present. |  |
| 4 | In a Linux terminal, navigate to the testing directory and type “*./run\_average\_aqueous\_sources.sh*” (without the quotation marks) to execute the shell script. | The script executes. |  |
| 5 | Confirm the following files were generated in the testing directory:   * **avg\_aq\_src\_mpondSVA\_screen.log** * **sources\_mpondSVA.log** * **rads1-src\_srcavg\_last.card** | The expected files are present. |  |
| 6 | Ensure the sources are averaged over the proper years in ***rads1-src\_srcavg\_last.card*** for 2101-M POND. Open ***rads1-src\_srcavg\_last.card*** in a text editor and examine lines 239 to 267.  Note that the years in the ***\*.card*** files are actually dates (e.g., 1955 = Jan 1, 1955): the years over which the aqueous volumetric rates are applied are listed sequentially in the ***\*.card*** files. Each year of data has two lines associated with it—one indicating the value at the start of the year, and one indicating the value at the end of the year (i.e., start of the next year). The rate for that year should be the same at the beginning and the end. See the simplified example below:  1954, year, **rate x**, m^3/year  1955, year, **rate x**, m^3/year  1955, year, **rate y**, m^3/year  1956, year, **rate y**, m^3/year  In this example, the first two lines define the rate for 1954. At the beginning of 1954, the rate is **rate x**. At the end of the year (demarcated as the start of the next year, 1955), the rate is **rate x**. The next two lines define the rate for 1955, which is **rate y**. These lines follow the same pattern. | | |
| 6.1 | Ensure the years of output in this section begin at 1950 and end at 1964 (that is, the last year of data is 1963, therefore the last line with a year listed is 1964). The output year is the first four numbers in the line, followed by a comma. | The output years begin at 1950 and end at 1964. |  |
| 6.2 | Ensure the averaged output time periods indicated in step 3 are internally consistent with their values, (e.g., all aqueous volumetric values from 1950 through 1954 should match each other, all values from 1955 through 1956 should match each other, etc.) | The averaged output time periods have internally consistent values. |  |
| 6.3 | Ensure the non-averaged years (1957 through 1958) have unchanged aqueous volumetric rates from ***rads1-src.card***. | The non-averaged years have not been averaged and have the same rates as found in ***rads1-src.card***. |  |
| 7 | Ensure the sum of the averaged values for 2101-M POND in ***rads1-src\_srcavg\_last.card*** are within rounding error of the sum of the original values for 2101-M POND in ***rads1-src.card***. | | |
| 7.1 | Sum the aqueous volumetric values for years 1950 through 1954 in ***rads1-src\_srcavg\_last.card*** and compare that sum to the sum of the values for years 1953 through 1954 in ***rads1-src.card***. | The values match within rounding error (error less than 0.01 per cent). |  |
| 7.2 | Sum the aqueous volumetric values for years 1955 through 1956 in ***rads1-src\_srcavg\_last.card*** and compare that sum to the sum of the values for years 1955 through 1956 in ***rads1-src.card***. | The values match within rounding error (error less than 0.01 per cent). |  |
| 7.3 | Sum the aqueous volumetric values for years 1959 through 1963 in ***rads1-src\_srcavg\_last.card*** and compare that sum to the sum of the values for years 1959 through 1960 in ***rads1-src.card***. | The values match within rounding error (error less than 0.01 per cent). |  |
| 7.4 | Sum the aqueous volumetric values for years 1950 through 1963 in ***rads1-src\_srcavg\_last.card*** and compare that sum to the sum of the values for years 1953 through 1960 in ***rads1-src.card***. | The values match within rounding error (error less than 0.01 per cent). |  |
| 8 | Ensure the value in line 238 indicating the number of lines of aqueous volumetric data from 2101-M POND was updated properly. | The final number in line 238 in ***rads1-src\_srcavg\_last.card*** is 29, and is followed by 29 lines of data, each beginning with a year. Line 268 begins with “Solute,”. |  |
| 9 | Ensure no edits were made to any other part of the file. | Besides extra spaces at the end of the commented-out text in the first four lines, and besides the discussed differences in the aqueous volumetric dataset for 2101-M Pond, the files ***rads1-src.card*** and ***rads1-src\_srcavg\_last.card*** are identical. |  |

# Acceptance Test Report

To complete the Acceptance Testing use Appendix A. The test case is described as follows:

* In a Linux terminal, navigate to the testing directory and type “*./run\_average\_aqueous\_sources.sh*” (without the quotation marks) to execute the shell script.
* Ensure the following files were generated:
  + ***avg\_aq\_src\_mpondSVA\_screen.log***
  + ***sources\_mpondSVA.log***
  + ***rads1-src\_srcavg\_last.card***
* Ensure the aqueous volumetric rate averaging as defined in the control file was executed properly, and that only the aqueous volumetric rates for the appropriate years for the appropriate sources were modified.

Details of this test, when it was conducted, by whom, and the Pass/Fail data are in Table A-1 in Appendix A.

# User Guide

Refer to Section 4 of this software management plan for a full description of the required inputs for the Aqueous Source Averaging tool. The structure for the control file is provided in Section 1. It is recommended that a shell script is used to execute the tool. The recommended structure of this shell script is shown below:

TOOL=<path/to/aq\_mod\_avg\_linux-intel-64.exe>

SOURCEFILE=<path/to/source/file>

CONTROLFILE=<path/to/control//file>

$TOOL $SOURCEFILE $CONTROLFILE

# Tool Versions

This section details changes incorporated into each version of the Aqueous Source Averaging tool.

* 1.0 – Tool was developed.

# Appendix A

**Completed Acceptance Test Cases**

**Testing Process Description**

To ensure that the sum of the averaged values of aqueous volumetric rates for 2101-M POND in ***rads1-src\_srcavg\_last.card*** are within rounding error of the sum of the original values for 2101-M POND in ***rads1-src.card,*** follow the steps below:

1. Open the ***rads1-src.card*** file in Excel (coma delimited). The Aqueous Volumetric flux rate information starts from row 238 and goes down to row 253.
2. In a cell F242, sum values from cells C239 and C241, to calculate the sum of aqueous volumetric rates for years 1953-1954.
3. In a cell F245, sum values from cells C243 and C245, to calculate the sum of aqueous volumetric rates for years 1955-1956.
4. In a cell F250, sum values from cells C251 and C253, to calculate the sum of aqueous volumetric rates for years 1959-1960.
5. In a cell F253, sum values from cells C239, C241, C243, C245, C247, C249, C251, and C253, to calculate the sum of aqueous volumetric rates for years 1953-1960.
6. Open the ***rads1-src\_srcavg\_last.card*** file in Excel (coma delimited). The Aqueous Volumetric flux rate information starts from row 238 and goes down to row 267.
7. In a cell F243, sum values from cells C239, C241, C243, C245, and C247 to calculate the sum of aqueous volumetric rates for years 1950-1954.
8. In a cell F251, sum values from cells C249 and C251, to calculate the sum of aqueous volumetric rates for years 1955-1956.
9. In a cell F257, sum values from cells C257, C259, C261, C263, and C265, to calculate the sum of aqueous volumetric rates for years 1959-1963.
10. In a cell F267, sum values from cells C239, C241, C243, C245, C247, C249, C251, C253, C255, C257, C259, C261, C263, C265, and C267, to calculate the sum of aqueous volumetric rates for years 1950-1963.
11. Compare the following values:

|  |  |  |
| --- | --- | --- |
| ***rads1-src.card*** |  | ***rads1-src\_srcavg\_last.card*** |
| Cell F242 | with | Cell F243 |
| Cell F245 | with | Cell F251 |
| Cell F250 | with | Cell F257 |
| Cell F253 | with | Cell F267 |

**Tool Runner Log**

###Executing AQ MOD AVG Tool###

###Executing Fingerprint Tool###

INFO--03/31/2020 02:27:51 PM--Starting CA-CIE Tool Runner. Logging to "./sources\_mpondSVA.log"

INFO--03/31/2020 02:27:51 PM--Code Version: 0b4478192d987adbff818006239cda369278912a v2.2: /opt/tools/pylib/runner/runner.py<--1bcfd6779e9cbdb82673405873a8e5e81514ae27

INFO--03/31/2020 02:27:51 PM--Code Version: 0b4478192d987adbff818006239cda369278912a v2.2: /opt/tools/pylib/fingerprint/fingerprint.py<--13a885dc11cc15aea74c14b09c0d8584ec6cfd08

INFO--03/31/2020 02:27:51 PM--QA Status: QUALIFIED : /opt/tools/pylib/runner/runner.py

INFO--03/31/2020 02:27:51 PM--QA Status: QUALIFIED : /opt/tools/pylib/fingerprint/fingerprint.py

INFO--03/31/2020 02:27:51 PM--Invoking Command:"python3.6" with Arguments:"/opt/tools/pylib/fingerprint/fingerprint.py /home/gtartakovsky/CAVE/v4-2Test/mpondSVA/sources\_test/rads1-src.card --output ./sources\_mpondSVA.log --outputmode a"

INFO--03/31/2020 02:27:51 PM--Username:gtartakovsky Computer:olive Platform:Linux 4.4.0-38-generic #57~14.04.1-Ubuntu SMP Tue Sep 6 17:20:43 UTC 2016

Fingerprint generated at 2020-03-31 14:27:51.404991

/home/gtartakovsky/CAVE/v4-2Test/mpondSVA/sources\_test/rads1-src.card 0e05fd7b986731dfba6dd26ba12252fb38e0b7c56c61e457f14da14d369d1c7a

###Finished Process###

###Executing Fingerprint Tool###

INFO--03/31/2020 02:27:51 PM--Starting CA-CIE Tool Runner. Logging to "./sources\_mpondSVA.log"

INFO--03/31/2020 02:27:51 PM--Code Version: 0b4478192d987adbff818006239cda369278912a v2.2: /opt/tools/pylib/runner/runner.py<--1bcfd6779e9cbdb82673405873a8e5e81514ae27

INFO--03/31/2020 02:27:51 PM--Code Version: 0b4478192d987adbff818006239cda369278912a v2.2: /opt/tools/pylib/fingerprint/fingerprint.py<--13a885dc11cc15aea74c14b09c0d8584ec6cfd08

INFO--03/31/2020 02:27:51 PM--QA Status: QUALIFIED : /opt/tools/pylib/runner/runner.py

INFO--03/31/2020 02:27:51 PM--QA Status: QUALIFIED : /opt/tools/pylib/fingerprint/fingerprint.py

INFO--03/31/2020 02:27:51 PM--Invoking Command:"python3.6" with Arguments:"/opt/tools/pylib/fingerprint/fingerprint.py /home/gtartakovsky/CAVE/v4-2Test/mpondSVA/sources\_test/src\_node\_aq\_avg-sources.dat --output ./sources\_mpondSVA.log --outputmode a"

INFO--03/31/2020 02:27:51 PM--Username:gtartakovsky Computer:olive Platform:Linux 4.4.0-38-generic #57~14.04.1-Ubuntu SMP Tue Sep 6 17:20:43 UTC 2016

Fingerprint generated at 2020-03-31 14:27:51.658572

/home/gtartakovsky/CAVE/v4-2Test/mpondSVA/sources\_test/src\_node\_aq\_avg-sources.dat b6a448ade4de56b0ea9180076d3392b41b2b8506a381f2f2200a41fd8a8e4d39

###Finished Process###

###Executing aq\_mod\_avg Tool for: /home/gtartakovsky/CAVE/v4-2Test/mpondSVA/sources\_test/rads1-src.card ###

INFO--03/31/2020 02:27:51 PM--Starting CA-CIE Tool Runner. Logging to "./sources\_mpondSVA.log"

INFO--03/31/2020 02:27:51 PM--Code Version: 0b4478192d987adbff818006239cda369278912a v2.2: /opt/tools/pylib/runner/runner.py<--1bcfd6779e9cbdb82673405873a8e5e81514ae27

INFO--03/31/2020 02:27:51 PM--Code Version: dfcdf4f10bb810bfe419f5fd4cf870c4696ee195 Local repo SHA-1 has does not correspond to a remote repo release version: ../../../CA-CIE-Tools-TestRepos/repo\_aq\_mod\_avg.f/tools/ca-srcavg/linux/aq\_mod\_avg\_linux-intel-64.exe<--fb2c2f62a1bbafaa2f335f34d1babb104c94c9a8

INFO--03/31/2020 02:27:51 PM--QA Status: QUALIFIED : /opt/tools/pylib/runner/runner.py

INFO--03/31/2020 02:27:51 PM--QA Status: TEST : ../../../CA-CIE-Tools-TestRepos/repo\_aq\_mod\_avg.f/tools/ca-srcavg/linux/aq\_mod\_avg\_linux-intel-64.exe

INFO--03/31/2020 02:27:51 PM--Invoking Command:"../../../CA-CIE-Tools-TestRepos/repo\_aq\_mod\_avg.f/tools/ca-srcavg/linux/aq\_mod\_avg\_linux-intel-64.exe" with Arguments:"/home/gtartakovsky/CAVE/v4-2Test/mpondSVA/sources\_test/rads1-src.card /home/gtartakovsky/CAVE/v4-2Test/mpondSVA/sources\_test/src\_node\_aq\_avg-sources.dat "

INFO--03/31/2020 02:27:51 PM--Username:gtartakovsky Computer:olive Platform:Linux 4.4.0-38-generic #57~14.04.1-Ubuntu SMP Tue Sep 6 17:20:43 UTC 2016

###Finished Process###

###Executing Fingerprint Tool###

INFO--03/31/2020 02:27:52 PM--Starting CA-CIE Tool Runner. Logging to "./sources\_mpondSVA.log"

INFO--03/31/2020 02:27:52 PM--Code Version: 0b4478192d987adbff818006239cda369278912a v2.2: /opt/tools/pylib/runner/runner.py<--1bcfd6779e9cbdb82673405873a8e5e81514ae27

INFO--03/31/2020 02:27:52 PM--Code Version: 0b4478192d987adbff818006239cda369278912a v2.2: /opt/tools/pylib/fingerprint/fingerprint.py<--13a885dc11cc15aea74c14b09c0d8584ec6cfd08

INFO--03/31/2020 02:27:52 PM--QA Status: QUALIFIED : /opt/tools/pylib/runner/runner.py

INFO--03/31/2020 02:27:52 PM--QA Status: QUALIFIED : /opt/tools/pylib/fingerprint/fingerprint.py

INFO--03/31/2020 02:27:52 PM--Invoking Command:"python3.6" with Arguments:"/opt/tools/pylib/fingerprint/fingerprint.py /home/gtartakovsky/CAVE/v4-2Test/mpondSVA/sources\_test/rads1-src\_srcavg\_last.card --output ./sources\_mpondSVA.log --outputmode a"

INFO--03/31/2020 02:27:52 PM--Username:gtartakovsky Computer:olive Platform:Linux 4.4.0-38-generic #57~14.04.1-Ubuntu SMP Tue Sep 6 17:20:43 UTC 2016

Fingerprint generated at 2020-03-31 14:27:52.262805

/home/gtartakovsky/CAVE/v4-2Test/mpondSVA/sources\_test/rads1-src\_srcavg\_last.card 422d29f3ffb286551f0d964a175ff51cad1ab5aab0981eaffd2bdd72dd718cab

###Finished Process###

| Table A-1 **Aqueous Source Averaging Acceptance Test Plan Case 1** | | | |
| --- | --- | --- | --- |
| **Aqueous Source Averaging Acceptance Testing**  **CACIE-Aqueous Source Averaging – AT-1** | | **Date: 03/31/2020** | |
| **Tool Runner Log File Location for this test:**  \CAVE\v4-2Test\mpondSVA\sources\_test | | **Test Performed By: Guzel Tartakovsky** | |
| **Testing Directory:** \CAVE\v4-2Test\mpondSVA\sources\_test | | | |
| **Test Step** | **Test Instruction** | **Expected Result** | **Test Result  (Pass/Fail)** |
| Navigate to the Testing Directory | | | |
| 1 | Ensure the testing directory contains only the following files:   * ***rads1-src.card*** * ***run\_average\_aqueous\_sources.sh*** * ***src\_node\_aq\_avg-sources.dat*** | The expected files are present, and no other files are present. | Pass |
| 2 | Ensure ***run\_average\_aqueous\_sources.sh*** has the following text in lines 6-8:  model=mpondSVA  input1="rads1-src.card"  input2="src\_node\_aq\_avg-sources.dat" | The expected text is present. | Pass |
| 3 | Ensure ***src\_node\_aq\_avg-sources.dat*** indicates the following averaging scheme:   | Site | in\_start\_yr | in\_end\_yr | out\_start\_yr | out\_end\_yr | | --- | --- | --- | --- | --- | | 2101-M POND | 1953 | 1954 | 1950 | 1954 | | 2101-M POND | 1955 | 1956 | 1955 | 1956 | | 2101-M POND | 1959 | 1960 | 1959 | 1963 | | The expected text is present. | Pass |
| 4 | In a Linux terminal, navigate to the testing directory and type “*./run\_average\_aqueous\_sources.sh*” (without the quotation marks) to execute the shell script. | The script executes. | Pass |
| 5 | Confirm the following files were generated in the testing directory:   * **avg\_aq\_src\_mpondSVA\_screen.log** * **sources\_mpondSVA.log** * **rads1-src\_srcavg\_last.card** | The expected files are present. | Pass |
| 6 | Ensure the sources are averaged over the proper years in ***rads1-src\_srcavg\_last.card*** for 2101-M POND. Open ***rads1-src\_srcavg\_last.card*** in a text editor and examine lines 239 to 267.  Note that the years in the ***\*.card*** files are actually dates (e.g., 1955 = Jan 1, 1955): the years over which the aqueous volumetric rates are applied are listed sequentially in the ***\*.card*** files. Each year of data has two lines associated with it—one indicating the value at the start of the year, and one indicating the value at the end of the year (i.e., start of the next year). The rate for that year should be the same at the beginning and the end. See the simplified example below:  1954, year, **rate x**, m^3/year  1955, year, **rate x**, m^3/year  1955, year, **rate y**, m^3/year  1956, year, **rate y**, m^3/year  In this example, the first two lines define the rate for 1954. At the beginning of 1954, the rate is **rate x**. At the end of the year (demarcated as the start of the next year, 1955), the rate is **rate x**. The next two lines define the rate for 1955, which is **rate y**. These lines follow the same pattern. | | |
| 6.1 | Ensure the years of output in this section begin at 1950 and end at 1964 (that is, the last year of data is 1963, therefore the last line with a year listed is 1964). The output year is the first four numbers in the line, followed by a comma. | The output years begin at 1950 and end at 1964. | Pass |
| 6.2 | Ensure the averaged output time periods indicated in step 3 are internally consistent with their values, (e.g., all aqueous volumetric values from 1950 through 1954 should match each other, all values from 1955 through 1956 should match each other, etc.) | The averaged output time periods have internally consistent values. | Pass |
| 6.3 | Ensure the non-averaged years (1957 through 1958) have unchanged aqueous volumetric rates from ***rads1-src.card***. | The non-averaged years have not been averaged and have the same rates as found in ***rads1-src.card***. | Pass |
| 7 | Ensure the sum of the averaged values for 2101-M POND in ***rads1-src\_srcavg\_last.card*** are within rounding error of the sum of the original values for 2101-M POND in ***rads1-src.card***.  The sums of the aqueous volumetric rates for various year ranges were calculated using Excel by following the steps outlined in the Testing Process Description section. The Excel file with calculations “aq-vol-sums-comparison.xlsx” is located in the testing directory. | | |
| 7.1 | Sum the aqueous volumetric values for years 1950 through 1954 in ***rads1-src\_srcavg\_last.card*** and compare that sum to the sum of the values for years 1953 through 1954 in ***rads1-src.card***.  Compare the value in a cell F242 of ‘rads1-src’ worksheet to the value in a cell F243 of ‘rads1-src\_srcavg\_last’ worksheet | The values match within rounding error (error less than 0.01 per cent). | Pass |
| 7.2 | Sum the aqueous volumetric values for years 1955 through 1956 in ***rads1-src\_srcavg\_last.card*** and compare that sum to the sum of the values for years 1955 through 1956 in ***rads1-src.card***.  Compare the value in a cell F245 of ‘rads1-src’ worksheet to the value in a cell F251 of ‘rads1-src\_srcavg\_last’ worksheet | The values match within rounding error (error less than 0.01 per cent). | Pass |
| 7.3 | Sum the aqueous volumetric values for years 1959 through 1963 in ***rads1-src\_srcavg\_last.card*** and compare that sum to the sum of the values for years 1959 through 1960 in ***rads1-src.card***.  Compare the value in a cell F250 of ‘rads1-src’ worksheet to the value in a cell F257 of ‘rads1-src\_srcavg\_last’ worksheet. | Thevalues match within rounding error (error less than 0.01 per cent). | Pass |
| 7.4 | Sum the aqueous volumetric values for years 1950 through 1963 in ***rads1-src\_srcavg\_last.card*** and compare that sum to the sum of the values for years 1953 through 1960 in ***rads1-src.card***.  Compare the value in a cell F253 of ‘rads1-src’ worksheet to the value in a cell F267 of ‘rads1-src\_srcavg\_last’ worksheet | The values match within rounding error (error less than 0.01 per cent). | Pass |
| 8 | Ensure the value in line 238 indicating the number of lines of aqueous volumetric data from 2101-M POND was updated properly. | The final number in line 238 in ***rads1-src\_srcavg\_last.card*** is 29, and is followed by 29 lines of data, each beginning with a year. Line 268 begins with “Solute,”. | Pass |
| 9 | Ensure no edits were made to any other part of the file. | Besides extra spaces at the end of the commented-out text in the first four lines, and besides the discussed differences in the aqueous volumetric dataset for 2101-M Pond, the files ***rads1-src.card*** and ***rads1-src\_srcavg\_last.card*** are identical. | Pass |

# Appendix B

**Completed Installation Test**

**Tool Runner Log**

###Executing aq\_mod\_avg Tool for: /home/slindberg/CAVE/CA-CIE-Tools-TestEnv/CA-CIE-Tools\_v2.X\_install\_tests/aq\_mod\_avg/rads1-src.card ###

INFO--04/03/2020 03:40:10 PM--Starting CA-CIE Tool Runner. Logging to "./aq\_mod\_avg\_sources\_install\_test.log"

INFO--04/03/2020 03:40:10 PM--Code Version: a32f44c54431c9dfd3639b08c648e89b8b78b3e7 v2.4: /opt/tools/pylib/runner/runner.py<--1bcfd6779e9cbdb82673405873a8e5e81514ae27

INFO--04/03/2020 03:40:10 PM--Code Version: a32f44c54431c9dfd3639b08c648e89b8b78b3e7 v2.4: /opt/tools/tools/ca-srcavg/linux/aq\_mod\_avg\_linux-intel-64.exe<--fb2c2f62a1bbafaa2f335f34d1babb104c94c9a8

INFO--04/03/2020 03:40:10 PM--QA Status: QUALIFIED : /opt/tools/pylib/runner/runner.py

INFO--04/03/2020 03:40:10 PM--QA Status: QUALIFIED : /opt/tools/tools/ca-srcavg/linux/aq\_mod\_avg\_linux-intel-64.exe

INFO--04/03/2020 03:40:10 PM--Invoking Command:"/opt/tools/tools/ca-srcavg/linux/aq\_mod\_avg\_linux-intel-64.exe" with Arguments:"/home/slindberg/CAVE/CA-CIE-Tools-TestEnv/CA-CIE-Tools\_v2.X\_install\_tests/aq\_mod\_avg/rads1-src.card /home/slindberg/CAVE/CA-CIE-Tools-TestEnv/CA-CIE-Tools\_v2.X\_install\_tests/aq\_mod\_avg/src\_node\_aq\_avg-sources.dat "

INFO--04/03/2020 03:40:10 PM--Username:slindberg Computer:olive Platform:Linux 4.4.0-38-generic #57~14.04.1-Ubuntu SMP Tue Sep 6 17:20:43 UTC 2016

###Finished Process###

| Table B-1  **Aqueous Source Averaging Installation Test Plan** | | | |
| --- | --- | --- | --- |
| **Aqueous Source Averaging Installation Testing**  **CACIE-aq\_mod\_avg – IT-1** | | **Date: 04/03/2020** | |
| **Tool Runner Log File Location for this test:**  **\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\CA-CIE-Tools\_v2.X\_install\_tests\aq\_mod\_avg** | | **Test Performed By: Sara Lindberg** | |
| **Testing Directory: \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\CA-CIE-Tools\_v2.X\_install\_tests\aq\_mod\_avg** | | | |
| **Test Step** | **Test Instruction** | **Expected Result** | **Test Result  (Pass/Fail)** |
| Tools Code Repository Directory: | | | |
| Navigate to the testing directory | | | |
| 1 | Invoke Tool runner and test the installation of the tool as follows:  *./* *CACIE\_aq\_mod\_avg\_IT-1.sh* | | |
| 2 | Verify Tool Runner is invoked and executed. | Tool runner log file is generated (***aq\_mod\_avg\_sources\_install\_test.log***) | Pass |
| 3 | Verify tool is invoked and executed. | ***rads1-src\_srcavg\_last.card*** file and ***avg\_aq\_src\_install\_test\_screen.log*** file are generated | Pass |

**Appendix C**

**QA Checklist**

