

FILE FORMAT FOR NORMALIZING RADIOLOGICAL CONCENTRATION, EXPOSURE RATE, AND DOSE RATE DATA FOR THE EFFECTS OF RADIOACTIVE DECAY AND WEATHERING PROCESSES

(SNL17-CM-635, Normalizing Radiological Data for Analysis and Integration into Models)

Terry Kraus, Sandia National Laboratories

Prepared by
Sandia National Laboratories
Albuquerque, New Mexico 87185

Sandia National Laboratories is a multi-mission laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Approved for public release; further dissemination unlimited.



Sandia National Laboratories

Issued by Sandia National Laboratories, operated for the United States Department of Energy by Sandia Corporation.

NOTICE: This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government, nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors, or their employees, make any warranty, express or implied, or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represent that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government, any agency thereof, or any of their contractors or subcontractors. The views and opinions expressed herein do not necessarily state or reflect those of the United States Government, any agency thereof, or any of their contractors.

Printed in the United States of America. This report has been reproduced directly from the best available copy.

Available to DOE and DOE contractors from

U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831

Telephone: (865) 576-8401
Facsimile: (865) 576-5728
E-Mail: reports@osti.gov
Online ordering: <http://www.osti.gov/scitech>

Available to the public from

U.S. Department of Commerce
National Technical Information Service
5301 Shawnee Rd
Alexandria, VA 22312

Telephone: (800) 553-6847
Facsimile: (703) 605-6900
E-Mail: orders@ntis.gov
Online order: <http://www.ntis.gov/search>



Report No. SAND2017-xxxx
Unlimited Release
April 2017

**FILE FORMAT FOR NORMALIZING RADIOLOGICAL CONCENTRATION, EXPOSURE RATE, AND DOSE RATE
DATA FOR THE EFFECTS OF RADIOACTIVE DECAY AND WEATHERING PROCESSES
(SNL17-CM-635, Normalizing Radiological Data for Analysis and Integration into Models)**

Terry Kraus
Department 6631, Nuclear Incident Response Program
Sandia National Laboratories
P.O. Box 5800
Albuquerque, New Mexico 87185-MS0791

Abstract

This report specifies the electronic file format that was agreed upon to be used as the file format for normalized radiological data produced by the software tool developed under this TI project. The NA-84 Technology Integration (TI) Program project (*SNL17-CM-635, Normalizing Radiological Data for Analysis and Integration into Models*) investigators held a teleconference on December 7, 2017 to discuss the tasks to be completed under the TI program project. During this teleconference, the TI project investigators determined that the comma-separated values (CSV) file format is the most suitable file format for the normalized radiological data that will be outputted from the normalizing tool developed under this TI project. The CSV file format was selected because it provides the requisite flexibility to manage different types of radiological data (i.e., activity concentration, exposure rate, dose rate) from other sources [e.g., Radiological Assessment and Monitoring System (RAMS), Aerial Measuring System (AMS), Monitoring and Sampling]. The CSV file format also is suitable for the file format of the normalized radiological data because this normalized data can then be ingested by other software [e.g., RAMS, Visual Sampling Plan (VSP)] used by the NA-84's Consequence Management Program.

**FILE FORMAT FOR NORMALIZING RADIOLOGICAL CONCENTRATION, EXPOSURE RATE, AND DOSE RATE DATA FOR THE EFFECTS OF RADIOACTIVE DECAY AND WEATHERING PROCESSES
(SNL17-CM-635, Normalizing Radiological Data for Analysis and Integration into Models)**

PURPOSE:

To document the decision to use comma-separated values (CSV) electronic file format for normalized radiological data. The notes from the December 7, 2017 teleconference during which the TI project investigators agreed to use the CSV file format for the normalized data are provided below.

Meeting Notes from Data Normalization Teleconference on December 7, 2016

Participants:

Warnick Kernan (PNNL),
Terry Kraus (SNL),
Greg Madrid (SNL),
Colin Okada (RSL-Nellis),
Brenda Pobanz (NARAC), and
Dustin Whitener (SNL),

Decisions Made during the Teleconference:

- A software tool will be developed to normalize radiological data to a user specified point in time.
- The software tool will be capable of normalizing data the following data:
 - in-situ, laboratory analysis, and exposure/dose rate data from RAMS,
 - deposited activity files from NARAC,
 - RASCAL source term files, and
 - Exposure rate data from AVID.

NOTE: the software tool will not normalize data from RADRESPONDER.

- The tool will be capable of decaying and weathering data forward or backward in time, as specified by the user.
- **The output file of the normalized data will be in a CSV file format.**
- The output file will include metadata of the original data (e.g., radionuclide identity, radioactivity levels).

NOTE: the group decided that the metadata must include the radionuclide source term (assumed or known) when normalizing exposure/dose rate data

- The software tool will be capable of normalizing:
 - In-situ gamma spectroscopy data,
 - Laboratory analysis data, and
 - Exposure/dose rate data.
- The software tool will not normalize integrated air concentration data because it is unnecessary to normalize integrated data.

Action Items:

- All TI members are to develop a list of metadata that should be included in the output file
- SNL Assessment Scientists to develop rules for back-decaying short-lived daughter radionuclides to prevent over estimation of their previous activity.

NOTE: this may be done by assuming secular equilibrium has been established and using the decay constant of the parent radionuclide to back-decay the activity level.

- SNL Assessment Scientists to develop rule to back-decay daughter radionuclides that have half-lives longer than parent radionuclide's half-life.

NOTE: this may be done by assuming secular equilibrium has NOT been established and using the daughter radionuclides decay constant to back-decay the activity level.

- SNL Assessment Scientists to develop strategy for handling low-activity level (e.g., \approx background) data.

NOTE: rules must be developed to prevent back-decaying background activity-level data which would result in an overestimation of the previous activity. This may primarily be an issue with dose/exposure rate data. It may be appropriate for the user to specify a known or assumed background dose/exposure rate and all sample data points that are less than some multiple (e.g., 2-5 times) the background level are not back-decayed.

Next Meeting:

To be determined after the group has provided input on what metadata needs to be included in the output file.