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Launching Emergency Management Leadership

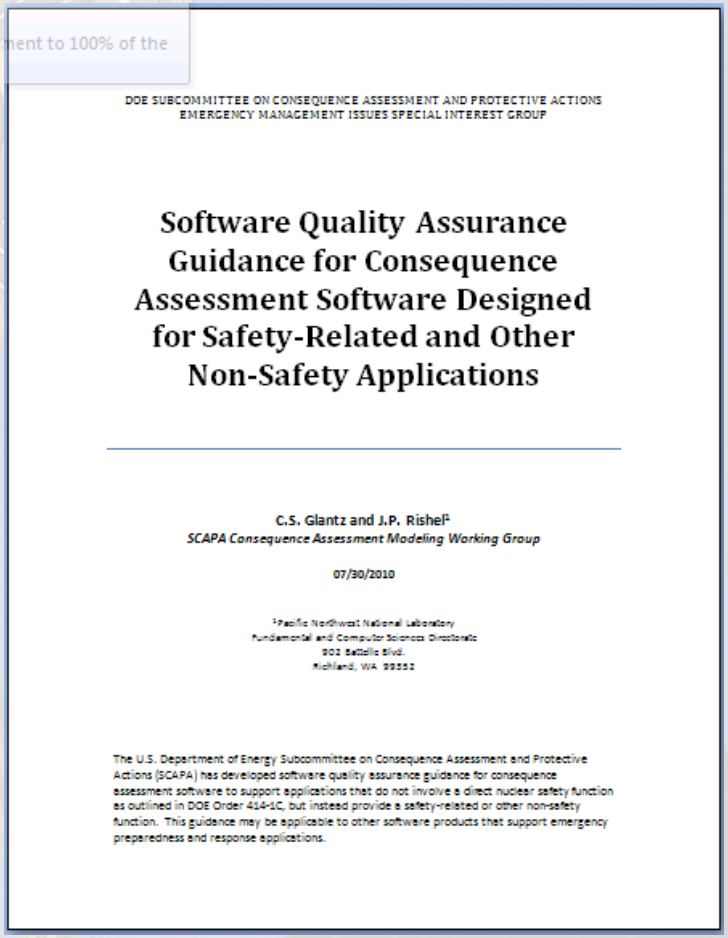
SCAPA Consequence Assessment Modeling Toolbox– It's Alive!

Cliff Glantz and Jeremy Rishel

PNNL

SCAPA SQA Guidance

- The SCAPA SQA guidance is based on the SQA framework for safety software described in DOE Guide 414.1-4.
- For the development of new or the upgrading of existing safety-related and other non-safety consequence assessment software, SCAPA recommends minimum compliance levels for each of the ten SQA work activities described in DOE Guide 414.1-4.
- Published in July 2010 and available on the SCAPA website.



DOE SUBCOMMITTEE ON CONSEQUENCE ASSESSMENT AND PROTECTIVE ACTIONS
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Software Quality Assurance Guidance for Consequence Assessment Software Designed for Safety-Related and Other Non-Safety Applications

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SCAPA Consequence Assessment Modeling Working Group

07/30/2010

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Richland, WA 99352

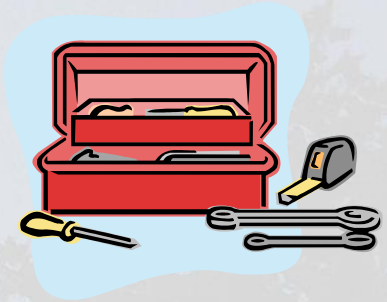
The U.S. Department of Energy Subcommittee on Consequence Assessment and Protective Actions (SCAPA) has developed software quality assurance guidance for consequence assessment software to support applications that do not involve a direct nuclear safety function as outlined in DOE Order 414-1C, but instead provide a safety-related or other non-safety function. This guidance may be applicable to other software products that support emergency preparedness and response applications.

What is the SCAPA CAM Toolbox?

- A website that provides a single location to access frequently-used CAM codes that adhere to SCAPA software quality assurance (SQA) guidelines.
- Models in the toolbox will have acceptable levels of:
  - technical & user documentation
  - configuration management
  - verification & validation testing
  - problem reporting and sharing

Benefits of the SCAPA CAM Toolbox

- Provide a "**one-stop shopping**" website with introductory material on the models and links to more detailed information on the model's individual websites.
- Supports the use of our "tried-and-true" legacy codes.
- Spearhead the drive toward adoption of consistent, reasonable SQA practices.



Toolbox Webpages

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SCAPA Consequence Assessment Modeling (CAM) Toolbox

The purpose of the SCAPA Consequence Assessment Modeling (CAM) Toolbox is to provide a collection of consequence assessment models that comply with the SCAPA software quality assurance (SQA) guidance document for safety-related and non-safety applications. These SCAPA SQA guidelines are less rigorous than DOE requirements for safety software, but they are appropriate for modeling applications where the results are not used to formulate initial protective action recommendations but are instead used to estimate the complex dispersion patterns of pollutants, guide the deployment of field monitoring teams to optimal sampling locations, and provide other initial consequence estimates. In these sorts of applications, decisions made based on modeling results cannot lead to an adverse impact on human health or safety (i.e., in-situ monitoring is conducted before any safety decisions are made).

The SCAPA SQA guidance incorporates the key elements found in the DOE guidance for safety software but does so using an appropriately graded approach that is readily implementable by DOE's emergency

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Toolbox Status

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Current SCAPA CAM Toolbox Models

As of April 2012, three models have completed, or nearly completed the SCAPA CAM Toolbox evaluation process and are being entered as SCAPA CAM Toolbox models. These models are CAPARS, APGEMS, and NARAC. Information on these models is available by clicking their links on this webpage, or by clicking the buttons on the left navigation menu.

The next group of models being scheduled for evaluation and admission to the SCAPA CAM Toolbox in 2012 are RASCAL, Puff-Plume, RAMS/LPDM, and HYSPLIT.

The status of each model in the evaluation process is:

Model Name	Preparation of Developer SQA Gap Analysis	GAP Analysis Under Review by CAMWG	SCAPA GAP Analysis Review Document Prepared	SCAPA Toolbox Entry Published
CAPARAS	COMPLETED	COMPLETED	COMPLETED	UNDERWAY
APGEMS	COMPLETED	COMPLETED	NEARLY DONE	UNDERWAY
NARAC	COMPLETED	NEARLY DONE	NEARLY DONE	UNDERWAY
RASCAL	UNDERWAY			
Puff Plume	PENDING			
RAMS/LPDM	PENDING			
HYSPLIT	PENDING			

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Status Close-UP

The status of each model in the evaluation process is:

Model Name	Preparation of Developer SQA Gap Analysis	GAP Analysis Under Review by CAMWG	SCAPA GAP Analysis Review Document Prepared	SCAPA Toolbox Entry Published
CAPARAS	COMPLETED	COMPLETED	COMPLETED	UNDERWAY
APGEMS	COMPLETED	COMPLETED	NEARLY DONE	UNDERWAY
NARAC	COMPLETED	NEARLY DONE	NEARLY DONE	UNDERWAY
RASCAL	UNDERWAY			
Puff Plume	PENDING			
RAMS/LPDM	PENDING			
HYSPLIT	PENDING			

CAPARS

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CAPARS

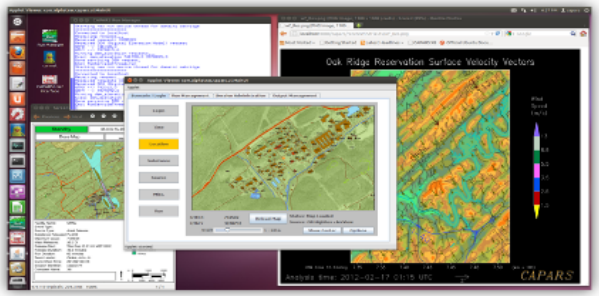
Computer-assisted Protective Action Recommendation System (CAPARS)

Development and Custodial Organization:
AlphaTRAC, Inc.
10385 Westmoor Drive, Suite 310
Westminster, CO 80021-2597
(303) 428-5670
email: info@alphatrac.com

CAPARS Webpage: http://www.alphatrac.com/PlumeModelingSystem

Key Contacts at AlphaTRAC:

- John Ciolek, Senior Atmospheric Scientist, (jciolek@alphatrac.com; 720.263.4271)
- Reed Hodgin, AlphaTRAC President, (rhodgin@alphatrac.com; 303.428.5670)



OVERVIEW

The CAPARS® system is a complex-terrain atmospheric dispersion modeling system used for projections of plume impacts from radiological,

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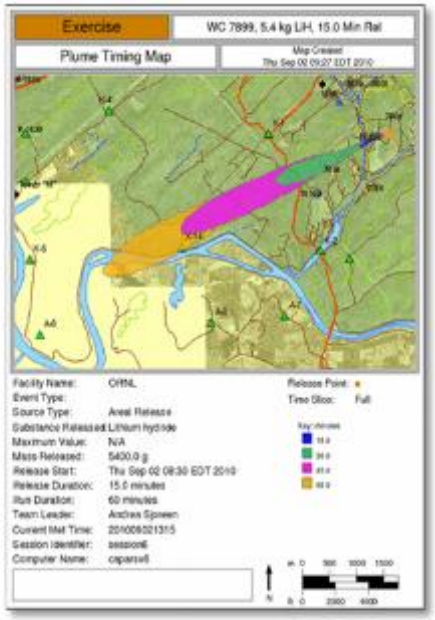
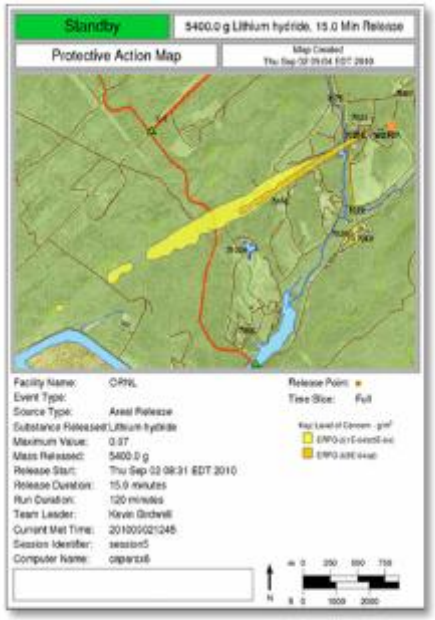
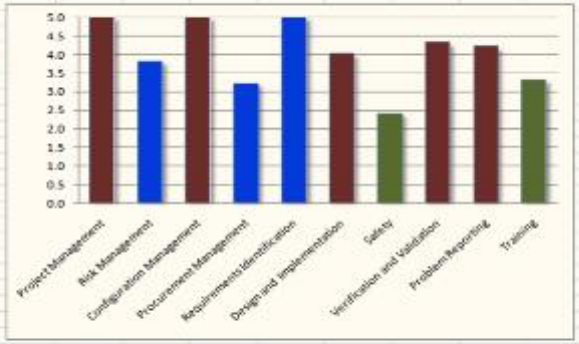




Software Quality Assurance Level: 1 2 3 **4** 5

Software Quality Assurance Evaluation:

#	SQA Work Activities	SQA Score	Priority Rating
1	Project Management	5.0	H
2	Risk Management	3.8	M
3	Configuration Management	5.0	H
4	Procurement Management	3.2	M
5	Requirements Identification	5.0	M
6	Design and Implementation	4.0	H
7	Safety	2.4	L
8	Verification and Validation	4.3	H
9	Problem Reporting	4.2	H
10	Training	3.3	L
	Average Score	4.0	



The CAPARS SQA gap analysis review (March 2011) is available for viewing.

APGEMS

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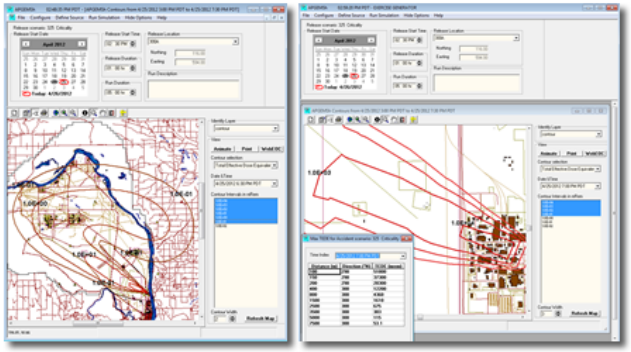
Air Pollutant Graphical Environmental Modeling System (APGEMS)

Development and Custodial Organization:
Pacific Northwest National Laboratory
902 Battelle Blvd
PO Box 999
Richland, WA 99352
509.375.2121 or 888.375.PNNL (7665)
web: http://www.pnnl.gov

APGEMS Webpage: http://mepas.pnnl.gov/earth/apintro.stm

Key Contacts at PNNL:

- Cliff Glantz, Senior Staff Scientist/Project manager, (cliff.glantz@pnnl.gov; 509.375.2166)
- Nino Zuljevic, APGEMS Code Custodian, (nino.zuljevic@pnnl.gov; 509.372-4434)



Overview

The Air Pollutant Graphical Environmental Monitoring System (***APGEMS***) is an important atmospheric dispersion and dose assessment modeling

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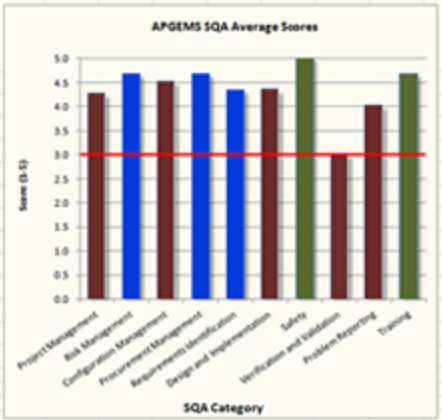
Software Quality Assurance Level:

1 2 3 4 5

Software Quality Assurance Evaluation:

#	SQA Work Activities	Scores	Priority Rating
1	Project Management	4.3	H
2	Risk Management	4.7	M
3	Configuration Management	4.5	H
4	Procurement Management	4.7	M
5	Requirements Identification	4.3	M
6	Design and Implementation	4.3	H
7	Safety	5.0	L
8	Verification and Validation	3.0	H
9	Problem Reporting	4.0	H
10	Training	4.7	L
	Average Score	4.3	



The APGEMS SQA gap analysis review (Sept 2012) is available for viewing.

APGEMS Documentation

Glantz, C.S., K.J. Allwine, M.A. Pelton, and K.J. Pattison. 2002. User's Guide for the Air Pollutant Graphical Environmental Modeling System (APGEMS). PNNL-14043. Pacific Northwest National Laboratory, Richland, Washington.

Allwine, K.J., and X. Bian. 1995. PGEMS 2.0 – An Atmospheric Dispersion Model for Routine Air Quality Assessments and Emergency Response Applications. PNL-12088. Battelle Northwest Laboratories, Richland, Washington.

Future Toolbox Models

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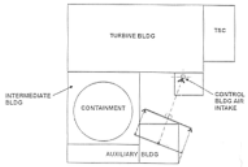
Future SCAPA CAM Toolbox Models

The next round of models to be considered for admission to the SCAPA SQA CAM Toolbox is tentatively slated to include:

- ARCON 96
- CHARM
- DUSTRAN
- HPAC
- RSAC-7

The SQA review of this next round of consequence assessment models is tentatively scheduled to begin in 2013. These models are **not** currently in the SCAPA CAM Toolbox, but we hope a review of their SQA gap analysis will indicate that they are worthy of admission. The following is a thumbnail sketch of each of these five modeling systems.

ARCON96 is a model for calculating concentrations in the vicinity of buildings. It is used by the U.S. Nuclear Regulatory Commission (NRC) to assess nuclear power plant control room habitability under accident conditions. ARCON96 uses hourly averaged meteorological data and recently developed methods for estimating dispersion in the vicinity of buildings to calculate relative concentrations (X/Q) at control room air intakes that would be exceeded no more than 5% of the time. Relative concentrations are calculated for averaging periods ranging from 1 hour to 30 days duration to support control room habitability dose calculations. The model incorporates straight-line Gaussian diffusion and does not allow for temporal and spatial variations in the wind field. It also assumes a constant release rate for the entire 30-day period of release. Source-receptor distance cannot exceed 10 km, while the intake height cannot exceed 100 meters.



CHARM, the Complex Hazardous Air Release Model, calculates and

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Discussion, Questions, Comments?

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