**From:** Mapp, Latisha
**Location:** your office
**Importance:** Normal
**Subject:** FW: meet and greet
**Start Date/Time:** Fri 8/16/2013 6:00:00 PM
**End Date/Time:** Fri 8/16/2013 7:00:00 PM
CERCLA Radiation_general_WM 2012.ppt

Stuart,
I need to cancel our meeting today @ 2:00. I'm working on a fire drill for Jim and a couple of other things I need to turn in today. I apologize in advance. Please reschedule for next week, my calendar is less hectic.

Thanks!
L.

-----Original Appointment-----
**From:** Walker, Stuart
**Sent:** Monday, August 12, 2013 6:21 PM
**To:** Walker, Stuart; Mapp, Latisha
**Subject:** meet and greet
**When:** Friday, August 16, 2013 2:00 PM-3:00 PM (GMT-05:00) Eastern Time (US & Canada).
**Where:** your office

A little background for our talk

Here is a website with all of our CERCLA radiation guidance, most of which I wrote or managed the project
http://www.epa.gov/superfund/health/contaminants/radiation/index.htm

Here is our intranet page for radiation, with our
http://intranet.epa.gov/osrti/ard/spb/radiation/related.html

Here is a general overview briefing of our CERCLA policies for radioactively contaminated remedial sites.

**To:** Walker, Stuart[Walker.Stuart@epa.gov]
**From:** Stuart Walker
**Sent:** Wed 7/3/2013 3:35:15 PM
**Subject:** Fw: OSRTI's Response: FOR DRG REVIEW: Frameworks Reminder, Power Plant Communications Document for Approval, & IND Comms Document Distribution
Summary of Comments on Improvised Nuclear Device Response and Recovery_draft final_OSRTI Comments_5_22_12.pdf
Summary of Comments on Communicating During and After NPP Incident 1-11-12 final draft_OSRTI Comments_5_22_12.pdf

----- Forwarded by Stuart Walker/DC/USEPA/US on 07/03/2013 11:35 AM -----

From: Barnes Johnson/DC/USEPA/US
To: Debbie Dietrich/DC/USEPA/US
Cc: Lisa Nanko/DC/USEPA/US, Phyllis Anderson/DC/USEPA/US, James Woolford/DC/USEPA/US, Helen Dawson/DC/USEPA/US@EPA, Jennifer Wilbur/DC/USEPA/US, Thea Williams/DC/USEPA/US, Dana Tulis/DC/USEPA/US, "Larry Stanton" <Stanton.Larry@epamail.epa.gov>, Stuart Walker/DC/USEPA/US, Suzanne Wells/DC/USEPA/US, "Melissa Dreyfus" <Dreyfus.Melissa@epamail.epa.gov>
Date: 05/23/2012 03:37 PM
Subject: Fw: OSRTI's Response: FOR DRG REVIEW: Frameworks Reminder, Power Plant Communications Document for Approval, & IND Comms Document Distribution

---

Dear Debbie,

OSRTI's comments on the two subject documents.

Give me (or any of us) a call if you need to discuss any of these. 703-347-8758.

Take care,
Barnes
---
Sent by EPA Wireless E-Mail Services

Thea Williams

----- Original Message -----
From: Thea Williams
Sent: 05/23/2012 03:26 PM EDT
To: Barnes Johnson
Subject: OSRTI's Response: FOR DRG REVIEW: Frameworks Reminder, Power Plant Communications Document for Approval, & IND Comms Document Distribution

**Barnes:**

**Below are the consolidated comments and draft email for Debbie D.**

Below are comments from OSRTI on 2 documents concerning communicating with the public after either a large scale release from a nuclear power plant or terrorist attack using a nuclear weapon.
Our comments are embedded in the attached PDF files, along with a summary pages of comments adjacent to each corresponding page of the document.

Throughout both documents, their are references to "safe" levels of radiation exposure (see yellow highlighted language in attached documents). Radiation is considered to be a carcinogen with no threshold for exposure below which there is considered to be no risk of cancer. For non-threshold

carcinogens, EPA considers there to be no safe level of exposure. EPA instead uses a cancer risk range of 10-4 to 10-6 to define protective or acceptable levels across a variety of statutory authorities. During the early and intermediate phase after a nationally significant NPP or IND incident, federal recommendations on exposures are contained within the PAGs. But the PAGs allow for exposures outside the risk range (e.g., the 2 rem evacuation PAG corresponds to a risk of 2 x 10-3 under current federal risk estimates in Federal Guidance 13, and 1 x 10-2 for infant girls in the most recent risk estimates by EPA in the Blue Book).

Several of the comments are text edits to avoid using the word "safe" and replacing with terms such as "risk to human health" or "risk of exposure to contamination". It appears that the same questions are repeated in the second document, so please be sure that the answers are the same in both places unless there are technical reason for them to be different.

We recommend rewriting those sentences where it appears that the documents are saying some level of radiation exposure is safe, since it appears that EPA is supposed to sign both documents. Otherwise EPA may be helping to undermine its own risk range.

Attachments

*(See attached file: Summary of Comments on Improvised Nuclear Device Response and Recovery_draft final_ OSRTI Comments_5_22_12.pdf)(See attached file: Summary of Comments on Communicating During and After NPP Incident 1-11-12 final draft_OSRTI Comments_5_22_12.pdf)*

**To:** Walker, Stuart[Walker.Stuart@epa.gov]; Anderson, RobinM[Anderson.RobinM@epa.gov]
**Cc:** Snyder, Emily[Snyder.Emily@epa.gov]
**From:** Lee, Sangdon
**Sent:** Tue 4/30/2013 2:07:12 PM
**Subject:** RE: Need your feedback on ESFs recoomendations and US Draft PAG manual is available

Conference call number is 866-299-3188 and pass code is Ex. 6 - Personal Privacy I will open up the line at 1 pm.


Sang Don Lee, Ph.D.

Environmental Research Scientist

Decontamination and Consequence Management Division

National Homeland Security Research Center

U.S. Environmental Protection Agency (MD-E343-06)

Office of Research and Development

109 T.W. Alexander Dr., Research Triangle Park, NC 27711

Phone 919-541-4531 Fax 919-541-0496


**From:** Walker, Stuart
**Sent:** Tuesday, April 30, 2013 10:03 AM
**To:** Lee, Sangdon; Anderson, RobinM
**Cc:** Snyder, Emily
**Subject:** RE: Need your feedback on ESFs recoomendations and US Draft PAG manual is available

This afternoon 1 to 2:30 works

---

**From:** Lee, Sangdon
**Sent:** Tuesday, April 30, 2013 9:07 AM
**To:** Walker, Stuart; Anderson, RobinM; DeCair, Sara
**Cc:** Snyder, Emily
**Subject:** RE: Need your feedback on ESFs recoomendations and US Draft PAG manual is available

Stuart, When will you be available for a call to discuss the items below?

Sang Don Lee, Ph.D.

Environmental Research Scientist

Decontamination and Consequence Management Division

National Homeland Security Research Center

U.S. Environmental Protection Agency (MD-E343-06)

Office of Research and Development

109 T.W. Alexander Dr., Research Triangle Park, NC 27711

Phone 919-541-4531 Fax 919-541-0496

**From:** Walker, Stuart
**Sent:** Monday, April 29, 2013 5:57 PM
**To:** Lee, Sangdon; Anderson, RobinM; DeCair, Sara
**Cc:** Snyder, Emily
**Subject:** RE: Need your feedback on ESFs recoomendations and US Draft PAG manual is available

Hi Sang Don,

I am still checking further for information, but for a quick response. We might want to discuss further before querying the regions for site-specific examples.

## Exit strategy for remediation

We do not have a CERCLA guidance document on this subject.

## How to set the repopulation standards

Our CERCLA guidance would indicate that if we temporarily relocating people for more than a year, we would permanently relocate them.

http://www.epa.gov/superfund/community/relocation/intpol.pdf

- Permanent relocation may be considered when an alternative under evaluation includes a temporary relocation expected to last longer than one year. A lengthy temporary relocation may not be **acceptable to the community.** Further, when viewed in light of the balancing of tradeoffs between alternatives, the temporary relocation remedy may not be practicable, nor meet the statutory requirement to be **cost-effective.** Additionally, a shortage of available long-term rentals within the immediate area, may make any potential temporary relocation extremely difficult to **implement.**

## Review of Decontamination Work

This ITRC document has a case studies section on D&D at 10 specific sites on pages 67-151. EPA Superfund staff participated on the workgroup developing the ITRC guide, and I think all or almost all of the site examples were CERCLA response actions.

http://www.itrcweb.org/Guidance/ListDocuments?TopicID=21&SubTopicID=24

**Decontamination and Decommissioning of Radiologically Contaminated Facilities**
(RAD-5) Jan-08

Compiles knowledge and experience acquired in recent years from facilities that have com
providing guidance on D&D to regulators, the public, project managers, cleanup contractor
providers.

Summary

## Public involvement practices and success measure

Should have something for you soon.

**From:** Lee, Sangdon
**Sent:** Monday, April 29, 2013 12:24 PM
**To:** Walker, Stuart; Anderson, RobinM; DeCair, Sara
**Cc:** Snyder, Emily
**Subject:** FW: Need your feedback on ESFs recoomendations and US Draft PAG manual is available

Hi Stuart, Robin, and Sara,

Please see the email below from Nishiyama-san in MOE. He is asking actual examples in detail. I can summarize his request items as

1. Exit strategy for remediation
2. How to set the repopulation standards
3. Review of decontamination work
4. Public involvement practices and success measure

Do you have any relevant reports or documents that describe the listed items with the actual contaminated sites as examples? I do not know how to address this. What's your thought?

Sang Don Lee, Ph.D.

Environmental Research Scientist

Decontamination and Consequence Management Division

National Homeland Security Research Center

U.S. Environmental Protection Agency (MD-E343-06)

Office of Research and Development

109 T.W. Alexander Dr., Research Triangle Park, NC 27711

Phone 919-541-4531 Fax 919-541-0496

**From:** HIDEHIKO_NISHIYAMA@env.go.jp [mailto:HIDEHIKO_NISHIYAMA@env.go.jp]
**Sent:** Sunday, April 21, 2013 8:30 PM
**To:** Lee, Sangdon; TAKESHI_SEKIYA@env.go.jp; NOBUHIRO_KINO@env.go.jp
**Cc:** mark.triplett@pnnl.gov; robert.sindelar@srnl.doe.gov; MillerJA6@state.gov
**Subject:** RE: Need your feedback on ESFs recoomendations and US Draft PAG manual is available

Dear Dr. Lee:

Regarding our feedback on ESFs' recommendations, first of all, we think that your recommendations are reasonable and of great importance for our future actions. In addition to that, if you could consider the points below which are listed in order of you recommendations to enrich relevant information when you draft the report, we would appreciate it.

(Radiation Protection)

1. Develop repopulation and dose reduction framework and …….at a community specific level.

We would like to obtain information on concrete examples based on the U.S. experiences, to consider the items described in the "supporting actions." For example, in terms of "remediation end-states" and "re-population standards", we heard that it depended on the condition and target stakeholder groups of each case and decisions were made through the discussion in the local communities. If you could show us concrete examples in any specific cases including actual standards and underpinning calculation, we would appreciate it.

(Remediation Strategy)

1. Conduct a systematic review of the decontamination work……. remaining decontamination work.

When we consider "systematic review" of our work, it would be helpful if we could see relevant examples of such review in the U.S. If you could provide us any reports regarding specific U.S. decontamination cases we would appreciate it.

(Cross-Cutting Consideration)

1. There is an immediate need to develop more effective processes…. for evacuate areas)

As you described in the "supporting action", we may need to review a variety of public involvement practices and identify the factors that lead to success. If you could provide us appropriate cases in the U.S. including succeeding factors, it would be an important reference for us.

I hope these comments can help you work.

We look forward to reading your report in the near future.

Best regards,

Hidehiko Nishiyama

MOE

**From:** Lee, Sangdon [mailto:Lee.Sangdon@epa.gov]
**Sent:** Tuesday, April 16, 2013 3:30 AM
**To:** 西山 英彦; 関谷 毅史; 木野 修宏
**Cc:** Triplett, Mark B; robert.sindelar@srnl.doe.gov; Miller, Jeffrey A
**Subject:** Need your feedback on ESFs recoomendations and US Draft PAG manual is available

Nishiyama-san, Sekiya-san, and Kino-san,

How are you? Hope you enjoy the great spring weather. The spring is gone already in North Carolina. It is almost 30 degrees everyday.

Before leaving Japan, the Embassy Science Fellows (Bob, Mark, and me) provided our recommendations to you. We want to have your feedback on those recommendations. We are currently trying to finish the report that contains extended information of our recommendations. Your inputs will greatly help prepare this report. Can you tell us which recommendations you are most interested and you want further information from US?

Last week I received the notification from the other EPA program offices about the draft Protective Action Guides and Planning Guidance for Radiological Incidents. This PAG Manual is in draft format and can be shared with you. Please follow the link here: http://www.epa.gov/radiation/docs/er/pag-manual-interim-public-comment-4-2-2013.pdf

In March, I provided you the previous Protective Action Guides from EPA. The current one is revised by multiple agencies and is waiting for the public comments. As I recall from the previous meetings at MOE, NRA is in charge with re-occupation standards. NRA must be

interested in this document too. Please distribute this document to the appropriate staff. And if you and other staff have any questions or need further resources, please feel free to contact me.

Thanks.

Sang Don Lee, Ph.D.

Environmental Research Scientist

Decontamination and Consequence Management Division

National Homeland Security Research Center

U.S. Environmental Protection Agency (MD-E343-06)

Office of Research and Development

109 T.W. Alexander Dr., Research Triangle Park, NC 27711

Phone 919-541-4531 Fax 919-541-0496

**To:** Walker, Stuart[Walker.Stuart@epa.gov]
**From:** Dolislager, Fredrick G.
**Sent:** Fri 8/7/2015 2:39:00 PM
**Subject:** FW: recent papers that might be of interest to you
cloud immersion protection facdtors for us Hamby 2014.pdf
hamby 2014 exp. shielding of structurall significant components 2014.pdf
hamby shielding factors for deposited contaminants.pdf

fred d.

**From:** Hertel, Nolan E [mailto:nolan.hertel@me.gatech.edu]
**Sent:** Thursday, August 6, 2015 1:44 PM
**To:** Fred Dolislager
**Subject:** FW: recent papers that might be of interest to you

I don't know how good them are as I have not read them yet.

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# Cloud immersion building shielding factors for US residential structures

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J. Radiol. Prot. **34** (2014) 853–871 doi:10.1088/0952-4746/34/4/853

# Cloud immersion building shielding factors for US residential structures

**E D Dickson**[1] **and D M Hamby**[2]

[1] United States Nuclear Regulatory Commission, Rockville, USA
[2] Department of Nuclear Engineering and Radiation Health Physics, Oregon State University, Corvallis, USA

E-mail: elijah.dickson@gmail.com and david.hamby@oregonstate.edu

Received 1 May 2014, revised 22 August 2014
Accepted for publication 19 September 2014
Published 23 October 2014

**Abstract**

This paper presents validated building shielding factors designed for contemporary US housing-stock under an idealized, yet realistic, exposure scenario within a semi-infinitecloud of radioactive material. The building shielding factors are intended for use in emergency planning and level three probabilistic risk assessments for a variety of postulated radiological events in which a realistic assessment is necessary to better understand the potential risks for accident mitigation and emergency response planning. Factors are calculated from detailed computational housing-units models using the general-purpose Monte Carlo N-Particle computational code, MCNP5, and are benchmarked from a series of narrow- and broad-beam measurements analyzing the shielding effectiveness of ten common general-purpose construction materials and ten shielding models representing the primary weather barriers (walls and roofs) of likely US housing-stock. Each model was designed to scale based on common residential construction practices and include, to the extent practical, all structurally significantcomponents important for shielding against ionizing radiation. Calculations were performed for floor-specificlocations as well as for computing a weighted-average representative building shielding factor for single- and multi-story detached homes, both with and without basement, as well for single-wide manufactured housing-units.

Keywords: validated building shielding factor, semi-infinite cloud, realistic source term, emergency response planning, probabilistic risk assessment, building shielding factor

(Some figures may appear in colour only in the online journal)

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ED_001057_00028515

## 1. Introduction

This manuscript is the second in a series reporting on the methodology applied by Dickson (2013) to develop validated building shielding factors for exposure within a semi-infinite cloud of radioactive material for a variety of generic US homes. These shielding factors are considered a point-estimate of the total reduced in exposure an occupant would receive while sheltering-in-place during the relatively short time period of the plume passage. The source term used to calculate the shielding factors is on based on a probabilistic risk assessment (NRC 1990) assessing severe accidents of five commercial US nuclear power plants using a generic core nuclide inventory (NRC, 1986) with an emitted energy spectrum with a median value of 1.101 MeV +/ − 0.74 MeV using nuclear decay data published in ICRP Publication 107 (2008).

A detailed discussion presents the important parameters and assumptions made to design each full-scale computational housing-unit model and the methods used to calculate a data-set of validated building shielding factors for generic residential housing units covering a range of primary weather barrier materials of varying density thicknesses as reported by Dickson and Hamby (2014). Monte Carlo calculations using the general-purpose Monte Carlo N-Particle computational code (LANL 2005), MCNP5, were performed at floor-specific locations, as well as for computing a weighted-average representative building shielding factor for each (see Appendix A). A regression analysis was performed with this dataset to demonstrate a relationship between the source term described above and the calculated protection factor provided each housing-unit. Results of the regression analysis demonstrate that the amount of protection each housing-unit provides is strongly dependent on the composition of material composing the primary weather barrier. Lastly, series of functions are presented which can be used to estimate a building shielding factor for one- and two-story housing-units constructed of materials not specifically studied in this investigation.

The first publication (Dickson and Hamby 2014) reports on the important parameters and assumptions made to characterize a realistic source term, the common primary weather barriers of US housing stock, the experimental and computational methods necessary to analyze the attenuating properties of a variety of general purpose construction materials and shielding models, and reduction factors for ten shielding models representing 69.6 million housing units (61.3%) in the United States. A third publication will report validated building shielding factors from contaminant deposition on the roof and surrounding surfaces.

## 2. Background

The shelter-in-place protective action strategy in-part utilizes building shielding factor data as part of the technical basis to determine the quality of shielding a certain community provides. The building shielding factor quantifies the amount of protection a certain building-type provides its inhabitants from ionizing radiation emitted from a passing plume of radioactive material and subsequent deposition on the surrounding grounds and roof. Traditionally, the building shielding factor, 'P,' is defined as the ratio of the detector response, '$D_o$,' in the standard unprotected position one meter above an infinitely flat surface to the protected detector response, 'D,' within a particular build-type expressed as:

$$P = \frac{D}{D_o}. \tag{1}$$

Much of the available data quantifying the structural shielding of a particular building-type is historically known to have large uncertainties; uncertain pedigree and weak technical basis based on 1950's era suburbia (Dickson 2013) and is no longer applicable to the densely



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populated urban environments seen today. Many notable radiological risk assessments and emergency response guidance utilize or refer to a set of building shielding factors published by Burson and Profio (1975, 1977) (e.g. (NRC 1975, 1990, 2010, EPA 1992, FRMAC 2013)), and in some cases were found to circular reference each other; making their use easily defensible. These building shielding factors were developed using modified point-kernel equations and were intended for a very small aspect of a much larger consequence study performed by the Nuclear Regulatory Commission (NRC) (NRC 1975).

## 3. Materials and methods

This publication reports the methods and methodology used to develop full-scale computational housing-unit models used to develop validated building shielding factors within a semi-infinite cloud of radioactive material for a variety of generic one- and two-story US home models both with and without basements and for single-wide manufactured units.

The source term used to calculate these protection factors are based on a probabilistic risk assessment (NRC 1990) assessing severe accidents of five commercial US nuclear power plants. The calculated source term is based on reactor core nuclide inventories found in NUREG/CR-4467 (NRC 1986), where the entire fission product inventory is available for release to the environment. Nuclear decay data published in ICRP Publication 107 (ICRP 2008) was used to characterize the photon energy spectrum which yielding 6093 photon emissions ranging from $8.9 \times 10^{-6}$ to 9.91 MeV with emission yields ranging from $1.31 \times 10^{-15}$ to 0.999. Photon emissions with relative intensities (Energy*Intensity) per disintegration less than 1% (MeV/dis) were omitted; leaving a total of 317 emissions ranging from 0.029 MeV to 3.71 MeV, a median of 1.101 MeV +/ − 0.74 MeV. The purpose of characterizing a representative energy spectrum was to ensure both the experimental and computational models focused on gamma-emissions with the greatest dosimetric importance with respect to developing generic building shielding factor; avoiding either 'softening' or 'hardening' the final building shielding factors. Further descriptions of the source term are discussed by Dickson (2013, 2014).

Recommended floor-specific reduction factors and weighted average building shielding factors calculated in this investigation are presented in Appendix A. Each housing-unit was modeled after standard US construction practices using general purpose building materials. As such, many realistic features have been built into these protection factors that more accurately model the photon fluence through the housing-unit to include: the buildup effect accounting for contributions of scattered radiation at each protected location; elevated protected positions when considering exposure on either the second story or first floor height above the ground; realistic occupant positioning within the structure; additional shielding provided by interior walls, joists, rafters, ceilings and OSB subflooring; and, exposure contributions from the photon fluence streaming through windows.

As discussed by Dickson (2014), good agreement was found between the experimental data and computational models used to develop reduction factors for ten primary weather barriers (walls and roofs) that are typical of US housing construction; providing validity for further simulations extended to analyzing the shielding effectiveness of other common components of homes as well as full-scale computational housing unit models which include all important components of a home important for shielding residents. As such, the models and methods reported by Dickson (2014) were applied in this analysis to develop validated building shielding factors which characterize a realistic semi-infinite cloud of radioactive material, the chemical and physical parameters of the structurally significant components of homes important for shielding, and the computational methods necessary to analyze the



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shielding properties of each housing-unit modeled. These full-scale models were then used to calculate the series of validated building shielding factors for generic residential housing units using MCNP5.

### *3.1. General housing-unit design*

Historically, protection factors developed by Burson and Profio(1975, 1977) for one- and two-story homes for both brick and wood frame housing-units has been applied to consequence studies and emergency response planning. As such, this investigation examines similar make and model homes of the original building shielding factors as well as for one style of a manufactured home; no data pertaining to the protection afforded by manufactured homes was identifiedthrough the literature review by Dickson (2013). As described by Spence (1999), US homes are constructed in a similar fashion built to specificstandards within all geographic regions of the US, with key differences between the use of materials composing the primary weather barrier of the exterior walls and roof. That is, the framing supporting the walls and that of the roof are composed of similar materials and constructed in the same fashion. As such, general guidance as explained by Spence (1999) to construct single-family units was used to model the structural members (walls, flooringand roof) that could reasonably be used as shielding, where exterior walls are designed based on the platform framing technique (see figures 1 and 2) and the roofs are of gable design on a 0.5 and 0.3 pitch (see figure 3) for single-family and manufactured units respectively. Data from the 2009 American Housing Survey (US Census 2009) were used to characterize the typical US housing-unit which considers the average foot-print area of a housing-unit to include only livable space, not including the garage or other similar structures.

Each full-scale housing-unit model is intended to be a generic representation of one- and two-story housing-units and are symmetrically designed, such that one side mirrors the other with all wall- and roof physical and material parameters important for shielding modeled to the extent practical. Internal walls and rooms are modeled on each floorabove ground level while the basement is considered a single room. For modeling simplicity, rooms above ground level between the one- and two-story models are modeled equally in volume; for instance a two-story housing unit model is composed of four rooms on each level with two internal walls bisecting each other at the floororigin (see figure 4). For all models, every exterior wall of a room is modeled with one generic window modeled as 91.44 cm by 121.92 cm single-pane glass 0.508 cm thick; including appropriate framing techniques (see figure 1). For instance, a corner-room with two exterior walls is modeled with two windows (one for each exterior wall). Interior and exterior doors are not modeled since they are not expected to contribute significantly to a reduction in exposure when compared to the material used for the primary weather barriers, and to simplify calculations since there are a wide variety of makes/models available and characterizing these specificationswas outside the scope of this investigation. The foundations are modeled as 20.32 cm thick concrete/cinderblocks; raising the unit 60.96 cm above the ground. The foundation for clay brick homes are modeled with an additional 12.7 cm-thick layer of concrete to support the weight of the brick and allow for a 2.54 cm air gap between the primary weather barrier and vapor barrier.

*3.1.1.General wall construction.* There are two primary framing systems used to build modern residential units, platform framing and balloon framing (Spence 1999). The platform framing system is the most common type of framing in residential construction and is modeled in this research. In platform construction, each wall is one story high. The framing for a two story house resembles the framing of a one-story house built directly on top of another one-story house. The



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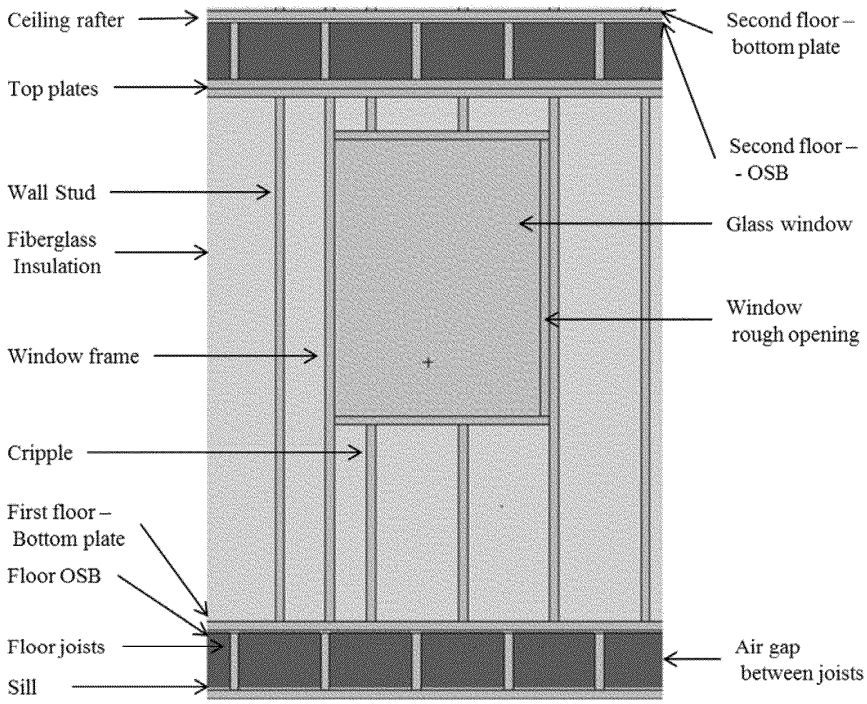


**Figure 1.** General component of exterior wall in *Y/Z*-plane as modeled in MCNP5.

exterior wall frame serves as the base on which all remaining construction materials are applied. Typical wall frames are made with 5.08 cm × 10.16 cm studs generally spaced 40.64 cm on-center. It is important to note stated lumber dimensions are rough cut dimensions, not finisheddimensions. Finished dimensions are 1.27 cm less than the generally stated rough cut dimensions, actual dimension of a finishedwall stud generally used to construct walls is 3.81 cm × 8.89 cm and are applied to the experimental and computational models throughout this investigation.

A typical exterior wall for platform framing consists of (from the base to the top) a sill, floorjoist, bottom plate, studs, double top plate, corner stud assemblies, trimmers, bracing, and sheathing (see figures 1 and 2). Exterior wall and partition (interior walls) construction is begun by placing bottom plates at the desired locations first,and then frame studs, rough openings, trimmers, and cripples are added. Bottom plates are treated 5.08 cm × 10.16 cm lumber placed directly on the subfloorwhile top plates are typically non-treated lumber placed at the top of the wall. Precut studs, 235.27 cm long, are available for framing walls when a 243.8 cm interior floor-to-ceilingfinishis desired and is modeled accordingly. The location of the studs should be such that the stock sheathing panels are set flushwith the outside face of the end stud. For this investigation, the first-,second-, and attic flooris supported by 5.08 cm × 25.4 cm joist all spaced on 40.64 cm centers. To frame a typical window, trimmerstuds are set on each side and cripples are placed to maintain the 40.64 on-center spacing. Basement walls are 20.32 cm thick except for brick homes which have an additional 12.7 cm to support the brick wall. All models are raised a standard 60.96 cm above the ground to model the foundation height above the ground.



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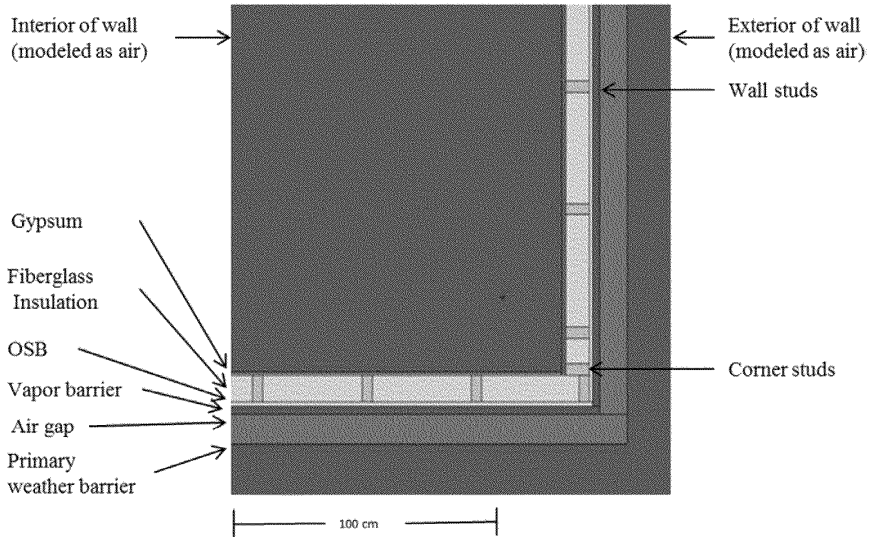


**Figure 2.** Exterior wall framing with material layers in *X/Y*-plane view as modeled in MCNP5.

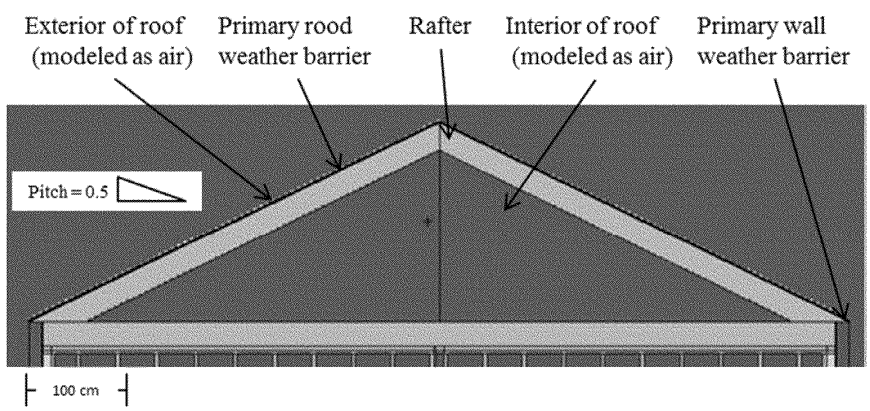


**Figure 3.** Gable roof frame with 0.5 pitch in *X/Z*-axis view.

*3.1.2. General roof construction.* Roofs are designed based on a typical gable roof consisting of a ridge-board upon which the top ends of the rafters are nailed (see figure 3). Rafters are the structural member used to frame a roof; carrying the sheathing and primary weather barrier material load. The size of a rafter depends on the distance it must span, roof slope, spacing between rafters, weight of the roofing material, and potential wind and snow load. Typically, 3.81 cm × 20.32 cm or 3.81 cm by 25.4 cm rafters on 40.64 cm on-center spacing are used. On top of the rafter, oriented strand board (OSB) is attached and covered with an underlayment to provide protection if a leak occurs in the primary weather barrier. Typically, asphalt-saturated felt paper is used as the



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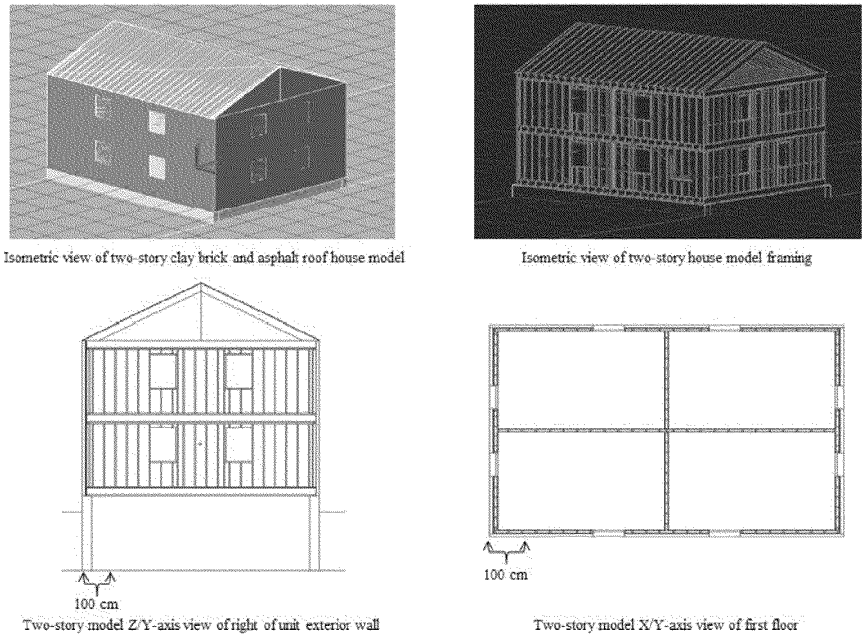


**Figure 4.** Two-story housing unit model.

underlayment and is required below fiberglass and asphalt shingles as well as various metal and clay roofing tiles. After the sheathing and felt is installed, the primary protective weather barrier is attached.

### *3.2. Two-story housing-unit model*

The two-story housing-unit model is modeled as general colonial-style home with 160 $m^2$ split evenly between the two stories with the outer dimensions approximately 10 m × 8 m. Models with an included basement consider that basement within the same foot-print, making a two-story home with a basement 240 $m^2$. Schematics of the two-story model can be found in figure 4.

### *3.3. One-story housing-unit design and model*

The one-story housing-unit model is modeled as general ranch-style home with 160 $m^2$ on one level; essentially a two-story floorplans with each level set side-by-side instead of stack on top of another. Models with an included basement consider that basement within the same foot-print, making a single story home 320 $m^2$. One internal wall along the *x*-axis (long-axis) spans the length of the floor-planwith three internal walls on the *y*-axis (short-axis) bisecting the *x*-axis internal wall at equal distances; creating eight internal rooms. Schematics of the one-story model can be found in figure 5.



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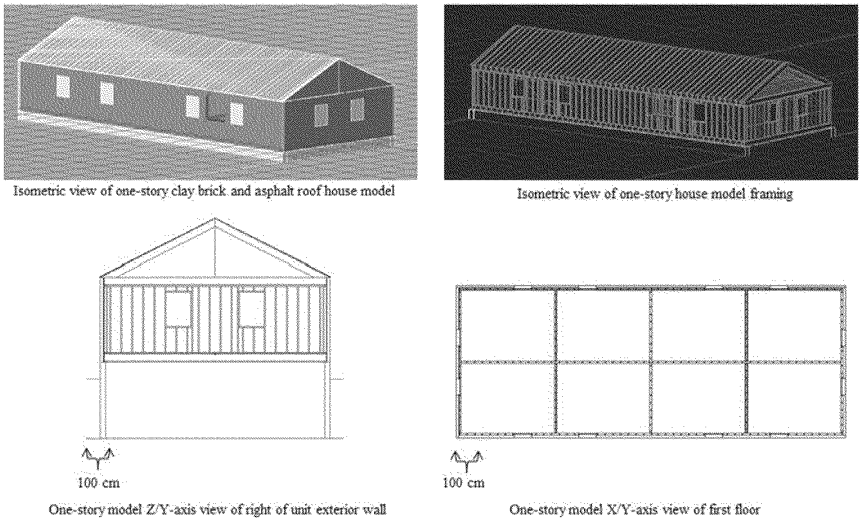


**Figure 5.** One-story housing unit model.

### *3.4. Manufactured housing-unit design and model*

The manufactured housing-unit model is designed as single-wide unit with a foot-print of 101 $m^2$ of livable space. A review of the HUD Code (HUD 2012) which establishes manufactured home standards for their construction and safety was used to develop the manufactured housing-unit model. It was found that recommended common wall studs ranged from 5.08 cm × 7.62 cm to 5.08 cm × 10.16 cm in dimension while joists ranged from 5.08 cm × 20.32 cm by 5.08 cm by 25.4 cm in dimension. For continuity between all housing-unit models, the same wall stud dimensions of 5.08 × 10.16 cm and slightly smaller joist of 5.08 cm by 20.32 cm were modeled for joist on 40.64 on-center spacing. Instead of the 0.5 roof pitch modeled for the one- and two story homes, a pitch of 0.3 regularly stated by the manufactures was modeled. Each model is symmetrically designed, such that each room has at least one window as stated by the HUD Code. Three internal walls on the *y*-axis (short-axis) bisect the *x*-axis are spaced at equal distances creating four internal rooms of equal volume. The foundation is modeled as 20.32 cm thick cement cinderblocks, raising the unit 60.96 cm above the ground. Schematics of the manufactured model can be found in figure 6.

### *3.5. Building shielding factor calculations*

The building shielding factor is indicative of the protection provided by a particular location within the structure. Historically, the unprotected and protected position for cloud immersion has been calculated in the same location with a spherical detector size 30 cm in diameter. This was reasonable due to the transport methods and simplistic geometry assumptions described in the literature review as discussed by Burson and Profio (1975, 1977).

For this investigation, the building shielding factor for cloud immersion is considered as a point-estimate of the total reduction in exposure an occupant would receive while



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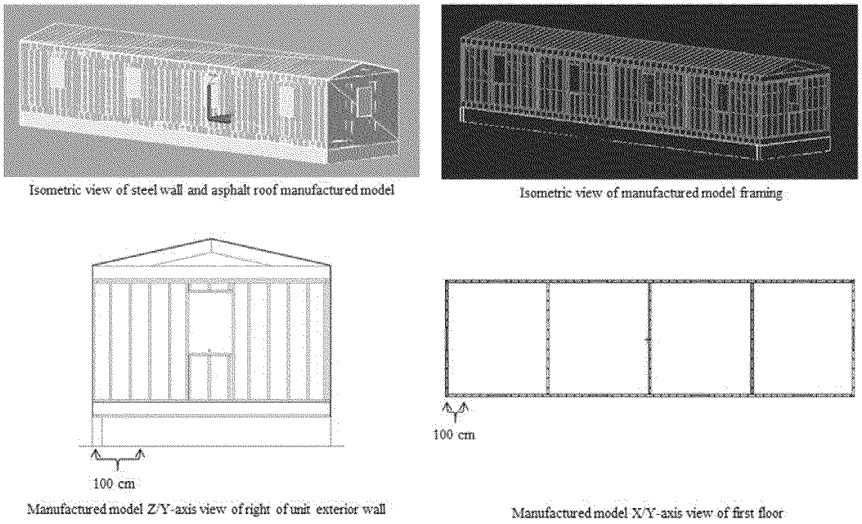


**Figure 6.** Manufactured housing unit model.

**Table 1.** Semi-infinite cloud building shielding factor matrix.

| Primary wall weather barrier | Primary roof weather barrier | | | |
|---|---|---|---|---|
| | Asphalt | Steel | Shake | Terracotta |
| Brick | 1[a], 2[b] | 1, 2 | 1, 2 | 1, 2 |
| Vinyl | 1, 2, M[c] | 1, 2 | 1, 2 | 1, 2 |
| Steel | 1, 2 | 1, 2, M | 1, 2 | 1, 2 |
| Stucco | 1, 2 | 1, 2 | 1, 2 | 1, 2 |
| Wood | 1, 2 | 1, 2 | 1, 2 | 1, 2 |

[a] 1 indicates calculations for one-story housing unit with specified material.
[b] 2 indicates calculations for two-story housing unit with specified material.
[c] M indicates calculations for manufactured housing unit with specified material.

sheltering-in-place during the relatively short period of the plume passage. The full-scale housing-unit models were used to develop a series of validated building shielding factors within the semi-infinite cloud of radioactive material for each combination of the ten primary weather barriers discussed by Dickson (2014). A total of 98 housing-unit models were developed (see table 1) and calculations of the reduction in exposure were performed at floor-specific locations within each. Floor-specific reduction factors were then used to calculate a weighted-average building shielding factor representative for the housing-unit (see Appendix A).

These calculations are based on the approximation of the KERMA (kinetic energy releases in material) as opposed to absorbed dose since it is an easily measurable/calculated quantity from the radiation fluence, and under conditions of charged-particle equilibrium, the two are approximately equal in magnitude. As such, these models were designed with this concept in mind by modeling the radiation field uniformly and the



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atomic composition and density parameters of materials homogeneously; allowing for the approximation of KERMA to be made. As described by Eckerman (1993), the calculation can be divided into two steps to overcome the statistical nature of Monte Carlo calculations involving the transport of high energy photons through many mean free paths. The first step is to model the source as an area source based on an uninhibited free-in-air photon field. In this case, the target and its surrounding medium (air at standard temperature and pressure) are the same and all particle tracks and their direction crossing a closed surface are recorded. Proper care in modeling the source in this manner must also consider the albedo effect of geometry beyond the specified surface. The closed surface source model contains all properties of the free-in-air photon field such that the strength per unit area in each direction, $\bar{\ }$, energy, $E$, and point, $r_s$, on the surface source, $S_A(r_s\bar{\ }, E)$, is equal to the flow rate $j_j(r_s\bar{\ }, E)$ at the corresponding point in the full field model. The second step is to replace the free-in-air photon field with the area source for all proceeding exposure assessments with the housing-type model in place and the protected position modeled as detectors located within the specified locations within the housing-unit.

Floor-specific reduction factor, $RF_{f_i}$, is defined as the ratio of the average detector responses in the protected position on a certain floor of the housing-unit, $\bar{D}_{f_i}$, to the standard unprotected position, $D_o$, expressed as:

$$RF_{f_i} = \frac{\bar{D}_{f_i}}{D_o} \tag{2}$$

The weighted average building shielding factor, $PF$, is defined as the average of each floor-specific reduction factor expressed as:

$$PF = \frac{\bar{D}_{f_i}}{n_i} \tag{3}$$

Where $n_i$ is the number of levels specific to the housing-unit model under consideration.

*3.5.1. Sensitivity study of various protected position locations.* A sensitivity study was performed to characterize the best method to model the protected position within each housing-unit by calculating the track-length estimates of KERMA for three different scenarios;

A. within a 30 cm diameter sphere-detector located at the center of each room one meter above the floor,
B. within the entire volume of each room, and
C. within a 30 cm diameter sphere-detector located at the same position were the unprotect position, $D_o$, as historically calculated.

Scenario A: The protected positions are estimated in each room containing a 30 cm diameter sphere located at its center on the $x/y$-plane and 115 cm on the $z$-axis. Two-story units are modeled with four detectors on each modeled level, including the basement. One-story units are modeled with eight detectors on each level including the basement. Manufactured units are modeled with 4 detectors. Figure 7 illustrates the protected positions of each 30 cm diameter sphere located at the center of each room (represented as white circles) for the two-story housing-unit model.



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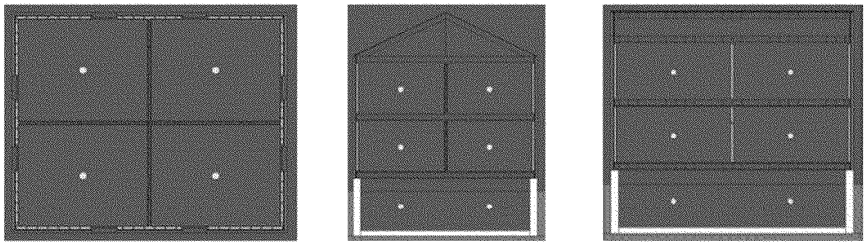

**Figure 7.** Scenario A; *X/Y*—1st floorplane view, *Y/Z*—plane view, and *X/Z*—plane view, respectively, with protected position represented by 30 cm diameter spheres located at the center of each room.

Scenario B: Similar to Scenario A, however, the protected positions are estimated within the entire air-volume of each room (represented as white rectangles in figure 8). This scenario is designed to examine the difference between small exposure volumes representing the vital organs of a person versus the entire accessible volume of the housing unit.

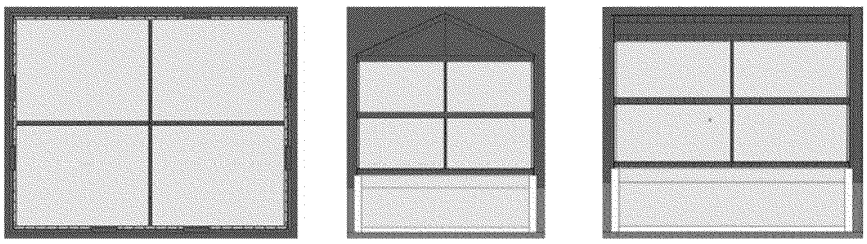

**Figure 8.** Scenario B; *X/Y*—1st floorplane view, *Y/Z*—plane view, and *X/Z*—plane view, respectively, with protected positions estimated within the entire air-volume of each room.

Scenario C: This scenario is designed to make a direct comparison between protection factors modeled in this investigation and those produced by Burson and Profio (1975, 1977) (represented as white circles in figure 9). The protected position is estimated on each floor with a single 30 cm diameter sphere located at its center on the *x/y*-plane and 115 cm on the *z*-axis.

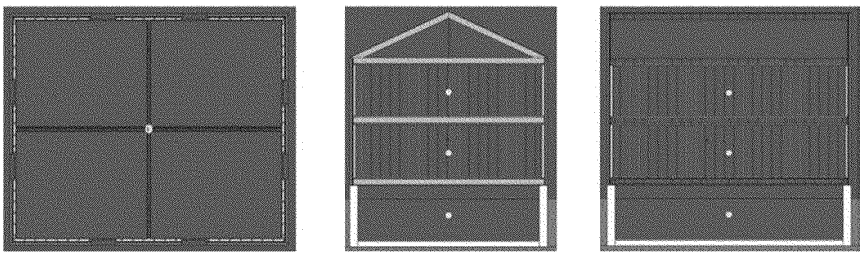

**Figure 9.** Scenario C; *X/Y*—1st floorplane view, *Y/Z*—plane view, and *X/Z*—plane view, respectively, with protected positions estimated at the center of each floor.



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**Table 2.** Number of mean-free-path of each primary weather barrier at the 1.101 MeV photon energy.

| Primary weather barrier | u ($cm^{-1}$) | *x* (cm) | *u***x* |
|---|---|---|---|
| Concrete | 0.061 | 34.436 | 2.111 |
| Brick | 0.052 | 24.115 | 1.247 |
| Stucco | 0.019 | 12.596 | 0.236 |
| Wood | 0.011 | 14.110 | 0.148 |
| Steel | 0.012 | 11.452 | 0.132 |
| Vinyl | 0.010 | 11.528 | 0.110 |
| Asphalt | 0.061 | 2.114 | 0.130 |
| Terracotta | 0.080 | 2.044 | 0.168 |
| Shake | 0.033 | 4.342 | 0.143 |
| Steel | 0.059 | 1.410 | 0.084 |

Results of the sensitivity analysis demonstrate that the type and location of the protected position does have an influenceon the estimated protection provided by the housing unit. For instance, the average protection factor calculated for the two story vinyl-sided/asphalt-roof housing-unit with a basement for Scenarios A, B and C was estimated to be 0.65, 0.62, and 0.60 respectively. Scenario C, models the standard protected and unprotected positions within the same location and happens to be within the structural supports of the housing-unit (e.g. within internal walls); providing an unrealistic amount of shielding not normally available to the occupant. As such, Scenario C was decided to be an impractical modeling assumption (though appropriate when using point-kernel methods) and not considered for further calculations since it predicts an unrealistic greater reduction in exposure (e.g. calculating lower building shielding factors) provided by the housing-unit. Scenario B averages the reduction of exposure throughout the entire volume of the room, balancing higher exposure levels near the perimeter exterior wall with lower exposure levels near the center of the housing-unit. This modeling assumption in effect calculates additional protection provided by the housing-unit that does not accurately model the location an occupant would reside within the housing unit. For radiation protection purposes, it is common to model the human body as a 30 cm diameter sphere to represent the approximate location and volume of vital organs of human. As such, it was decided Scenario A would be used to calculate the protection factors for the other housing-unit models.

### *3.6. Regression analysis*

A regression analysis was performed to investigate the relationship between the two variables composing the primary weather barriers as a function of the calculated weighted average protection factors for each of the housing-unit models both with and without basements. First, the ten primary weather barriers under investigation (Dickson and Hamby 2014) were normalized by computing the number of mean-free-paths, *ux*, for each, where *u* ($cm^{-1}$) is the total linear attenuation coefficientfor each shield model at the 1.101 MeV photon energy, and *x* (cm) is the total thickness composed of all layers of material composing the exterior wall or roof. Table 2 lists for each of the ten primary weather barriers, the calculated linear attenuation coefficient, the measured shield thickness, and calculated mean-free paths (see Dickson (2013).

Figures 10 and 11 illustrate the relationship between the material used as the primary weather barrier for either the wall or roof of the housing-unit and the calculated weighted average building shielding factors both with and without basements. A strong linear relationship can be seen between the type of material used to construct the primary weather barrier of walls and the calculated weighted average building shielding factors as demonstrated with an $R^2$ value of nearly 1 for both the one- and two story housing-unit models. Little correlation between the primary weather barrier



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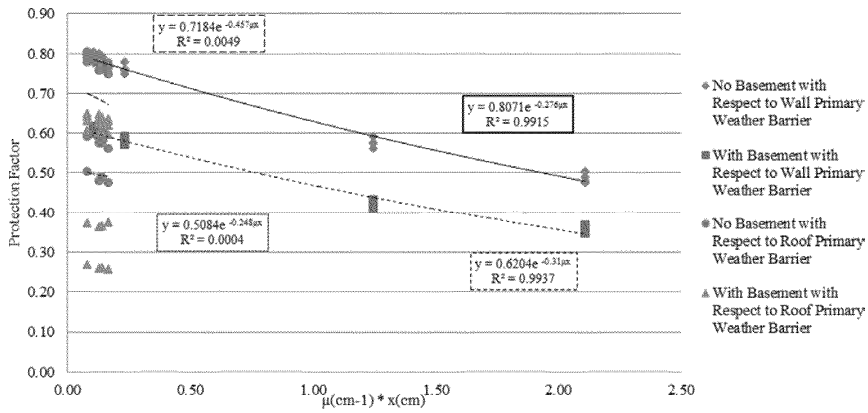


**Figure 10.** One-story model building shieling factors for semi-infinite cloud source.

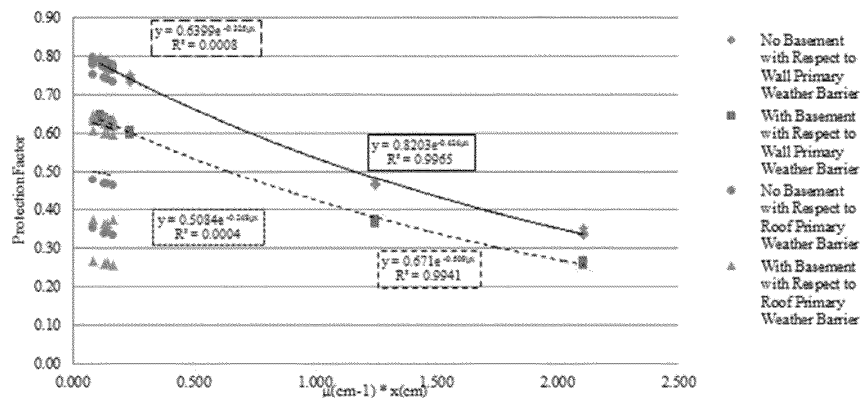


**Figure 11.** Two-story model building shieling factors for semi-infinite cloud source.

material of the roof and the calculation weighted average building shielding factors is seen. The strong correlation between the exterior walls and the calculated weighted average building shielding factors is due to a greater amount of shielding surface area relative to the roof. As such, results of the regression analysis demonstrate that the amount of protection each housing-unit provides is strongly dependent on the composition of material composing the exterior wall weather barrier. A series of functions are presented which can be used to estimate a building shielding factor for one- and two-story housing-units composed of other materials not specifically studied in this investigation given that the number of mean-free-paths of the primary wall weather barrier is known.

To estimate building shielding factors for one-story homes with primary weathers barriers not specifically analyzed in the study, the following equations can be used:

One-story without a basement

$$PF = 0.8071e^{-0.276\,x}; \text{ and,} \tag{4}$$

One-story with a basement

$$PF = 0.6204e^{-0.31\,x}. \tag{5}$$



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To estimate building shielding factors for two-story homes with primary weathers barriers not specifically analyzed in the study, the following equations can be used:

Two-story without a basement

$$y = 0.8203e^{-0.424\,x} \text{ and,} \tag{6}$$

Two-story with a basement

$$PF = 0.671e^{-0.509\,x}. \tag{7}$$

## 4. Results

Results of the building-shielding factors for the semi-infinite cloud immersion exposure scenario developed through this investigation are in agreement with findings from full-scale experimental work performed in the 1950s and 1960s and other laboratory experiments as discussed by Dickson (2013). In general, the amount of protection provided by a particular structure was found to be dependent on the size of the housing-unit, the type and amount of material composing the primary weather barriers, and the location within the building (e.g. the basement provides more protection than the second floor). The final building shielding factors for each of the 98 housing-unit models, and associated standard error, $\sigma_{SE}$, of the calculations are provided in Appendix A. The presentation of these building shielding factors with two significant figures does not indicate the precision of the calculation but rather illustrates the subtle differences between each housing-unit model. Comparisons between models demonstrate a wide range of effective reductions in KERMA and it is apparent that housing-unit protection factors are specific to the primary weather barriers and the availability of basements.

Using the two-story brick home with a basement as an example, the calculated floor-specific reduction factor, from the second floor to the basement is 0.56, 0.36, and 0.16, respectively. If occupants were given enough early notice and knew to shelter in the lowest, most shielded position of the home while the plume passed, a relative estimate in the reduction in exposure provided by the first floor from the second floor and the basement from the first floor is about 35% and 63%; a considerable amount when considering the time of exposure is quite short and the amount of resources needed to implement this reduction in exposure is minimal.

When comparing the cloud immersion building shielding factors developed in this investigation to similar building shielding factors published by Burson and Profio (1975, 1977), a larger reduction in exposure is estimated for cloud immersion protection factors.

The shielding factors presented by Burson and Profio (1975, 1977) were developed using point-kernel methods with the latest shielding technology and data available at the time; making many modeling simplifications to perform the calculations with limited computational resources. These modeling assumptions include; modeling the housing unit geometry as a hemispherical shell with homogenized exterior wall and roof compositions equal in mass-thickness; performing the attenuation calculations for five energy intervals representing the source spectra; applying scaled buildup factors intended for water to model the scattering effects of the primary weather barriers; and, no modeling of windows to approximate streaming effects.

Assuming a two-story home without basements, Burson and Profio (1975, 1977) estimated protection factors for wood-frame and masonry housing units with no basement to be 0.9 and 0.6 respectively. The estimated protection factors for similar vinyl sided and clay brick housing unit in this investigation is 0.79 and 0.47 respectively; which is about 12% and 22% further reduction in exposure than previously estimated. For the basement of wood-frame and masonry housing units, Burson and Profio (1975, 1977) estimated protection factors of 0.6 and 0.4 respectively. The estimated protection factors for similar basements is 0.37 for a vinyl-sided housing unit and 0.16 for a clay brick housing unit; which is about a 38% and 60% further reduction in exposure



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than previously estimated. These differences are expected and appropriate since these housing-unit models are designed based on general construction practices, are of high-fidelity, and use state-of-the-art computation methods to perform the calculations in an effort to develop a more realistic understand of the shielding effectiveness of various residential buildings and the buildup effect accounting for contributions of scattered radiation at the protected locations.

The weighted average building shielding factor are intended to act as a realistic approximation of the general protection within the entirety of the housing-unit since the actual location of the occupant is unknown during a relatively short time period of exposure. However, if early notification to the general population was announced to shelter-in-place within the center of the lower levels of the housing-unit additional credit to account for more protected locations such as the basement could be modeled.

## 5. Discussion

The NRC policy for implementing risk-informed regulations was expressed in the 1995 policy statement (NRC 1995) on the use of probabilistic risk assessment methods in nuclear regulatory activities. The policy states that the use of [probabilistic risk assessment] PRA technology should be increased in all regulatory matters to the extent supported by the state-of-the-art in PRA methods and data and in a manner that complements the NRC's deterministic approach and supports the NRC's traditional defense-in-depth philosophy. As such, PRA and associated analyses should be used when practical and within the bounds of state-of-the-art to reduce unnecessary conservatism. The methods used to develop this dataset of validated building shielding factors were designed for this purpose. The Monte Carlo method to perform the calculations was chosen over deterministic techniques because it more accurately represents the geometry and nuclear data than do deterministic methods for complete geometries. While deterministic techniques do provide an exact solution to an approximation of the problem, Monte Carlo techniques provide an approximate solution to an exact representation of the problem (Goorley 2000). As such, the building shielding factors produced in this research reduce the conservative assumptions applied to the deterministic calculations of the historically relied upon building shielding factors, allowing for the development of more realistic modeling of general housing unit models which respond similarly to real world environmental exposer scenarios (submersion within a semi-infinite cloud containing uniformly-distributed contamination). With this purpose in mind, these building shielding factors should be a key component of any state-of-the-art radiologic consequence assessment or robust emergency response plan to ensure adequate protection is in place prior to an event taking place.

Lastly, although this rigorous investigation considered validated narrow-beam, material-specific and broad-beam, shield-specific data over a broad spectrum of photon energies to capture all important physics interaction for the free-in-air source term, numerous assumptions were still necessary. These assumptions innately affect the limitations of the study at hand and the models developed for the application and use of the building shielding factors.

The most fundamental assumptions regarding the source term characterization assume all dosimetrically important radionuclides available in the core inventory are available for release into the environment for light water reactor designs. The purpose of characterizing a representative energy spectrum was to ensure both the experimental and computational models focused on gamma-emissions with the greatest dosimetric importance with respect to developing generic building shielding factors; avoiding either 'softening' or 'hardening' the final building shielding factors. With the development and eventual deployment of small modular- and advanced generation IV reactors in the US, the fission product core inventory is different to the one modeled in this investigation. Once more data in regards to design, operation and risk surrounding these reactor designs becomes available, an analysis of the available



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core inventory for release to the environment would be necessary to determine if the building shielding factors developed in this investigation and presented in the following publication accurately characterize the reduction in exposure from a release produced by these facilities.

The building shielding factor is indicative of the protection provided by a particular location within the structure. Any additional shielding due to ground roughness, terrain effects and other structural shielding is later considered a deviation from the standard unprotected position, and accounted for as reduction factors later in a radiologic consequence analysis. Also, this analyses only analyzes the shielding from ionizing radiation provided by the exterior weather barriers and structurally significant components of house-units; not the infiltrationof contamination into the home. NUREG-1150 (NRC 1990) suggests that dose from building infiltrationcontributes up to 5% of the total dose for those who stay indoors. Recent research performed by Ishikawa *et al* (2014) sought to develop realistic air decontamination factors for a five-storybuilding located in the Chiba Prefecture of Japan after the Fukushima Daiichi Nuclear Power Station accident. However, the topic of air ingress into homes for certain housing-unit designs is outside the scope of this investigation and more research is necessary.

## 6. Conclusion

This investigation leads in the development of high-quality data to support radiologic consequence analysis and emergency response planning through the evaluation of the shielding effectiveness provided by the primary weather barriers of contemporary US housing stock against the ever-present risk contained within the reactor core or the very real threat of a radiological dispersal device explosion in an urban environment. Although the concept of sheltering populations from ionizing radiation is not new and has been studied since the early-1950s, this investigation sought to assist in an area long-known to have both an uncertain pedigree and weak technical basis. As such, the building shielding factors reported here-in make the best attempt to estimate of the level of shieling provided to the occupants for contemporary US housing stock from a realistic source term based on experimental data.

The urban environment is much different both in building-type and population density than it was nearly 60 years ago. For example, the socioeconomic impacts of rural-industrialized projects have led to the creation of energy boomtowns that were not previously accounted for during the original siting of nuclear power plants over 40 years ago. In such cases, reassessments of the viability of the original emergency plans should be reviewed continually. Periodic reviews of the local infrastructure need to be performed to understand whether expeditious movement would be successful, or if shelter-in-place protective actions are more suited to the present surrounding population. These contemporary building shielding factors would prove very beneficialin this type of work. As such, it is necessary and timely to reassess the shielding data used in the consequence assessment today to better serve the American public.

The views expressed in this article do not necessarily represent the views of the Nuclear Regulatory Commission or the United States.

## Acknowledgment

While drafting this manuscript, a transcription error was identified in Dickson (2013), Table 23, entitled 'Building shielding factor for cloud immersion,' for the published shielding factors specifictoo two-story homes with vinyl siding and asphalt roof and have been corrected in the Appendix A below.

This study was partly funded by the US Nuclear Regulatory Commission under the grant: NRC-HQ-11-G-38–0084, entitled, 'Contemporary Building Shielding Factors Research for Level 3 PRA.'



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## Appendix A

**Table A1.** One-story model, building shielding factors for semi-infinite cloud source.

| | | One-story with basement | | | | | | | | One-story without basement | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Primary roof weather barrier | | | | | | | | Primary roof weather barrier | | | | | | | |
| | | Asphalt | | Shake | | Steel | | Terracotta | | Asphalt | | Shake | | Steel | | Terracotta | |
| Primary wall weather barrier | Location | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ |
| Concrete | | | | | | | | | | | | | | | | | |
| | First Floor | 0.47 | 2.E-02 | 0.48 | 2.E-02 | 0.50 | 2.E-02 | 0.47 | 2.E-02 | 0.48 | 2.E-02 | 0.49 | 2.E-02 | 0.50 | 2.E-02 | 0.48 | 2.E-02 |
| | Basement | 0.23 | 1.E-02 | 0.23 | 1.E-02 | 0.24 | 1.E-02 | 0.22 | 1.E-02 | — | — | — | — | — | — | — | — |
| | Weighted PF | 0.35 | 1.E-02 | 0.35 | 1.E-02 | 0.37 | 1.E-02 | 0.35 | 1.E-02 | 0.48 | 2.E-02 | 0.49 | 2.E-02 | 0.50 | 2.E-02 | 0.48 | 2.E-02 |
| Brick | | | | | | | | | | | | | | | | | |
| | First Floor | 0.57 | 2.E-02 | 0.57 | 2.E-02 | 0.58 | 3.E-02 | 0.55 | 2.E-02 | 0.57 | 2.E-02 | 0.58 | 2.E-02 | 0.59 | 3.E-02 | 0.56 | 2.E-02 |
| | Basement | 0.27 | 2.E-02 | 0.27 | 2.E-02 | 0.28 | 2.E-02 | 0.27 | 2.E-02 | — | — | — | — | — | — | — | — |
| | Weighted PF | 0.42 | 1.E-02 | 0.42 | 1.E-02 | 0.43 | 2.E-02 | 0.41 | 1.E-02 | 0.57 | 2.E-02 | 0.58 | 2.E-02 | 0.59 | 3.E-02 | 0.56 | 2.E-02 |
| Stucco | | | | | | | | | | | | | | | | | |
| | First Floor | 0.75 | 3.E-02 | 0.75 | 3.E-02 | 0.77 | 3.E-02 | 0.74 | 3.E-02 | 0.76 | 3.E-02 | 0.76 | 3.E-02 | 0.78 | 3.E-02 | 0.75 | 3.E-02 |
| | Basement | 0.41 | 2.E-02 | 0.41 | 2.E-02 | 0.42 | 2.E-02 | 0.40 | 2.E-02 | — | — | — | — | — | — | — | — |
| | Weighted PF | 0.58 | 2.E-02 | 0.58 | 2.E-02 | 0.59 | 2.E-02 | 0.57 | 2.E-02 | 0.76 | 3.E-02 | 0.76 | 3.E-02 | 0.78 | 3.E-02 | 0.75 | 3.E-02 |
| Wood | | | | | | | | | | | | | | | | | |
| | First Floor | 0.77 | 3.E-02 | 0.76 | 3.E-02 | 0.78 | 3.E-02 | 0.75 | 3.E-02 | 0.78 | 3.E-02 | 0.78 | 3.E-02 | 0.79 | 3.E-02 | 0.76 | 3.E-02 |
| | Basement | 0.42 | 2.E-02 | 0.43 | 2.E-02 | 0.43 | 2.E-02 | 0.42 | 2.E-02 | — | — | — | — | — | — | — | — |
| | Weighted PF | 0.59 | 2.E-02 | 0.60 | 2.E-02 | 0.61 | 2.E-02 | 0.59 | 2.E-02 | 0.78 | 3.E-02 | 0.78 | 3.E-02 | 0.79 | 3.E-02 | 0.76 | 3.E-02 |
| Steel | | | | | | | | | | | | | | | | | |
| | First Floor | 0.77 | 3.E-02 | 0.77 | 3.E-02 | 0.79 | 3.E-02 | 0.76 | 3.E-02 | 0.79 | 3.E-02 | 0.78 | 3.E-02 | 0.80 | 3.E-02 | 0.77 | 3.E-02 |
| | Basement | 0.43 | 2.E-02 | 0.44 | 2.E-02 | 0.44 | 2.E-02 | 0.43 | 2.E-02 | — | — | — | — | — | — | — | — |
| | Weighted PF | 0.60 | 2.E-02 | 0.60 | 2.E-02 | 0.61 | 2.E-02 | 0.59 | 2.E-02 | 0.79 | 3.E-02 | 0.78 | 3.E-02 | 0.80 | 3.E-02 | 0.77 | 3.E-02 |
| Vinyl | | | | | | | | | | | | | | | | | |
| | First Floor | 0.78 | 3.E-02 | 0.78 | 3.E-02 | 0.79 | 3.E-02 | 0.76 | 3.E-02 | 0.79 | 5.E-02 | 0.79 | 3.E-02 | 0.80 | 3.E-02 | 0.78 | 3.E-02 |
| | Basement | 0.44 | 2.E-02 | 0.44 | 2.E-02 | 0.44 | 2.E-02 | 0.43 | 2.E-02 | — | — | — | — | — | — | — | — |
| | Weighted PF | 0.61 | 2.E-02 | 0.61 | 2.E-02 | 0.62 | 2.E-02 | 0.60 | 2.E-02 | 0.79 | 5.E-02 | 0.79 | 3.E-02 | 0.80 | 3.E-02 | 0.78 | 3.E-02 |



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**Table A2.** Two-story model, building shielding factors for semi-infinite cloud source.

| Primary wall weather barrier | Location | Two-story with basement | | | | | | | | Two-story without basement | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Primary roof weather barrier | | | | | | | | Primary roof weather barrier | | | | | | | |
| | | Asphalt | | Shake | | Steel | | Terracotta | | Asphalt | | Shake | | Steel | | Terracotta | |
| | | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ |
| Concrete | | | | | | | | | | | | | | | | | |
| | Second Floor | 0.44 | 1.E-02 | 0.44 | 1.E-02 | 0.46 | 1.E-02 | 0.43 | 1.E-02 | 0.44 | 1.E-02 | 0.44 | 1.E-02 | 0.46 | 1.E-02 | 0.43 | 1.E-02 |
| | First Floor | 0.23 | 7.E-03 | 0.23 | 7.E-03 | 0.24 | 8.E-03 | 0.23 | 7.E-03 | 0.23 | 7.E-03 | 0.24 | 8.E-03 | 0.24 | 8.E-03 | 0.23 | 7.E-03 |
| | Basement | 0.10 | 4.E-03 | 0.10 | 4.E-03 | 0.11 | 4.E-03 | 0.10 | 4.E-03 | — | — | — | — | — | — | — | — |
| | Weighted PF | 0.26 | 5.E-03 | 0.26 | 5.E-03 | 0.27 | 5.E-03 | 0.26 | 5.E-03 | 0.34 | 7.E-03 | 0.34 | 7.E-03 | 0.35 | 8.E-03 | 0.33 | 7.E-03 |
| Brick | | | | | | | | | | | | | | | | | |
| | Second Floor | 0.56 | 2.E-02 | 0.56 | 2.E-02 | 0.58 | 2.E-02 | 0.59 | 2.E-02 | 0.56 | 2.E-02 | 0.57 | 2.E-02 | 0.58 | 2.E-02 | 0.56 | 2.E-02 |
| | First Floor | 0.36 | 8.E-03 | 0.36 | 9.E-03 | 0.37 | 9.E-03 | 0.37 | 9.E-03 | 0.37 | 1.E-02 | 0.37 | 1.E-02 | 0.37 | 1.E-02 | 0.37 | 1.E-02 |
| | Basement | 0.16 | 5.E-03 | 0.16 | 6.E-03 | 0.17 | 6.E-03 | 0.17 | 6.E-03 | — | — | — | — | — | — | — | — |
| | Weighted PF | 0.36 | 6.E-03 | 0.36 | 6.E-03 | 0.37 | 7.E-03 | 0.37 | 7.E-03 | 0.47 | 9.E-03 | 0.47 | 1.E-02 | 0.48 | 1.E-02 | 0.46 | 1.E-02 |
| Stucco | | | | | | | | | | | | | | | | | |
| | Second Floor | 0.81 | 2.E-02 | 0.81 | 2.E-02 | 0.83 | 2.E-02 | 0.80 | 2.E-02 | 0.81 | 2.E-02 | 0.81 | 2.E-02 | 0.83 | 2.E-02 | 0.81 | 2.E-02 |
| | First Floor | 0.66 | 2.E-02 | 0.65 | 2.E-02 | 0.66 | 2.E-02 | 0.65 | 2.E-02 | 0.67 | 2.E-02 | 0.67 | 2.E-02 | 0.67 | 2.E-02 | 0.66 | 2.E-02 |
| | Basement | 0.33 | 9.E-03 | 0.34 | 1.E-02 | 0.34 | 1.E-02 | 0.34 | 1.E-02 | — | — | — | — | — | — | — | — |
| | Weighted PF | 0.60 | 1.E-02 | 0.60 | 1.E-02 | 0.61 | 1.E-02 | 0.60 | 1.E-02 | 0.74 | 1.E-02 | 0.74 | 1.E-02 | 0.75 | 1.E-02 | 0.73 | 1.E-02 |
| Wood | | | | | | | | | | | | | | | | | |
| | Second Floor | 0.83 | 2.E-02 | 0.83 | 2.E-02 | 0.85 | 2.E-02 | 0.83 | 2.E-02 | 0.84 | 2.E-02 | 0.84 | 2.E-02 | 0.85 | 6.E-02 | 0.83 | 2.E-02 |
| | First Floor | 0.69 | 2.E-02 | 0.69 | 2.E-02 | 0.69 | 2.E-02 | 0.68 | 2.E-02 | 0.70 | 2.E-02 | 0.70 | 2.E-02 | 0.70 | 2.E-02 | 0.69 | 2.E-02 |
| | Basement | 0.35 | 1.E-02 | 0.35 | 1.E-02 | 0.35 | 1.E-02 | 0.35 | 1.E-02 | — | — | — | — | — | — | — | — |
| | Weighted PF | 0.63 | 1.E-02 | 0.62 | 1.E-02 | 0.63 | 1.E-02 | 0.62 | 1.E-02 | 0.77 | 1.E-02 | 0.77 | 1.E-02 | 0.78 | 3.E-02 | 0.76 | 1.E-02 |
| Steel | | | | | | | | | | | | | | | | | |
| | Second Floor | 0.84 | 2.E-02 | 0.84 | 2.E-02 | 0.86 | 2.E-02 | 0.83 | 2.E-02 | 0.85 | 2.E-02 | 0.84 | 2.E-02 | 0.86 | 2.E-02 | 0.84 | 2.E-02 |
| | First Floor | 0.70 | 2.E-02 | 0.70 | 2.E-02 | 0.70 | 2.E-02 | 0.70 | 2.E-02 | 0.71 | 2.E-02 | 0.71 | 2.E-02 | 0.72 | 2.E-02 | 0.71 | 2.E-02 |
| | Basement | 0.37 | 1.E-02 | 0.36 | 1.E-02 | 0.36 | 1.E-02 | 0.36 | 1.E-02 | — | — | — | — | — | — | — | — |
| | Weighted PF | 0.64 | 1.E-02 | 0.63 | 1.E-02 | 0.64 | 1.E-02 | 0.63 | 1.E-02 | 0.78 | 1.E-02 | 0.78 | 2.E-02 | 0.79 | 2.E-02 | 0.77 | 2.E-02 |
| Vinyl | | | | | | | | | | | | | | | | | |
| | Second Floor | 0.86 | 2.E-02 | 0.85 | 2.E-02 | 0.87 | 2.E-02 | 0.84 | 2.E-02 | 0.86 | 2.E-02 | 0.85 | 2.E-02 | 0.87 | 2.E-02 | 0.84 | 2.E-02 |
| | First Floor | 0.71 | 2.E-02 | 0.71 | 2.E-02 | 0.71 | 2.E-02 | 0.70 | 2.E-02 | 0.72 | 2.E-02 | 0.72 | 2.E-02 | 0.72 | 2.E-02 | 0.71 | 2.E-02 |
| | Basement | 0.37 | 1.E-02 | 0.37 | 1.E-02 | 0.37 | 1.E-02 | 0.36 | 1.E-02 | — | — | — | — | — | — | — | — |
| | Weighted PF | 0.65 | 1.E-02 | 0.64 | 1.E-02 | 0.65 | 1.E-02 | 0.64 | 1.E-02 | 0.79 | 1.E-02 | 0.79 | 2.E-02 | 0.80 | 2.E-02 | 0.78 | 2.E-02 |



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**Table A3.** Manufactured building shieling factors for semi-infinite cloud source.

| | | Manufactured | | | |
|---|---|---|---|---|---|
| | | Primary roof weather barrier | | | |
| | | Asphalt | | Steel | |
| Primary wall weather barrier | Location | RF or PF | $\sigma_{SE}$ | RF or PF | $\sigma_{SE}$ |
| Steel | | | | | |
| | First Floor | — | — | 0.84 | 4.E-02 |
| | Weighted PF | — | — | 0.84 | 4.E-02 |
| Vinyl | | | | | |
| | First Floor | 0.82 | 4.E-02 | — | — |
| | Weighted PF | 0.82 | 4.E-02 | — | — |

## References


Burson Z G and Profio AE 1975 *Structure Shielding from Cloud and Fallout Gamma Ray Sources for Assessing the Consequences of Reactor Accidents* (Las Vegas, NV: EG&G)

Burson Z G and Profio A E 1977 Structure shielding in reactor accidents *Health Phys.* **33** 287–99

Dickson E 2013 Experimental shielding evaluation of the radiation protection provided by residential structures *Dissertation* Oregon State University

Dickson E and Hamby D 2014 Experimental shielding evaluation of the radiation protection provided by the structurally significant components of residential structures *J. Radiol. Prot.* **34** 201–21

Eckerman K J 1993 *External Exposure to Radionuclides in Air, Water, and Soil. US Enviornmental Protection Agency, Office of Radiation and Indoor Air* (Washington, DC: US Enviornmental Protection Agency)

EPA 1992 *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents* (Washington, DC: Enviornmental Protection Agency)

FRMAC 2013 *FRMAC Assessment Manual Vol. 1: Overview and Methods* (Albuquerque, NM: Sandia National Laboratory)

Goorley T 2000 *Criticality Calculations with MCNP5: A Primer* (Los Alamos, NM: Los Alamos National Laboratory)

HUD 2012 *24 CFR Part 3280: Manufactured Home Construction and Safety Standard Department of Housing and Urban Development* (Washington, DC: US Government)

ICRP 2008 Nuclear decay data for dosimetric calculations (ICRP Publication 107 *Ann. ICRP* **38** 3)

Ishikawa T, Sorimachi A, Arae H, Sahoo S K, Janik M, Hosoda M and Tokonami S 2014 Simultaneous sampling of indoor and outdoor airborne radioactivity after the Fukushima Daiichi nuclear power plant accident *Environ. Sci. Technol.* **48** 2430–5

LANL, X.-5. M 2005 *MCNP—A General Monte Carlo N-Particle Transport Code, Version 5* (Los Alamos: Los Alamos National Laboratory)

NRC 1975 *Reactor Safety Study: An Assessment of Accident Risk in US Commercial Nuclear Power Plants, WASH-1400* (Washington, DC: US Nuclear Regulatory Commission)

NRC 1986 *Relative Importance of Individual Elements to Reactor Consequences Assuming Equal Release Fractions* (Washington, DC: Nuclear Regulatory Commission)

NRC 1990 *Severe Accident Risk: An Assessment for Five US Nuclear Power Plants: Appendices A, B, C* (Washington, DC: US Nuclear Regulatory Commission)

NRC 1995 Use of probabilistic risk assessment methods in nuclear regulatory activities; finalpolicy statement Federal Register **60** 158

NRC 2010 *Review of NUREG-0654 Supplement 3, Criteria for Protective Action Recommendations for Severe Accidents* (Washington, DC: NRC)

Spence W P 1999 *Carpentry Building Construction: A Do-it-Youself Guide* (New York: Sterling)

US Census 2009 *American Housing Surve for the United State: 2009* (Washington, DC: US Department of Housing and Urban Development)




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**To:** Walker, Stuart[Walker.Stuart@epa.gov]
**Cc:** Fitz-James, Schatzi[Fitz-James.Schatzi@epa.gov]
**From:** Gartner, Lois
**Sent:** Mon 12/19/2016 9:27:42 PM
**Subject:** 900 Methods & Application at SF Sites

Stuart: OW is pushing back on us regarding that PAGs control, which references IEL and application of 900 Methods on untreated water. They are going to address the PAGs part but can't speak to the 900 Methods application at SF sites. SOOOO, Schatzi told me we need your input in order to draft a response to the Methods comment in the email, which I've excerpted below.

Ms. McCarthy, I believe that those same US EPA experts **who had long ago shared their worries about the PAGs being implemented all too well**

**understood the "gaming" of the rad testing that had already been going on for years. .... - i.e, so called "compliance monitoring"** - using the US EPA

"Finished Drinking Water 900 Methods" - methods meant for finished, treated water systems and they said was never meant to be used on raw, untreated water

sources found like at IEL. Please see numerous letters documenting these serious deviations away from what is considered to be best available science in

letters to EPA found on our group's website: http://cclt.starksummit.org

Thus, the EPA scientists not simply expressed their fears of the PAGs being misused leaving Americans at risk to dangerous radiation, *but they likewise raised*

*serious concerns to me about the US EPA's unscientific usage of the "EPA Finished Drinking Water 900 Methods" on raw, untreated water sources suspected of*

*containing radiation, which is what occurred at Uniontown IEL.*

**Lois Haas Gartner**

Special Assistant

Office of Superfund Remediation

and Technology Innovation

U.S. Environmental Protection Agency

703.603.8711 (desk)

703.581.9794 (cell)

Attached for Pete's use in preparing for the meeting is a one page hot topic paper that Wynne developed and Dave and I reviewed.

**AA hot topic for Rads PAGsv3.doc** AA hot topic for Rads PAGsv3.doc

Also Pete may want to review the Enviro Groups letter requesting the meeting

**09-001-1844 CC env groups on rads PAGs.pdf** 09-001-1844 CC env groups on rads PAGs.pdf

And because the radionuclides standards are rather complex, Pam thought we may want to provide a background document that explains how the standards were developed. The following is a two pager that may be useful

**Background Information on Rads Rule 7-1-09.doc** Background Information on Rads Rule 7-1-09.doc

Cynthia Dougherty---10/30/2009 08:02:54 AM---Are any of you aware that the AAs for OAR, OW, OSWER and OGC are meeting Monday with a group of envi

From: Cynthia Dougherty/DC/USEPA/US

To: Pamela Barr/DC/USEPA/US@EPA, Phil Oshida/DC/USEPA/US@EPA, Eric Burneson/DC/USEPA/US@EPA, Wynne Miller/DC/USEPA/US@EPA

Cc: Keara Moore/DC/USEPA/US@EPA, Nanci Gelb/DC/USEPA/US@EPA

Date: 10/30/2009 08:02 AM

Subject: AA meeting Monday Nov 2 with enviros on radiation PAGs

---

Are any of you aware that the AAs for OAR, OW, OSWER and OGC are meeting Monday with a group of enviros who wrote the Agency in August raising concerns about what OAR was doing with the PAGs? And that Congressman Markey has sent a letter to the Administrator on 10/27 asking a series of questions on this issue -- including the impact on MCLs? I'll check at staff meeting, but I'm not aware that we've provided Pete with any information for that meeting.

Cynthia C. Dougherty
Director
Office of Ground Water and Drinking Water (4601M)
(202) 564-3750 - Phone
(202) 564-3753 - Fax

As discussed, please see Attached.

Sam

PAG Water Recomendations SRMD.docx PAG Water Recomendations SRMD.docx PAGs Summary Paper.docx PAGs Summary Paper.docx

==========

Samuel Hernández Quiñones
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

Lisa Christ---10/25/2011 04:23:39 PM---Got it Sam, please draft the 1-2 page summary. I'll be in late afternoon tomorrow after the AWWA wor

From: Lisa Christ/DC/USEPA/US
To: Eric Burneson/DC/USEPA/US@EPA
Cc: Samuel Hernandez/DC/USEPA/US@EPA
Date: 10/25/2011 04:23 PM
Subject: Re: Pam wants a 1 -2 page summary of the history and Issues with PAG

---

Got it
Sam, please draft the 1-2 page summary. I'll be in late afternoon tomorrow after the AWWA workshop to review.
Lisa
Eric Burneson

----- Original Message -----
**From:** Eric Burneson
**Sent:** 10/25/2011 04:13 PM EDT
**To:** Lisa Christ
**Cc:** Samuel Hernandez
**Subject:** Pam wants a 1 -2 page summary of the history and Issues with PAG
She would like us to find an existing summary of the PAG,(and our concerns) insure it is up to date and send it forward to Nancy Stoner in advance of the meeting. I told her I would ask you 2 to work on this tomorrow.

Hi Lisa,

I have only one edit on page 35 of the Draft PAG Manual. Section 3.5.1, "**maximum ~~contaminate~~ contaminant levels (MCLs)**".

# Ex. 5 - Deliberative Process

Sam

==========
Samuel Hernández Quiñones
Environmental Engineer
Environmental Protection Agency
Office of Water
1200 Pennsylvania Ave. NW
Washington, DC 20460
202-564-1735

"USEPA Protecting Human Health and the Environment"

Lisa Christ---05/23/2012 04:12:58 PM---Hi Sam, Please review the attached guidance and FRN and provide comments to me by COB Friday, May 25

From: Lisa Christ/DC/USEPA/US
To: Samuel Hernandez/DC/USEPA/US@EPA
Date: 05/23/2012 04:12 PM
Subject: Fw: FOR REVIEW: Draft Federal Register Notice and Radiation Guidance

---

Hi Sam,
Please review the attached guidance and FRN and provide comments to me by COB Friday, May 25. If you prefer to meet and talk through the comments like we did this week, schedule a meeting for you and me sometime Tuesday (May 29) morning instead.
Let me know if you have any questions or concerns -
Thanks!
Lisa

----- Forwarded by Lisa Christ/DC/USEPA/US on 05/23/2012 03:48 PM -----

From: Eric Burneson/DC/USEPA/US
To: Lisa Christ/DC/USEPA/US@EPA, Samuel Hernandez/DC/USEPA/US@EPA
Cc: Elizabeth Doyle/DC/USEPA/US@EPA, Phil Oshida/DC/USEPA/US@EPA
Date: 05/23/2012 02:32 PM
Subject: Fw: FOR REVIEW: Draft Federal Register Notice and Radiation Guidance

---

Here is another one we need to respond to.
----- Forwarded by Eric Burneson/DC/USEPA/US on 05/23/2012 02:29 PM -----

From: Debbie Dietrich/DC/USEPA/US
To: Lisa Feldt/DC/USEPA/US@EPA, Larry Stanton/DC/USEPA/US@EPA, Dana Tulis/DC/USEPA/US@EPA, James Woolford/DC/USEPA/US@EPA, Barnes Johnson/DC/USEPA/US@EPA, Pamela Barr/DC/USEPA/US@EPA, Eric Burneson/DC/USEPA/US@EPA, David Travers/DC/USEPA/US@EPA, John

Michaud/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, Mike Flynn/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA
Cc: Juan Reyes/DC/USEPA/US@EPA, Lisa Nanko/DC/USEPA/US@EPA, Cayce Parrish/DC/USEPA/US@EPA
Date: 05/23/2012 02:26 PM
Subject: FOR REVIEW: Draft Federal Register Notice and Radiation Guidance

---

Intra-agency colleagues and PAGs reviewers,

This is in follow-up to Alan Perrin's email of March 28, 2012 and my more recent message of May 17, 2012. Attached for your review is a proposed federal register notice and radiation guidance that has been drafted as a result of Principal Level Exercise (PLE) 3-10.

Since your last review of the PAG Manual and FR Notice in early April (Alan's email), an agreement was reached between EPA, DHS and the White House to incorporate the DHS 2008 RDD/IND Planning Guide into the PAG Manual, in effect, merging the Deputies' PLE Cleanup paper and the RDD/IND Late Phase guidance. Attached are draft versions of the slightly expanded combined Manual and the FR Notice for your review and concurrence.

Since the language in the PAGs and the Deputies' PLE papers has already been approved at a high level, very few changes have been made. Since the last review: most comments received were incorporated; some text was updated to provide bridging language between the Deputies' cleanup paper and the 2008 RDD/IND Late Phase guidance. It is good news that, with this merged document, users will end up with a single guidance for radiological incidents once the PAG Manual is finalized.

I apologize for the current review time frame! EPA is being asked to meet some very demanding external deadlines, unfortunately that means our internal deadlines must be equally demanding. **Please provide your office's consolidated concurrence/comments via email not later than 4:00 pm on Tuesday, May 29, to Alan Perrin with a cc to me**. We are meeting with the Deputy Administrator at 1 pm the following day (5/30) to discuss any remaining issues. Let me know if you have any concerns, and thank you for providing your input on such a short schedule.

[attachment "Draft PAGs FR 5-22-2012.doc" deleted by Samuel Hernandez/DC/USEPA/US] [attachment "Draft 2012 PAG Manual 5-22-2012.doc" deleted by Samuel Hernandez/DC/USEPA/US]

---

Debbie Dietrich
Associate Administrator for Homeland Security
USEPA
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Ph 202-564-6978
Fax 202-501-0026

**From:** "Chick Phillips" <cphillips@scainc.com>
**To:** Sara DeCair/DC/USEPA/US@EPA
**Subject:** Re: Much anticipated: New FRMAC Assessment Manual
**Submit Time:** 8/5/2010 13:57:06

Got it.
Chick Phillips
SC&A
251-202-4640
----- Original Message -----
From: <DeCair.Sara@epamail.epa.gov>
To: "Chick Phillips" <cphillips@scainc.com>
Sent: Thursday, August 05, 2010 1:53 PM
Subject: Re: Much anticipated: New FRMAC Assessment Manual

> One more thing that just came up -- until we start again on dose
> assessment drills (maybe in October or so?) we are changing your NARAC
> account to view-only. In fact, this year we hope to get real live NARAC
> people to do some modeling for us, and we'll switch your account back to
> run-or-view mode when needed. :)
>
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> |---------->
> | From: |
> |---------->
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|
> |"Chick Phillips" <cphillips@scainc.com>
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> |---------->
> | To: |
> |---------->
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|
> |Sara DeCair/DC/USEPA/US@EPA
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> |---------->
> | Date: |
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|
> |08/05/2010 11:27 AM
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> | Subject: |
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|
> |Re: Much anticipated: New FRMAC Assessment Manual
> |
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>
>
>
> Hi Sara,
>
> I did not have an attachment on my email. Please send as I am
> interested in
> it.
>
> Hope all is well with you.
>
> Chick Phillips
> SC&A
> 251-202-4640
> ----- Original Message -----
> From: <DeCair.Sara@epamail.epa.gov>
> To: <Diaz.Angelique@epamail.epa.gov>; <Hooper.CharlesA@epamail.epa.gov>;
>
> <cphillips@scainc.com>; <Liles.Darrell@epamail.epa.gov>;
> <Zhen.Davis@epamail.epa.gov>; <dschneider@scainc.com>;
> <Tupin.Edward@epamail.epa.gov>; <Eng.Jeanette@epamail.epa.gov>;
> <Pate.Joshua@epamail.epa.gov>; <Ralston.Lowell@epamail.epa.gov>;
> <Boyd.Mike@epamail.epa.gov>; <Nelson.Neal@epamail.epa.gov>;
> <Azzam.Nidal@epamail.epa.gov>; <Povetko.Oleg@epamail.epa.gov>;
> <Giardina.Paul@epamail.epa.gov>; <Newkirk.Phillip@epamail.epa.gov>;
> <Clark.Ray@epamail.epa.gov>; <Graham.Richardv@epamail.epa.gov>;

> <Goodman.Roger@epamail.epa.gov>; <Fraass.Ron@epamail.epa.gov>;
> <DeCair.Sara@epamail.epa.gov>; <telofski.scott@epamail.epa.gov>;
> <Boyd.Wesley@epamail.epa.gov>
> Cc: <Ferguson.Rafaela@epamail.epa.gov>
> Sent: Thursday, August 05, 2010 9:01 AM
> Subject: Much anticipated: New FRMAC Assessment Manual
>
>
>>
>> Hi all;
>>
>> This newly issued FRMAC Assessment Manual relieves us of having to
> refer
>> to that bootleg/unofficial Sept. 2007 PAGs Manual for these methods
> and
>> numbers!! Please use it and share it widely. As Lowell notes, it is
>> always being updated (next with plume passage) but is issued
>> infrequently -- just like PAGs :-)
>>
>> S.
>> ----- Forwarded by Sara DeCair/DC/USEPA/US on 08/05/2010 09:57 AM
> -----
>> |---------->
>> | From:  |
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>
>>  |Lowell Ralston/DC/USEPA/US
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>
>>  |Sara DeCair/DC/USEPA/US@EPA, Jennifer Mosser/DC/USEPA/US@EPA
>> |

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>>  |08/04/2010 09:51 AM
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>> | Subject:  |
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>>  |New FRMAC Assessment Manual
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>>
>> See link (below) from Terry.  Volume I, Appendix C, provides the DRLs
>> for all time phases, except plume passage.
>> _____
>> Lowell G. Ralston, PhD
>> Radiation Protection Division
>> Office of Radiation and Indoor Air
>> U.S. Environmental Protection Agency
>> Washington, DC 20460

>>
>> 202-343-9831 voice
>> 202-343-2305 fax
>> ralston.lowell@epa.gov
>> ----- Forwarded by Lowell Ralston/DC/USEPA/US on 08/04/2010 09:47 AM
>> -----
>> |---------->
>> | From:  |
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>
>>  |"Kraus, Terrence D" <tdkraus@sandia.gov>
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>>  |Lowell Ralston/DC/USEPA/US@EPA
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>>  |08/02/2010 03:04 PM
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>> | Subject:  |
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>>  |RE: Question on the derivation/meaning of Surface Deposition DRLs
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> http://www.nv.doe.gov/nationalsecurity/homelandsecurity/frmac/manuals.aspx
>
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>>
>> -----Original Message-----
>> From: Ralston.Lowell@epamail.epa.gov [
>> mailto:Ralston.Lowell@epamail.epa.gov]
>> Sent: Monday, August 02, 2010 7:46 AM
>> To: Kraus, Terrence D
>> Cc: griggs.john@epamail.epa.gov; drbob20@comcast.net
>> Subject: Question on the derivation/meaning of Surface Deposition DRLs
>>
>> Hi Terry,
>>
>> It's been a while...  I hope things have been well with you.
>>
>> If you have a moment, would you please give me a call (703-980-5896)
> to
>> discuss the question above?  I "think" I know the answer, but I wanted
>> to double check with you before I explain it to the group I'm working
>> with.  In particular, I'd like to focus on two examples:
> Cs-137/Ba-137m

>> and Pu-239. According to Table 3.2 of the revised PAG manual
>> (1-7-2009), the DRL values are:
>>
>> For Pu-239, in microCi/m2:
>> Early phase: 43
>> Year one: 30
>> Year two: 74
>>
>> For Cs-137/Ba-137m (same units)
>> Early phase: 1710
>> Year one: 42
>> Year two: 12
>>
>> I re-read the detailed discussion in Chapter 3 of the revised PAG
>> manual, and believe I figured out how the calculations work for these
>> two nuclides. In the case of Pu-239, it appears that the resuspension
>> factor is the key determinant and is responsible for the difference in
>> the DRLs by a factor of ~10 from year one to year two, after
> accounting
>> for the difference in the PAG dose limits of 2000 mrem in the first
> year
>> vs. 500 mrem in the second year. For Cs, the primary driver is
> burial,
>> accounting for a decrease of ~10-14% between years one and two.
>>
>> The larger issue is what do these DRLs values "mean," or more
>> specifically, how should they be applied? As far as I can see, the
> only
>> way they make sense is if you compare your measured soil concentration
>> at the time you sample to the DRL for each time period. For example,
> if
>> I analyzed a soil sample on day 2 after a release and found 50
>> microCi/m2 of Pu-239, then, looking at the DRLs for this nuclide, I
>> would conclude: (1) I exceeded the early phase PAG of 1000 mrem, (2) I
>> will exceed the Year One PAG of 2000 mrem, and (3) I will not exceed
> the
>> Year Two PAG of 500 mrem. However, if I measured 25 microCi/m2 at day
>> 300, I would conclude that no PAGs are or will be exceeded. Am I
>> interpreting this correctly?
>>
>> Anyway, I'd appreciate a consultation at your convenience.
>>
>> Thanks,
>> Lowell
>>
>> _____
>> Lowell G. Ralston, PhD

>> Radiation Protection Division
>> Office of Radiation and Indoor Air
>> U.S. Environmental Protection Agency
>> Washington, DC 20460
>>
>> 202-343-9831 voice
>> 202-343-2305 fax
>> ralston.lowell@epa.gov
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> --
> I am using the free version of SPAMfighter.
> We are a community of 7 million users fighting spam.
> SPAMfighter has removed 19965 of my spam emails to date.
> Get the free SPAMfighter here: http://www.spamfighter.com/len
>
> The Professional version does not have this message
>
>
>
>
>

--
I am using the free version of SPAMfighter.
We are a community of 7 million users fighting spam.
SPAMfighter has removed 20020 of my spam emails to date.
Get the free SPAMfighter here: http://www.spamfighter.com/len

The Professional version does not have this message

**From:** Melody Geer <mgeer@trininc.com>
**To:** Thomas Agee/DC/USEPA/US@EPA
**Cc:** Sara DeCair/DC/USEPA/US@EPA
**Subject:** RE: draft training outlines and questions about Work assignment
**Submit Time:** 9/19/2011 15:12:00

Thanks, Thomas. I already had a copy of the Worker Exposure example; just hadn't gotten that far in the outline.

I will make the changes and flesh it out just a little more and send it back to y'all.

I am available on Wednesday afternoon for the webinar familiarization - just let me know when (and how!).

I am awaiting a review of the (initial) work plan by one person and will have it to Sara by this afternoon. We can make revisions after receiving the revised work assignment.

-----Original Message-----
From: Agee.Thomas@epamail.epa.gov [mailto:Agee.Thomas@epamail.epa.gov]
Sent: Monday, September 19, 2011 10:57 AM
To: Melody Geer
Cc: DeCair.Sara@epamail.epa.gov
Subject: RE: draft training outlines and questions about Work assignment

Melody, here are the suggested edits and answers to your questions that Sara and I discussed this morning. I've also attached the PAGs sample problems from an earlier mini-drill in case you wanted to see the emergency worker sample question.

(See attached file: Revised PAG Training Outline_9_19_2011_TA edits.docx)(See attached file: Examples on PAGs Oct 2008.ppt)

-Will you be available for about 20-30 minutes sometime Wednesday afternoon to test your access to the EPA portal and webinar system?
(1ish/2ish)

-Val also tells me that the amended WA is still awaiting Contractor Office approval and should (maybe?) be in your hands by the end of the week. It's annoying how slow that office runs.

Best,

Thomas Agee
Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov
Office: (202)-343-9933
Fax: (202)-343-2302

From: Melody Geer <mgeer@trininc.com>
To: Sara DeCair/DC/USEPA/US@EPA
Cc: Thomas Agee/DC/USEPA/US@EPA
Date: 09/19/2011 10:32 AM
Subject: RE: draft training outlines and questions about Work assignment

Yes, I will be happy to draft an agenda for Thursday's call. I will try to have it to you by COB tomorrow. I look forward to getting the information from Thomas. I also have a draft of the EXCEL workbook almost ready to send to you.

Good idea to start on RadNet after that. I have someone that will be plowing through the RadNet website(s) later this week.

Melody

-----Original Message-----
From: DeCair.Sara@epamail.epa.gov [mailto:DeCair.Sara@epamail.epa.gov]
Sent: Monday, September 19, 2011 10:27 AM
To: Melody Geer
Cc: Agee.Thomas@epamail.epa.gov
Subject: Re: draft training outlines and questions about Work assignment

Hi Melody!

Thomas will send you some updates, just minor additions and a plan to test EPA's webinar system with you this week to see if it works for our purposes.

I wonder if you could pull together an agenda for Thursday's team call with a run-through of the PAGs outline, and substantive material drafts that we have in hand already, to gauge the Team's feel for the material?
If you have other substantive ideas for our call, let us know, too.

Then maybe the next Team call could focus on RadNet, if that seems timely, and we can have a couple chats in between to flesh out those materials.

Thanks for letting me know if that sounds good,

Sara

From: Melody Geer <mgeer@trininc.com>
To: Sara DeCair/DC/USEPA/US@EPA, Thomas Agee/DC/USEPA/US@EPA

Date: 09/15/2011 05:02 PM
Subject: draft training outlines and questions about Work assignment

Sara: I am looking forward to our call tomorrow at 12:30 p.m. I especially need a number of questions answered about the work assignment so that I can finish the work plan and get it to you. I have attached my questions so that you will know what I need.

I have also attached a revision to the PAG training outline and the RadNet training outline. We need to talk about those also so that I can be heading in the correct direction on them.

I have started a workbook on the differences between the 92 PAG manual tables and the 2003 and 2010 FRMAC tables. We can talk about it tomorrow also.

Thanks!

Melody

Melody Geer

Trinity Engineering Associates

mgeer@trininc.com<mailto:mgeer@trininc.com>

724-473-0650

980-241-2724 (cell)
[attachment "Questions for Sara about WA 2 - Rev1.docx" deleted by Sara DeCair/DC/USEPA/US] [attachment "PAG training outline, rev 1.docx" deleted by Sara DeCair/DC/USEPA/US] [attachment "RadNet training outline, rev 0.docx" deleted by Sara DeCair/DC/USEPA/US]

Yep, this works well. I had asked Glenna the other day about making it searchable and she told me we could do an electronic OCR. It looks like that was done to this version. I will ask her if they can post it.

Is there something else you wanted me to work on for the PAGs? **Where is the document that you refer to in this PAG FAQ?** We could ask Glenna's center to post it as well.

> The PAGs were developed for a nuclear power plant incidents. Are they also appropriate for a non-NPP incident?
>
> - A Symposium in [need to make a link here – we have the document scanned but it's not posted on web yet] concluded that the PAGs were also applicable to non-NPP incidents, such as transportation and industrial incidents. DHS's 2006 RDD/IND Application of PAGs document also vetted the EPA PAGs for use in RDD and IND responses.

Best,

Thomas Agee
Radiological Emergency Management Intern
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov
Office: (202)-343-9933
Fax: (202)-343-2302

Sara DeCair---09/30/2009 10:57:07 AM---See if this is better than our PAG manual on the web page? If so, ask Glenna's center to post it? Tx

From: Sara DeCair/DC/USEPA/US

To: agee.thomas@epa.gov

Date: 09/30/2009 10:57 AM

Subject: Fw: Searchable .pdf

---

See if this is better than our PAG manual on the web page? If so, ask Glenna's center to post it? Tx!!
S.
---
Sent by EPA Wireless E-Mail Services

---

**From:** "Daniel R. Ruedy" [druedy@endyna.com]
**Sent:** 09/29/2009 01:53 PM AST
**To:** Sara DeCair
**Subject:** Searchable .pdf

Good Afternoon Sara,
I checked through the MS Word files of the original, but then thought that it may be better to do this with the original .pdf and preserve the look and feel of the 1992 document. This also frees the text to be copied into word processing applications with moderate fidelity.

Best,
Daniel

Daniel R. Ruedy | Program Advisor
P: 703.848.3529 | F: 703.848.9001
druedy@endyna.com

**EnDyna, Inc.**
7925 Jones Branch Drive.
Suite 5300
McLean, VA 22102
www.endyna.com

[attachment "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents.pdf" deleted by Thomas Agee/DC/USEPA/US]

Dangit!
---
Sent by EPA Wireless E-Mail Services
Thomas Agee

----- Original Message -----
**From:** Thomas Agee
**Sent:** 06/30/2010 02:08 PM EDT
**To:** Sara DeCair
**Subject:** Re: PAGs - Respond with availability for Conf Call
You still have Colby on there :(

Thomas Agee
Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov
Office: (202)-343-9933
Fax: (202)-343-2302

Sara DeCair---06/30/2010 02:07:01 PM---PAGs Partners; I am hoping to set up a 60 to 90 minute conference call to discuss the PAGs Manual re

From: Sara DeCair/DC/USEPA/US

To: Andrew.Wallo@eh.doe.gov, cym3@cdc.gov, man@cdrh.fda.gov, patricia.milligan@nrc.gov, ricardo.reyes@dtra.mil, stanton.colby@epa.gov, Sara DeCair/DC/USEPA/US@EPA, stephen.domotor@eh.doe.gov, Vanessa.Quinn@dhs.gov, william.cunningham@nist.gov, walker.stuart@epa.gov, ammon.doug@epa.gov, schumann.jean@epa.gov, Ferris.John@dol.gov, druedy@endyna.com, siddhanti@endyna.com, asa4@CDC.GOV, Jack.Patterson@rss.usda.gov, tdkraus@sandia.gov, "Conklin, Craig" <craig.conklin@HQ.DHS.GOV>, "MacKinney, John A" <John.Mackinney@dhs.gov>

Cc: Alan Perrin/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Darrell Liles/DC/USEPA/US@EPA, Nate McMichael/DC/USEPA/US@EPA, Jessica Wieder/DC/USEPA/US@EPA, Thomas Agee/DC/USEPA/US@EPA

Date: 06/30/2010 02:07 PM

Subject: PAGs - Respond with availability for Conf Call

---

PAGs Partners;

I am hoping to set up a 60 to 90 minute conference call to discuss the PAGs Manual revision. The Agency administration has reviewed our Jan. 2009 proposal and we're ready to get started again toward getting the revision out for public review & comment! By COB on Thursday, July 8th, please tell me which of these times you are NOT available for a call. Thank you so much, and I look forward to talking with you!

Monday, July 19, 9 to 11 am
Wednesday, July 21, 9 to 11 am or 1 to 3 pm
Thursday, July 22, 9 to 11 am

Sara
Sara D. DeCair, Health Physicist

www.epa.gov/radiation/rert/pags.html
Center for Radiological Emergency Management
U.S. Environmental Protection Agency
office (202) 343-9713
fax (202) 343-2304
decair.sara@epa.gov

Ex. 5 - Deliberative Process

-----Thomas Agee/DC/USEPA/US wrote: -----

To: Sara DeCair/DC/USEPA/US@EPA
From: Thomas Agee/DC/USEPA/US
Date: 07/23/2010 01:01PM
Subject: Re: Action Plan

Ex. 5 - Deliberative Process

Thomas Agee
Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov
Office: (202)-343-9933
Fax: (202)-343-2302

Ex. 5 - Deliberative Process

From: Sara DeCair/DC/USEPA/US

To: Thomas Agee/DC/USEPA/US@EPA

Date: 07/23/2010 12:04 PM

Subject: Re: Action Plan

---

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

-----Thomas Agee/DC/USEPA/US wrote: -----

To: Sara DeCair/DC/USEPA/US@EPA
From: Thomas Agee/DC/USEPA/US
Date: 07/23/2010 10:04AM
Subject: Re: Action Plan

Hey,

Ex. 5 - Deliberative Process

Thomas Agee
Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov
Office: (202)-343-9933
Fax: (202)-343-2302

Ex. 5 - Deliberative Process

Welcoming your thoughts, and thank you for moving the ball while I'm gone!
S.
---
Sent by EPA Wireless E-Mail Services
Jonathan Edwards

----- Original Message -----
**From:** Jonathan Edwards
**Sent:** 05/11/2010 08:17 AM EDT
**To:** Alan Perrin; Lee Veal; Sara DeCair
**Subject:** Fw: Next Steps on PAGs
FYI
---
Sent from my BlackBerry Wireless Handheld (www.BlackBerry.net)
Jonathan Edwards

----- Original Message -----
**From:** Jonathan Edwards
**Sent:** 05/11/2010 08:16 AM EDT
**To:** Mike Flynn
**Subject:** Re: Next Steps on PAGs
Great!--thanks, Jon
---
Sent from my BlackBerry Wireless Handheld (www.BlackBerry.net)
Mike Flynn

----- Original Message -----
**From:** Mike Flynn
**Sent:** 05/11/2010 08:15 AM EDT
**To:** Jonathan Edwards
**Subject:** Fw: Next Steps on PAGs
Fyi I'm meeting with Dana later this week.
to ----------\Sent by EPA Wireless E-Mail Services.
Mike Flynn

----- Original Message -----
**From:** Mike Flynn
**Sent:** 05/10/2010 06:40 PM EDT
**To:** Dana Tulis
**Subject:** Fw: Next Steps on PAGs

Ex. 5 - Deliberative Process

Mike Flynn, Director
Office of Radiation and Indoor Air (MC-6601-J)
U.S. Environmental Protection Agency
Phone: (202) 343-9320
Fax: (202) 343-2395

----- Forwarded by Mike Flynn/DC/USEPA/US on 05/10/2010 06:37 PM -----

From: Mike Flynn/DC/USEPA/US

To: Dana Tulis/DC/USEPA/US@EPA, Barnes Johnson/DC/USEPA/US@EPA, Elizabeth Southerland/DC/USEPA/US@EPA, Cynthia Dougherty/DC/USEPA/US@EPA, Pamela Barr/DC/USEPA/US@EPA, Mary-Kay Lynch/DC/USEPA/US@EPA, Richard Ossias/DC/USEPA/US@EPA

Cc: Jonathan Edwards/DC/USEPA/US@EPA, Alan Perrin/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Jean Schumann/DC/USEPA/US@EPA, Stuart Walker/DC/USEPA/US@EPA, Wynne Miller/DC/USEPA/US@EPA, David Huber/DC/USEPA/US@EPA

Date: 05/10/2010 06:32 PM

Subject: Next Steps on PAGs

---

# Ex. 5 - Deliberative Process

Thanks for all your efforts on this. If you have any questions, please give me a call or contact Alan Perrin at 202.343.9775.

Mike Flynn, Director
Office of Radiation and Indoor Air (MC-6601-J)
U.S. Environmental Protection Agency
Phone: (202) 343-9320
Fax: (202) 343-2395

----- Forwarded by Mike Flynn/DC/USEPA/US on 05/10/2010 05:59 PM -----

From: Alan Perrin/DC/USEPA/US

To: Dana Tulis/DC/USEPA/US@EPA, Barnes Johnson/DC/USEPA/US@EPA, Elizabeth Southerland/DC/USEPA/US@EPA, Cynthia Dougherty/DC/USEPA/US@EPA, Pamela Barr/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA

Cc: Jonathan Edwards/DC/USEPA/US@EPA, Mike Flynn/DC/USEPA/US@EPA, Jean Schumann/DC/USEPA/US@EPA, Stuart Walker/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Wynne Miller/DC/USEPA/US@EPA, David Huber/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA

Date: 04/30/2010 03:31 PM

Subject: PAGs paper

---

Thank you for the comments you provided on the PAGs talking points for meeting with the Administrator. Your comments were used to produce the attached revision of the paper, and the revision has been forwarded to Gina McCarthy. -Alan

[attachment "PAGs_draft_adp-v2.doc" deleted by Jonathan Edwards/DC/USEPA/US]
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

**Alan Perrin**

Deputy Director, Radiation Protection Division
Office of Radiation and Indoor Air, USEPA
1200 Pennsylvania Avenue, NW (6608J)
Washington, DC 20460

phone: (202) 343-9775
fax: (202) 343-2304
perrin.alan@epa.gov
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

**Subject:** PAG comments
**To:** "Kylie Zirbel" <kzirbel@endyna.com>
**Cc:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Darrell Liles/OU=DC/O=USEPA/C=US
**Submit Time:** 4/14/2011 11:31:06

Kylie,

# Ex. 5 - Deliberative Process

Any questions email or call me. I'm temporarily at Ex. 6 - Personal Privacy

Darrell Liles
Health Physicist
Center for Radiological Emergency Management
Environmental Protection Agency MC-6608J
1200 Pennsylvania Ave NW
Washington DC 20460-1000
Phone (202)343-9550

------ Forwarded by Darrell Liles/DC/USEPA/US on 04/14/2011 11:21 AM ------

From: Ofori Boateng/DC/USEPA/US@EPA
To: Darrell Liles/DC/USEPA/US@EPA
Date: 04/14/2011 11:14 AM
Subject: Scanned from a Xerox multifunction device

---

Please open the attached document. It was scanned and sent to you using a Xerox multifunction device.

Attachment File Type: PDF

multifunction device Location: machine location not set
Device Name: XRX0000AAC37CF0

For more information on Xerox products and solutions, please visit http://www.xerox.com

Scanned001.PDF Scanned001.PDF

**Subject:** PAG Manual: Chapter 2; a few edits, many questions
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA CN=Darrell Liles/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Glenna Shields/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Tony Nesky/OU=DC/O=USEPA/C=US
**Submit Time:** 8/2/2010 12:22:17

Attached is my first cut at an edit of Chapter 2. **Ex. 5 - Deliberative Process**

# Ex. 5 - Deliberative Process

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Chapter 2-TN.doc Chapter 2-TN.doc

Mario,

You are certainly welcome. We'll do our best to keep you (and the EPA team) up to speed. Please do feel free to give us a call if you do have any questions about what we are doing.

Lee

Lee B. Veal
Director, Center for Radiological Emergency Management
Radiation Protection Division
Office of Radiation and Indoor Air
Environmental Protection Agency
1310 L Street, NW
Washington DC, 20005
Mail Code: 6608J
202-343-9448
cell 202-617-4322

Mario Ierardi---10/07/2010 08:28:50 AM---Lee, Thanks for providing this to me. I had asked about this previously and was told I could not

From: Mario Ierardi/DC/USEPA/US

To: Lee Veal/DC/USEPA/US@EPA

Cc: Sara DeCair/DC/USEPA/US@EPA

Date: 10/07/2010 08:28 AM

Subject: Re: Fw: PAGs one-pager for you

---

Lee,

**Ex. 5 - Deliberative Process**

"Begin with the end in mind.....How are you going to handle your waste?" ..... Visit us at:
www.epa.gov/waste/homeland/

Mario E. Ierardi
Homeland Security Team Leader
Waste Characterization Branch
Materials Recovery and Waste Management Division (MC: 5304P)
U.S. EPA Office of Resource Conservation and Recovery
1200 Pennsylvania Ave, NW
Washington, D.C. 20460-0001

P (703) 308-8894

F (703) 308-0522
Email: ierardi.mario@epa.gov

Send couriers to:
Two Potomac Yard
5th Floor, Room N-5847
2733 South Crystal Dr
Arlington, VA 22202

Lee Veal---09/30/2010 05:23:49 PM---Dear Mario, It was so nice to see you again this week! Glad to be out of the EOC.

From: Lee Veal/DC/USEPA/US

To: Mario Ierardi/DC/USEPA/US@EPA

Cc: Sara DeCair/DC/USEPA/US@EPA

Date: 09/30/2010 05:23 PM

Subject: Fw: PAGs one-pager for you

---

Dear Mario,

It was so nice to see you again this week! Glad to be out of the EOC.

**Ex. 5 - Deliberative Process**

Call me or Sara DeCair if you have any questions.

Lee

Lee B. Veal
Director, Center for Radiological Emergency Management
Radiation Protection Division
Office of Radiation and Indoor Air
Environmental Protection Agency
1310 L Street, NW
Washington DC, 20005
Mail Code: 6608J
202-343-9448
cell 202-617-4322

[attachment "One pager on new Agency direction 9-30-2010.doc" deleted by Mario

lerardi/DC/USEPA/US]

See what Alan thinks. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

---

Sent by EPA Wireless E-Mail Services
Jessica Wieder

----- Original Message -----
**From:** Jessica Wieder
**Sent:** 11/03/2009 03:13 PM EST
**To:** Colby Stanton
**Cc:** Sara DeCair
**Subject:** Re: Cmts from Colby -- Markey responses

I am pretty happy with the responses to 4. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process Take a look. Let me know if you want us to add it in.

Jessica Wieder
U.S. Environmental Protection Agency
Radiation Protection Division
Center for Radiation Information
(202) 343-9201

Colby Stanton---11/03/2009 03:07:55 PM---Oh, sorry, I wasn't saying broad range should be in #7 - that's just where I thought of it, at the e

From: Colby Stanton/DC/USEPA/US

To: Jessica Wieder/DC/USEPA/US@EPA

Cc: "Sara DeCair" <Decair.Sara@epamail.epa.gov>

Date: 11/03/2009 03:07 PM

Subject: Re: Cmts from Colby -- Markey responses

---

Oh, sorry, I wasn't saying broad range should be in #7 - that's just where I thought of it, at the end. I guess it would belong in #4?

---

Sent by EPA Wireless E-Mail Services

Jessica Wieder

----- Original Message -----
**From:** Jessica Wieder
**Sent:** 11/03/2009 03:03 PM EST
**To:** Sara DeCair; Colby Stanton
**Cc:** Alan Perrin; Nate McMichael; Thomas Agee
**Subject:** Re: Cmts from Colby -- Markey responses

Here is the updated version - with track changes.

A question back to the group...

Ex. 5 - Deliberative Process

# Ex. 5 - Deliberative Process

Enjoy!

[attachment "MARKEY CONTROL RESPONSE 11-3-2009 v2.doc" deleted by Colby Stanton/DC/USEPA/US]

Nate, Thomas and Jess (your personal writing think tank)

Jessica Wieder
U.S. Environmental Protection Agency
Radiation Protection Division
Center for Radiation Information
(202) 343-9201

Sara DeCair---11/03/2009 01:35:31 PM---Next!!! ----- Forwarded by Sara DeCair/DC/USEPA/US on 11/03/2009 01:34 PM -----

From: Sara DeCair/DC/USEPA/US

To: Nate McMichael/DC/USEPA/US@EPA, Jessica Wieder/DC/USEPA/US@EPA, Thomas Agee/DC/USEPA/US@EPA

Cc: Alan Perrin/DC/USEPA/US@EPA

Date: 11/03/2009 01:35 PM

Subject: Cmts from Colby -- Markey responses

---

Next!!!
[attachment "MARKEY CONTROL RESPONSE 11-3-2009.doc" deleted by Jessica Wieder/DC/USEPA/US]

----- Forwarded by Sara DeCair/DC/USEPA/US on 11/03/2009 01:34 PM -----

From: Colby Stanton/DC/USEPA/US

To: Sara DeCair/DC/USEPA/US@EPA, Alan Perrin/DC/USEPA/US@EPA

Date: 11/03/2009 01:32 PM

Subject: Re: Time to read Markey responses on b-berry?

---

# Ex. 5 - Deliberative Process

Thanks for all the hard work!
---
Sent by EPA Wireless E-Mail Services
Sara DeCair

----- Original Message -----
**From:** Sara DeCair
**Sent:** 11/03/2009 01:16 PM EST
**To:** Colby Stanton; Alan Perrin
**Subject:** Time to read Markey responses on b-berry?

Here is a long paste -- at this point, will you take a look (and Alan, too?) and then tomorrow morning I can include people like Mike Boyd, Dana Tulis, and Jon? Who else? Sue, who is coordinating for OGC? Thomas and Nate drafted these then Jess helped edit before I did some edits. We have bets that a lot of detail will be cut on its way up... thanks for any suggestions!! (It takes a village...)

*DRAFT – MARKEY LETTER CONTROL RESPONSE to PAGs QUESTIONS*

# Ex. 5 - Deliberative Process

# Ex. 5 - Deliberative Process

# Ex. 5 - Deliberative Process

**Submit Time:** 9/30/2010 17:17:06
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** PAGs one-pager for you

Lee -- I think this still reflects our understanding of the new PAGs approach, and I updated a couple things to make it current, but is there anything else you wish was mentioned? Let me know, and thank you!

S.

One pager on new Agency direction 9-30-2010.doc One pager on new Agency direction 9-30-2010.doc

## Proposed Protective Action Guides (PAGs) Manual Revision and Update

### Background

- A draft 2008 revision to the EPA 1992 Manual of Protective Actions Guides and Protective Actions for Nuclear Incidents (the PAGs Manual) was held (per Emanuel memo) for review by the new Administration just prior to its being slated for public review and comment.

- The draft 2008 PAGs Manual revision included science updates (dosimetry and dose calculations), and two new updates – a drinking water PAG level and guidance for late phase cleanup. Per Office of Management and Budget (OMB) advice, public review of the draft 2008 revision would have been limited to the new dosimetry and drinking water chapter.

- In 2008, the Department of Homeland Security (DHS) issued guidance for terrorist incidents called the "Planning Guidance for Protection and Recovery Following Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents." This DHS document includes a drinking water PAG and an "optimization" approach for long-term recovery. A sunset provision in the DHS guidance states it will be incorporated into the new EPA PAGs manual.

- Given the concerns that have been raised including congressional interest (e.g., Boxer and Markey), the existing DHS guidance, and the pressing demand for updated guidance for emergency responders, the EPA administrator has decided upon a new direction for revising the PAGs Manual.

### Proposed Approach

- Confine the PAGs Manual scope to the Early and Intermediate Phases, focusing on emergency response.
    - No drinking water PAG is provided because EPA has established enforceable drinking water standards for radionuclides under the Safe Drinking Water Act.
    - No late phase cleanup guidance is provided because it is outside the scope of emergency response, and existing state and federal regulations and programs are available for clean-up following a radiological emergency.

- The final DHS "Planning Guidance for Protection and Recovery Following RDD and IND Incidents" document states that the DHS guidance will be incorporated in its entirety into the revision of the 1992 EPA PAGs Manual. Due to reasons noted above including the limit on the scope of the revised EPA PAGs Manual, EPA will not be incorporating the DHS Planning Guidance for RDD and IND Incidents into the EPA PAGs revision.

- Issue the complete draft Manual for public review to provide for better participation by stakeholders.

### Next Steps

- Reconvene the interagency PAGs Subcommittee that supports the development process for the EPA PAGs Manual to discuss how to best implement the proposed approach.

- Once agreement has been reached at the Federal level, the revised PAGs manual, in its entirety, would be published in the Federal Register for public comment.
- The interagency workgroup will reconvene after the public comment period.
- If, after public review, comments suggest reconsidering the established (1992) early and intermediate PAG levels, there may be significant implications for Nuclear Regulatory Commission and Federal Emergency Management Agency regulations, and for state and local planning efforts around nuclear power plants.



ED_001057C_T3_00068491

Ex. 5 - Deliberative Process

Bill Steuteville
USEPA III (3HS30)
1650 Arch Street
Philadelphia, PA 19103
(215) 814-3264
Fax (215) 814-3254

Ex. 5 - Deliberative Process

From: Colby Stanton/DC/USEPA/US

To: Sara DeCair/DC/USEPA/US@EPA, William Steuteville/R3/USEPA/US@EPA

Cc: "Colby Stanton" <stanton.colby@epa.gov>, "Jessica Wieder" <wieder.jessica@epa.gov>

Date: 02/03/2010 01:48 PM

Subject: Re: exercise questions (Inside EPA)

---

Ex. 5 - Deliberative Process

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Sent by EPA Wireless E-Mail Services
Sara DeCair

----- Original Message -----
**From:** Sara DeCair
**Sent:** 02/03/2010 01:44 PM EST
**To:** William Steuteville
**Cc:** "Colby Stanton" <stanton.colby@epa.gov>; wieder.jessica@epa.gov
**Subject:** Re: exercise questions (Inside EPA)

Bill -

Ex. 5 - Deliberative Process

Sara
---
Sent by EPA Wireless E-Mail Services
William Steuteville

----- Original Message -----
**From:** William Steuteville
**Sent:** 02/03/2010 01:20 PM EST

**To:** Sara DeCair
**Subject:** Fw: exercise questions (Inside EPA)

# Ex. 5 - Deliberative Process

Bill Steuteville
USEPA III (3HS30)
1650 Arch Street
Philadelphia, PA 19103
(215) 814-3264
Fax (215) 814-3254
----- Forwarded by William Steuteville/R3/USEPA/US on 02/03/2010 01:12 PM -----

From: Terri-A White/R3/USEPA/US

To: William Steuteville/R3/USEPA/US@EPA

Date: 02/03/2010 01:08 PM

Subject: Fw: exercise questions (Inside EPA)

---

Bill -- asking for clarification...
----- Forwarded by Terri-A White/R3/USEPA/US on 02/03/2010 01:08 PM -----

**Doug Guarino <doug.guarino@iwpnews.com>**

02/02/2010 05:22 PM

To

Terri-AWhite/R3/USEPA/US@EPA

cc

Subject

Terri,

Thanks for the response. I'm not sure however what you mean when you say "exercise players will consider all appropriate cleanup standards for all media in their cleanup planning." Which cleanup standards are considered appropriate? Will they be considering standards included in the new Protective Action Guidance (PAG) that EPA drafted last year (and if so, which ones?). Will they consider the Superfund Removal Action Levels (RALs)? Both? Neither? Any additional information you can provide me would be most helpful.

My deadline is Thursday.

Thanks again.

--
Douglas P. Guarino
Associate Editor
Inside Washington Publishers
(Inside EPA's Superfund Report)
1919 South Eads Street, Suite 201
Arlington, VA 22202
703-416-8518
fax:703-416-8543
mailto:dguarino@iwpnews.com

White.Terri-A@epamail.epa.gov wrote:
> Hi Doug,
>
> Here are answers to your question. We hope you'll consider coming to
> Philly to cover the exercise. We plan to hold a media briefing and tour
> on April 27; more info to come. -- Terri
>
> The exercise scenario is in the "post-emergency" phase (approximately 30
> to 90 days) of a radiological dirty bomb incident. The scenario
> envisions a dispersion of Cesium 137 over a very wide area (almost 50
> linear miles, 300 square miles). The largest concern for public health
> during this time frame in the scenario is surface concentrations of
> Cesium 137 in soil, pavement, buildings, cars, vegetation, etc., which
> contribute to the overall radiological dose/exposure to the public and
> response personnel. Exercise planners believe that response agencies,
> including EPA, would be concerned for reducing total radiation dose from
> all sources (air, water, soil, building, etc.) until final cleanup is
> achieved. Final cleanup of such an incident will take many years.
> Until final cleanup is achieved, response agencies would seek to reduce
> public dose/exposure through temporary and long-term relocation, interim
> mitigation and cleanup actions, and by planning long-term/final cleanup
> actions to address highest exposures first. Essentially, the purpose of
> exercise is to consider how response agencies will tackle these
> difficult issues.
>
> Generally, air concentrations will not be an issue for the exercise.
> The exercise planners believe that air concentrations in this time-frame

> would be low and have not developed the scenario to where air
> concentrations play a significant role in the exercise. Significant
> soil contamination is a predicted outcome of a radiological dirty bomb.
> Soil concentrations represent a significant factor for total
> radiological dose/exposure to the public and response personnel and are
> a concern for the exercise. Exercise planners have not specified soil
> cleanup standards. It is expected that exercise players will consider
> all appropriate cleanup standards for all media in their cleanup
> planning.
>
> In contrast, drinking water standards were considered by exercise
> planners because the safety of the public water supply is something that
> EPA, state and local officials would have ascertained and addressed in
> the emergency phase of the incident and the exercise planners developed
> the scenario accordingly. It is also true that exercise planners
> believe that the specific circumstances of the Liberty RadEx scenario
> and the water supply would not result in public drinking water supplies
> exceeding applicable drinking water standards.
>
>
>
> Doug Guarino
> <doug.guarino@iw
> pnews.com> To
> Terri-A White/R3/USEPA/US@EPA
> 01/19/2010 06:24 cc
> PM
> Subject
> Re: exercise questions
>
>
>
>
>
>
>
>
>
>
> Terri -- Thanks again for this -- it is very helpful. Can you tell me
> what standards the agency will use during the exercise for soil,
> buildings and air?
>
> --
> Douglas P. Guarino
> Associate Editor
> Inside Washington Publishers
> (Inside EPA's Superfund Report)
> 1919 South Eads Street, Suite 201
> Arlington, VA 22202
> 703-416-8518
> fax:703-416-8543
> mailto:dguarino@iwpnews.com
>
>
>

> Thanks again.
>
> White.Terri-A@epamail.epa.gov wrote:
>
>> Hi Doug,
>>
>> Here is background on Liberty RadEx and responses to your two
>>
> questions:
>
>> Liberty RadEx is a National Tier 2 (Federal-wide, DHS sanctioned)
>> radiological dispersion device (RDD) or "dirty bomb" exercise. It is
>>
> a
>
>> "post-emergency" exercise. A dirty bomb is a conventional
>> explosive--not a nuclear weapon--which is coupled with radioactive
>> material to cause widespread radiation contamination. Liberty RadEx
>>
> is
>
>> the first Tier 2 exercise sponsored by EPA. EPA has been planning the
>> exercise for over a year. It was proposed by EPA in 2008 and was
>> intended to address activities that are important to EPA and EPA's
>> National Response Framework hazardous substances responsibilities.
>>
> EPA
>
>> participates in almost all national exercises and we have many
>> responsibilities but they all boil down to protecting the public from
>> exposure to hazardous substances including, but not exclusively,
>> chemical, biological and radiological WMD agents. Most exercises deal
>> with the first few days of an incident. Although EPA would and does
>> respond in the first hours of an emergency and would begin critical
>> assessment and cleanup activities immediately, for a wide-spread
>> incident involving radiological contamination, the cleanup is only
>> really beginning in earnest after the first week. The cleanup would
>> take weeks, months or years depending on the size of the incident.
>> Liberty RadEx will address the post-emergency cleanup following a
>> notional RDD attack with Cesium-137 that has caused wide-spread
>> contamination over many miles. It will address how EPA, the State and
>> locals manage the assessment and cleanup, how we coordinate the
>>
> cleanup
>
>> with health agencies and others, and how we coordinate our activities
>> with all the other post-emergency response activities that would be
>> going on at the same time. The cleanup impacts all the other response
>> and recovery activities and other response and recovery activities
>> impact the cleanup. There will be approximately 20 other Federal
>> agencies involved in the exercise as well as the City of Philadelphia
>> Office of Emergency Management and Pennsylvania Department of
>> Environmental Protection. It is a complex exercise involving many
>> different issues.
>>
>> As for your question about recent terrorism incidents: The recent

>> attempt to detonate an explosive on an airplane does not impact the
>> Liberty RadEx scenario or activities.
>>
>> As to the water standard: The water standard we will use for Liberty
>> RadEx for Cesium 137 is the derived drinking water MCL which is 200
>> pCi/L, (picocuries per liter of water). This yields a dose of 4
>>
> mrem/yr
>
>> to the total body or any critical organ.
>>
>> Here is the page which references the Cesium 137 MCL:
>>
>> This page is from a Small Systems Radionuclide Compliance guide that
>>
> is
>
>> on our website:
>>
>>
> http://www.epa.gov/safewater/radionuclides/pdfs/guide_radionuclides_smallsystems_compliance.pdf
>
>
>> I hope this is helpful. -- Terri
>>
>> Terri A. White
>> Office of Public Affairs
>> EPA Region 3
>> 215-814-5523
>>
>>
>>
>>
>
>
>> Doug Guarino
>>
>
>
>> <doug.guarino@iw
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>> pnews.com>
>>
> To
>
>> Terri-A White/R3/USEPA/US@EPA
>>
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>
>> 01/07/2010 11:54
>>
> cc
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>> AM

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>
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> Subject
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>> exercise questions
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>>
>> As discussed I wanted to chat on background about whether the recent
>> terrorism scare would have any impact on EPA's planned drills. I was
>> also curious as to what water standards would be used during the
>>
> drill.
>
>> No need to quote anybody.
>>
>> Thanks.
>>
>> --
>> Douglas P. Guarino
>> Associate Editor
>> Inside Washington Publishers
>> (Inside EPA's Superfund Report)
>> 1919 South Eads Street, Suite 201
>> Arlington, VA 22202
>> 703-416-8518
>> fax:703-416-8543
>> mailto:dguarino@iwpnews.com
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**Subject:** Fw: QUICK TURNAROUND ASSIGNMENT -- DUE by Noon, Monday November 30
**To:** OAR-ORIA-RPD-CREM
**Cc:**
**From:** CN=Colby Stanton/OU=DC/O=USEPA/C=US
**Submit Time:** 11/24/2009 12:52:09

Anyone have anything? The only thing I could think of was PAGs, which I'm asking Jon whether we want to include....
----- Forwarded by Colby Stanton/DC/USEPA/US on 11/24/2009 12:51 PM -----

From: Rafaela Ferguson/DC/USEPA/US

To: Tom Peake/DC/USEPA/US@EPA, Glenna Shields/DC/USEPA/US@EPA, Colby Stanton/DC/USEPA/US@EPA, Jerome Puskin/DC/USEPA/US@EPA

Cc: Mike Boyd/DC/USEPA/US@EPA

Date: 11/24/2009 12:40 PM

Subject: QUICK TURNAROUND ASSIGNMENT -- DUE by Noon, Monday November 30

---

Hi Everyone --

The Administrator's Office is preparing a document for the White House on "big deal" items that will happen in FY 2010. OAR wants input from all of its program offices indicating things like expected date of proposed rules, expected date of final rules, and any other "big deal" action, document, or items in FY 2010. They are looking for a one to two sentence description for each item explaining the action and any other relevant information.

**Please send any items you have to me by 10:00 am Monday, November 30**. I will get them to Jon for review and approval so we can submit RPD's to Dennis O'Connor by noon.

Thanks.

Rafie

Rafaela Ferguson
Special Assistant/Regional Coordinator
Radiation Protection Division (6608J)
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Voice: 202-343-9362
Fax: 202-343-2304
Email: ferguson.rafaela@epa.gov

**Subject:** Division Meeting this Wednesday, June 30
**To:** OAR-ORIA-RPD
**Cc:**
**From:** CN=Rafaela Ferguson/OU=DC/O=USEPA/C=US
**Submit Time:** 6/28/2010 10:25:54

Good Morning All,

Just wanted to remind you that we have a Division meeting this Wednesday, June 30 from 10-10:30am in conference room 152. Topic: "Status of PAGs". See you there!

Rafie

Rafaela Ferguson
Special Assistant/Regional Coordinator
Radiation Protection Division (6608J)
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Voice: 202-343-9362
Fax: 202-343-2304
Email: ferguson.rafaela@epa.gov

**Subject:** Fw: Next Steps on PAGs
**From:** CN=Jonathan Edwards/OU=DC/O=USEPA/C=US
**Submit Time:** 5/11/2010 08:17:58
**To:** CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA "Sara DeCair" <DeCair.Sara@epamail.epa.gov>

FYI
---
Sent from my BlackBerry Wireless Handheld (www.BlackBerry.net)
Jonathan Edwards

----- Original Message -----
**From:** Jonathan Edwards
**Sent:** 05/11/2010 08:16 AM EDT
**To:** Mike Flynn
**Subject:** Re: Next Steps on PAGs
Great!--thanks, Jon
---
Sent from my BlackBerry Wireless Handheld (www.BlackBerry.net)
Mike Flynn

----- Original Message -----
**From:** Mike Flynn
**Sent:** 05/11/2010 08:15 AM EDT
**To:** Jonathan Edwards
**Subject:** Fw: Next Steps on PAGs
Fyi I'm meeting with Dana later this week.
to ----------\Sent by EPA Wireless E-Mail Services.
Mike Flynn

----- Original Message -----
**From:** Mike Flynn
**Sent:** 05/10/2010 06:40 PM EDT
**To:** Dana Tulis
**Subject:** Fw: Next Steps on PAGs
Dana, I know you're probably swamped with oil spill stuff, but would like to chat with you about strategy for reaching out to other Feds on this, and how best to do to preserve relationships while moving forward. Hopefully, coffee on Friday still works for you - if not, would like to catch you briefly. thanks,Mike

Mike Flynn, Director
Office of Radiation and Indoor Air (MC-6601-J)
U.S. Environmental Protection Agency
Phone: (202) 343-9320
Fax: (202) 343-2395
----- Forwarded by Mike Flynn/DC/USEPA/US on 05/10/2010 06:37 PM -----

From: Mike Flynn/DC/USEPA/US

To: Dana Tulis/DC/USEPA/US@EPA, Barnes Johnson/DC/USEPA/US@EPA, Elizabeth Southerland/DC/USEPA/US@EPA, Cynthia Dougherty/DC/USEPA/US@EPA, Pamela Barr/DC/USEPA/US@EPA, Mary-Kay Lynch/DC/USEPA/US@EPA, Richard Ossias/DC/USEPA/US@EPA

Cc: Jonathan Edwards/DC/USEPA/US@EPA, Alan Perrin/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Jean Schumann/DC/USEPA/US@EPA, Stuart Walker/DC/USEPA/US@EPA, Wynne Miller/DC/USEPA/US@EPA, David Huber/DC/USEPA/US@EPA

Date: 05/10/2010 06:32 PM

Subject: Next Steps on PAGs

---

I wanted let you know that Gina McCarthy passed on that she was able to talk to the Administrator concerning the Agency's policy direction on the PAGs Manual, and the Administrator agreed with our proposed approach (outlined below). I will be setting up a meeting shortly with you to discuss our process/approach to engaging our inter-agency partners. In the meantime, we will begin the process of updating the draft PAGs Manual and the draft Federal Register Notice of Availability for Public Comment to reflect the new approach.

Thanks for all your efforts on this. If you have any questions, please give me a call or contact Alan Perrin at 202.343.9775.

Mike Flynn, Director
Office of Radiation and Indoor Air (MC-6601-J)
U.S. Environmental Protection Agency
Phone: (202) 343-9320
Fax: (202) 343-2395

----- Forwarded by Mike Flynn/DC/USEPA/US on 05/10/2010 05:59 PM -----

From: Alan Perrin/DC/USEPA/US

To: Dana Tulis/DC/USEPA/US@EPA, Barnes Johnson/DC/USEPA/US@EPA, Elizabeth Southerland/DC/USEPA/US@EPA, Cynthia Dougherty/DC/USEPA/US@EPA, Pamela Barr/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA

Cc: Jonathan Edwards/DC/USEPA/US@EPA, Mike Flynn/DC/USEPA/US@EPA, Jean Schumann/DC/USEPA/US@EPA, Stuart Walker/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Wynne Miller/DC/USEPA/US@EPA, David Huber/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA

Date: 04/30/2010 03:31 PM

Subject: PAGs paper

---

Thank you for the comments you provided on the PAGs talking points for meeting with the Administrator. Your comments were used to produce the attached revision of the paper, and the revision has been forwarded to Gina McCarthy. -Alan

[attachment "PAGs_draft_adp-v2.doc" deleted by Jonathan Edwards/DC/USEPA/US]

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

**Alan Perrin**

Deputy Director, Radiation Protection Division
Office of Radiation and Indoor Air, USEPA
1200 Pennsylvania Avenue, NW (6608J)
Washington, DC 20460

phone: (202) 343-9775
fax: (202) 343-2304
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

perrin.alan@epa.gov

**Subject:** Safety Section of PAG Manual
**To:** CN=Tony Nesky/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Submit Time:** 2/14/2011 16:03:29
**From:**

Tony,

Can you take a quick look at the Safety Section? Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

DarrellDraftPAGManual12-10-2010 with new safety section and sections 2.7.4-2.7.7.doc

Sara,

I took at look at these two questions again and you like to hear you thoughts first before we change anything. I will go back through and check all the nomenclature again.

# Ex. 5 - Deliberative Process

Kylie,

Sorry about this I know I'm flip-flopping.

Thanks

Darrell Liles
Health Physicist
Center for Radiological Emergency Management
Environmental Protection Agency MC-6608J
1200 Pennsylvania Ave NW
Washington DC 20460-1000
Phone (202)343-9550

Sara DeCair---03/07/2011 06:22:21 PM---Kylie, I see you've sent a new version so I will stop beating this one up -- just a few tweaks in Ch

From: Sara DeCair/DC/USEPA/US
To: kzirbel@endyna.com
Cc: liles darrell
Date: 03/07/2011 06:22 PM
Subject: Sara's markup through p. 18, start of Section 2.4

---

Kylie, I see you've sent a new version so I will stop beating this one up -- just a few tweaks in Ch. 2 though I didn't get nearly as far as I had hoped. Only to page 18, top of Section 2.4. Very few changes, though one question for Darrell in there :)

Many thanks, and let's do this again tomorrow! *deep sigh*

Sara

DraftPAGManual Sara markup3 3-7-2011.doc DraftPAGManual Sara markup3 3-7-2011.doc

**Subject:** Comments
**To:** CN=Lisa Nanko/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Mike Flynn/OU=DC/O=USEPA/C=US@EPA CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Alan Perrin/OU=DC/O=USEPA/C=US
**Submit Time:** 2/17/2011 20:06:52

Lisa,

We believe the DA is looking for an even-handed, side-by-side comparison of Superfund and the Optimization process; toward that end, we have attached a draft one-pager for consideration. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Last, I am attaching two documents for your reference, because we mention them in our comments on the draft material, 1) the DHS Planning Guidance and, 2) a table with benchmarks considered during the development of the Planning Guidance.

Thank you for considering the input we've provided, and please call on us if you need further information to get ready for the upcoming discussions.

Cheers, Alan

*Recommended material:*

Superfund-Optimization side-by-side.docx Superfund-Optimization side-by-side.docx superfund vs optimization 6 pager RPD edit.doc superfund vs optimization 6 pager RPD edit.doc

*Comments/edits on other draft material:*

SF v Optim 2 pager RPD edit.doc SF v Optim 2 pager RPD edit.doc SFvsOptimization RPD comments.pptx SFvsOptimization RPD comments.pptx

*And, for your reference:*
**FEMA- FR Planning Guidance for Protection and Recovery following RDD & INDs Incident.pdf** FEMA- FR Planning Guidance for Protection and Recovery following RDD & INDs Incident.pdf
**Benchmarks Considered for RDD-IND Planning Guide.docx** Benchmarks Considered for RDD-IND Planning Guide.docx

Alan Perrin | Radiation Protection Division | USEPA | office (202) 343-9775 | bb (202) 279-0376 | perrin.alan@epa.gov

Examples of U.S. Benchmarks of Potential Use in Evaluating Long-Term Cleanup Options during the Late Phase[a,b]

| Example Organizations or Cleanup Programs | Summary of Selected Program-Specific Human Health Protection Goals or Concepts as Applied to the Cleanup of Radiological Contamination. |
|---|---|
| **States**<br><br>NRC Agreement State Decommissioning Programs | Varies across states. Usually, decommissioning programs seek to achieve:<br>• 25 mrem/y primary dose constraint;<br>• 100 mrem/y allowable exemption; and<br>• lower levels based on the ALARA concept.<br>• Some States have more stringent dose limits (e.g., 19, 15, or 10 mrem/y) |
| Environmental Department Contaminated Site Cleanup Programs | Varies across states. Usually, programs seek to achieve risk-based goals or a range of acceptable risk outcomes. Goals typically:<br>• fall within a risk range of $10^{-4}$ to $10^{-6}$ excess lifetime cancer risk; and<br>• include meeting existing applicable or relevant environmental regulations/standards.<br>• Some States have single risk-based standards or goals (e.g., $10^{-4}$, $10^{-5}$, or $10^{-6}$). |
| **Federal**<br><br>NRC and DOE decommissioning and site remediation programs | • Remediate or decommission to levels that are as low as reasonably achievable not to exceed 25 mrem/y given anticipated use either without restriction or with restriction<br>• If restricted use is anticipated, dose estimates, given assumed failure of restriction (institutional controls), should be less the 100 mrem/y or 500 mrem/y if durable institutional controls are employed.<br>• Exemptions to the 25 mrem/y constraint for anticipated use may be approved if conditions are met.<br>For more details see 10 CFR Part 20 Subpart E and DOE 5400.5 and associated guidance. |
| EPA Superfund remedial site cleanup program | Generally, remedial actions achieve human exposures that meet:<br>• $10^{-4}$ to $10^{-6}$ excess cancer risk;<br>• Hazard Index of one for non-cancer toxicity or less; and,<br>• all Applicable or Relevant and Appropriate Requirements (ARARs). These may be waived under specific circumstances.<br>• Cleanup levels should be developed considering the reasonably anticipated land use (For further information see: 40 CFR 300.430) |
| EPA Uranium and Thorium Mill Tailings Standards | • 5pCi/g surface and 15 pCi/g subsurface for Ra-226 and Ra-228 in soil above background<br>• 0.02 Working Levels (WL) not to exceed 0.03 WL for radon in habitable structures<br>• 20 $\mu$R/h above background in habitable structures<br>• Options available for supplemental limits to be used under certain conditions (e.g., actions to meet the limits would pose a clear and present risk of injury to the workers or public notwithstanding reasonable measures to avoid the risk).<br>For further details see 40 CFR Part 192 Subpart B: Uranium Mill Tailings Radiation Control Act (UMTRCA). |

[a]Table presents examples only. Final cleanup goals and/or actual cleanup outcomes for a particular incident may vary depending on the circumstances of the incident. No single cleanup target is recommended for all possible incidents.
[b]Although many response programs often articulate target cleanup goals or limits in planning guidance, whether these levels are met or exceeded on a response-specific basis generally depends on the program context and the site-specific circumstances. Levels and concepts in this table are presented for illustration only and should not be applied to a specific incident cleanup without a thorough understanding of their derivation and application in the originating programs.

**Subject:** Fw: New FAQ Available
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**Submit Time:** 5/28/2010 11:59:36
**To:** "Jeff Blizzard" <blizzard.jeffrey@epa.gov>

Print? :)
---
Sent by EPA Wireless E-Mail Services

---

**From:** David Musick
**Sent:** 05/27/2010 03:05 PM EDT
**To:** "Sara DeCair" <decair.sara@epa.gov>
**Subject:** Fw: New FAQ Available

FYI: I didn't know if you have seen this ...
Sent by EPA Wireless E-Mail Services

---

**From:** emisig
**Sent:** 05/27/2010 02:55 PM AST
**To:** "EMI SIG Members" <emisig@listserv.orau.gov>
**Subject:** New FAQ Available

The attached, new Frequently Asked Question on the Use of EPA 400 PAG Methodology in DOE/NNSA Emergency Management Programs has been issued and is posted to the EMI SIG Website at http://orise.orau.gov/emi/doe-o151/default.htm.

Dorothy S. Cohen

Group Manager/EMI SIG Manager

Oak Ridge Institute for Science and Education

P.O. Box 117, MS 11

Oak Ridge, TN 37831-0117

Phone: 865-576-2007

Fax: 865-576-9383

E-mail: Dorothy.Cohen@orise.orau.gov

EMI SIG: http://orise.orau.gov/emi/default.htm

NSEMP: http://orise.orau.gov/nsem/index.htm

Shipping Address

ORAU/ORISE

Attention: Dorothy Cohen, MS 11

1299 Bethel Valley Road

Oak Ridge, TN 37830-8007

---

You are subscribed to emisig as musick.david@epa.gov.
To unsubscribe, send a blank email to leave-25266-77971.db3cf7a6b038fd7c5af57b07c537342c@listserv.orau.gov

**FAQ - Use of the EPA 400 PAG Methodology in DOE-NNSA Emergency Management Programs 05-27-10.pdf**

# USE OF THE EPA 400 PAG METHODOLOGY IN DOE/NNSA EMERGENCY MANAGEMENT PROGRAMS

**QUESTION: DOE O 151.1C requires that the Protective Action Guides (PAGs) promulgated by the EPA (EPA 400-R-92-001 or "EPA 400") be used as the Protective Action Criteria (PACs) for radioactive material releases. However, in 2007, an amendment to 10 CFR 835, *OCCUPATIONAL RADIATION PROTECTION*, was issued that required a change (by 7/8/2010) in the measure used for reporting *occupational* doses from Total Effective Dose Equivalent (TEDE) to Total Effective Dose (TED). TEDE is calculated using International Commission on Radiation Protection (ICRP) 26/30 methodologies and certain tissue weighting factors to arrive at the whole body dose. TED is calculated using ICRP 60/68 methodologies and uses different radiation weighting factors and tissue weighting factors.**

**Although the current EPA 400 PAGs are based on ICRP 26/30 guidance, which uses TEDE as the dose measure to be compared with the PAGs, an ongoing (~ 10 year) effort to revise EPA 400 is expected to incorporate the TED and ICRP 60/68 methodology. Until a revised document is formally issued, however, can DOE/NNSA sites still use the current version of EPA 400 in their emergency plans?**

**ANSWER:** DOE O 151.1C requires that the Protective Action Guides (PAGs) promulgated by the EPA be used as the Protective Action Criterion (PAC) for radioactive material releases. The DOE Emergency Management Guide (EMG), DOE G 151.1-2, Appendix F, which also addresses this requirement, was issued in the same time frame as a 10 CFR 835, *OCCUPATIONAL RADIATION PROTECTION*, amendment that required a change (by 7/8/2010) in the measure used for reporting ***occupational*** doses from Total Effective Dose Equivalent (TEDE) to Total Effective Dose (TED). TEDE is calculated using ICRP 26/30 methodologies and certain tissue weighting factors to arrive at the whole body dose. TED is calculated using ICRP 60/68 methodologies and uses different radiation weighting factors and tissue weighting factors (ICRP 60/68 has not only changed the values for certain organs, but also added some organs to the list not on the ICRP 26/30 list). In addition, the 2007 amendment to 10 CFR 835, uses dose conversion coefficients based on an ***occupational*** exposure scenario of a worker inhaling 5 micron activity median aerodynamic diameter (AMAD) size particles. Offsite environmental and emergency management models typically use a 1 micron AMAD particle size.

The terminology was changed from TEDE to TED in 10 CFR 835 to make DOE regulations compatible with the guidance from ICRP 60/68. The changes specifically address assessing ***occupational*** doses to workers and the public inside controlled areas. EPA has started using the ICRP 60/68 dose terminology in its recent publications and it is expected that, when the revision of the EPA 400 PAG document is complete, it will include the ICRP 60/68 terminology as well.



ED_001057C_T3_00077873

The EPA 400 PAGs and dose projections conducted in support of emergency management applications are not used to assess ***occupational*** doses, but instead are used when determining event classification and protective actions in emergency situations. The current EPA 400 PAGs are based on ICRP 26/30 guidance, which uses TEDE as the dose measure to be compared with the PAGs.

DOE sites and facilities can still use EPA 400 as it currently exists in their emergency plans until the revised document is issued formally. The compelling factor for determining whether a site uses the ICRP 60/68 dose model prior to the release of the revised EPA PAG manual should be compatibility with the consequence assessment model results produced by offsite response authorities and not simply compatibility with ***occupational*** radiation reporting requirements according to 10 CFR 835. Although a common model for all functional requirements that involve dose estimates is a desirable choice for a site, the emergency management Order requires that consequence assessments must be "...coordinated with Federal, State, local, and Tribal organizations." Coordination is most effective and efficient when consequence calculations are performed using the same assumptions and dose models. Therefore, DOE sites and facilities can still use the current version of EPA 400 in their emergency plans to ensure compatibility of dose estimates with calculations performed by offsite authorities.



ED_001057C_T3_00077873

**Subject:** For 11 am PAGs 30-min meeting
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** edwards.jonathan@epa.gov veal.lee@epa.gov perrin.alan@epa.gov liles.darrell@epa.gov mcmichael.nate@epa.gov nesky.tony@epa.gov
**Cc:**
**Submit Time:** 7/19/2010 08:52:50

Hi all, I'm back!

I plan to call in from home for today's 11 am meeting on PAGs, and here are some things you probably already have, to go over today:

- Comms Plan with tactics from July 6th, which I plan to update based on today's discussions

- A one-pager for the multi-agency conference call this Thursday

Talk to you soon!

Sara

Comms Plan 7-6-2010 with subtactics.doc One pager on new Agency direction 5-21-2010.doc

**From:** "Kylie Zirbel" <kzirbel@endyna.com>
**To:** Sara DeCair/DC/USEPA/US@EPA
**Cc:** <siddhanti@endyna.com>
**Subject:** Updated Manual
**Submit Time:** 4/13/2011 17:29:49

Hi Sara,

I have attached the updated PAGs manual with the mSv or Sv conversions inserted. Please review footnote 15 that I mentioned in my last email. I wanted to send the draft to you so you have it before I receive confirmation on the footnote. Thank you!

Sincerely,

**Kylie Zirbel** | Analyst

P: 703.848.8842 x126

kzirbel@endyna.com

**EnDyna, Inc.**

7926 Jones Branch Drive.

Suite 620

McLean, VA 22102

www.endyna.com

**DraftPAGManual for Interagency Review 4-13-11.doc**

**Subject:** Briefing Materials for Gina
**To:** CN=Amit Srivastava/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Julia Miller/OU=DC/O=USEPA/C=US@EPA CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA CN=Mike Flynn/OU=DC/O=USEPA/C=US@EPA CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA CN=Anna Duncan/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Jonathan Edwards/OU=DC/O=USEPA/C=US
**Submit Time:** 5/19/2011 17:02:04

Hi Amit---

Here are the materials for tomorrow's Protective Action Guides (and Blue Book) meeting ---1:15pm to 2pm---with the AA:

**One pagers on PAGs status and Blue Book (the draft PAGs FR and Manual are also attached)**

**draft PAG Manual 5-19-2011.doc** draft PAG Manual 5-19-2011.doc **draft PAGs FR Notice 5-19-2011.doc** draft PAGs FR Notice 5-19-2011.doc **PAGsStatusMay2011.docx** PAGsStatusMay2011.docx

**5-19-2011 Blue Book one-page.docx** 5-19-2011 Blue Book one-page.docx

**Subject:** PAGS comments
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Submit Time:** 2/14/2011 12:57:59
**From:**

Copy of PAGs Comment Responses-Liles 02-14.xlsx

**Subject:** Fw: Inside EPA Story
**From:** CN=Colby Stanton/OU=DC/O=USEPA/C=US
**Submit Time:** 6/18/2009 10:36:15
**To:** "David Huber" <Huber.David@epamail.epa.gov> "Wynne Miller" <Miller.Wynne@epamail.epa.gov> "Susan Stahle" <Stahle.Susan@epamail.epa.gov>
**Cc:** "Sara DeCair" <Decair.Sara@epamail.epa.gov>

Sara's out on leave today and tomorrow; I wanted to be sure you saw this.
---
Sent by EPA Wireless E-Mail Services
Jessica Wieder

----- Original Message -----
**From:** Jessica Wieder
**Sent:** 06/18/2009 10:05 AM EDT
**To:** Sara DeCair; Colby Stanton; Jonathan Edwards; Glenna Shields; Nate McMichael
**Cc:** Michael Kokoszka
**Subject:** Inside EPA Story

FYI - Of course he didn't use the part of our statement saying that the proposal hasn't been issued. The last paragraph is on the cancelled PEER meeting. - Jess

Inside EPA - 6/19/2009

- Adjust Text Size +

# NUCLEAR GUIDE MAY REVIVE FAILED EFFORT TO RELAX WATER STANDARDS

EPA's use of a controversial method to calculate the drinking water protections in its draft nuclear emergency guide is prompting some activists to accuse agency officials of trying to use the document as a vehicle for reviving a decades-old proposal to relax the agency's drinking water standards that a federal court previously rejected.

The accusations come as activists are gearing up to pressure newly confirmed Obama appointees to the agency to abandon the nuclear emergency guide, and activists say their contention that the drinking water protections are at least in part based on the old proposal bolsters their argument against the controversial draft document.

Agency officials under the Bush administration calculated the drinking water protections in the draft *Revisions to the Protective Action Guides Manual for Radiological Incidents* using radiation dose conversion factors from EPA's *Federal Guidance Report 13* (FGR-13), which is based on models from a document known as International Commission on Radiological Protection (ICRP) Publication 60, an EPA spokeswoman recently told *Inside EPA*. The draft guide has been on hold pending further review since the Obama administration halted its publication in the *Federal Register* shortly after taking office in January.

Activists have been critical of the draft guide for suggesting that emergency responders need

not consider providing people with alternative sources of drinking water until contamination in their regular water supply reaches levels thousands of times higher than what the agency allows for in its formal regulations. They say FGR-13 and ICRP Publication 60 use what is commonly known as the effective dose equivalent (EDE) method of calculating radiation exposure limits. EPA also used the EDE method in a 1991 proposal to relax its drinking water standards -- called maximum contaminant levels (MCLs) -- for radioactive substances. But the agency ultimately withdrew the proposal and reverted back to its previous calculation method after 1996 amendments to the Safe Drinking Water Act (SDWA) made relaxing MCLs illegal, the activists note.

Major industry groups, including the Nuclear Energy Institute and the National Mining Association, filed lawsuits challenging EPA's assertion that it could not relax the MCLs in light of the SDWA amendments, arguing in part that the agency's decision ignored the "best available science" and that the agency did not properly evaluate the costs and benefits of its decision.

But the U.S. Court of Appeals for the District of Columbia Circuit upheld the agency's decision in a 2003 ruling. The "anti-backsliding provision" of the SDWA amendments "would still prevent the agency from raising the MCLs" even if the "best available science" or a cost-benefit analysis suggested otherwise, the court ruled. *Relevant documents are available on InsideEPA.com.*

Activists are now accusing officials in EPA's Office of Radiation & Indoor Air (ORIA) of using the new nuclear emergency guide as a vehicle for reviving the unsuccessful 1991 proposal to use the EDE method to relax drinking water standards.

While the agency has been blocked from using the method to relax its enforceable MCL regulations, the non-binding nuclear emergency guide provides ORIA officials with a vehicle to revive the 1991 proposal and "sneak it through the back door," one activist says.

An EPA spokeswoman in a June 11 statement to *Inside EPA* maintains, however, that the nuclear emergency guide "in no way impact[s] or affect[s] regulatory drinking water standards, which exist to protect public health on a day-to-day basis." The emergency guide is "used as guidance during immediate response to radiological emergencies," the spokeswoman says.

EPA officials have defended the nuclear emergency guide similarly in the past, arguing that the drinking water protections in the document address the relatively short-term radiological exposure anticipated after a nuclear emergency. In contrast, the more stringent MCLs are based on a lifetime of exposure, agency officials have argued.

But activists remain dissatisfied with the amount of information EPA is providing about the calculations and are vowing to pressure recently confirmed Obama appointees to abandon the nuclear emergency guide. The activists' contention that ORIA officials are using the document as means of reviving the 1991 EDE proposal bolsters their arguments against the document, one activist says.

The activist group Public Employees for Environmental Responsibility (PEER) recently canceled a planned meeting with ORIA officials in protest after PEER officials complained ORIA staff did not provide them with all the background information on the nuclear emergency guide that activists had hoped to discuss during the meeting, which had been scheduled for May 26. -- *Douglas P. Guarino*

INSIDEEPA-30-24-17

Definitely Sue; Ariadne?

# Ex. 5 - Deliberative Process

Thanks for all the hard work!
---
Sent by EPA Wireless E-Mail Services
Sara DeCair

----- Original Message -----
**From:** Sara DeCair
**Sent:** 11/03/2009 01:16 PM EST
**To:** Colby Stanton; Alan Perrin
**Subject:** Time to read Markey responses on b-berry?

Here is a long paste -- at this point, will you take a look (and Alan, too?) and then tomorrow morning I can include people like Mike Boyd, Dana Tulis, and Jon? Who else? Sue, who is coordinating for OGC? Thomas and Nate drafted these then Jess helped edit before I did some edits. We have bets that a lot of detail will be cut on its way up... thanks for any suggestions!! (It takes a village...)

*DRAFT – MARKEY LETTER CONTROL RESPONSE to PAGs QUESTIONS*

# Ex. 5 - Deliberative Process

# Ex. 5 - Deliberative Process

# Ex. 5 - Deliberative Process

Cool! I will review and then call you - might be as late as 1:30 but I have a 2 pm meeting, so not any later than that. Talk to you soon,

S.

-----Tony Nesky/DC/USEPA/US wrote: -----

To: Sara DeCair/DC/USEPA/US@EPA
From: Tony Nesky/DC/USEPA/US
Date: 08/16/2010 12:42PM
cc: Glenna Shields/DC/USEPA/US@EPA
Subject: Revised Sections of Chapter 2

Dear Sara:

Here's what I've come up with so far. Please take a look. Take as much time as you need to review this--it won't inconvenience me if our call takes place later than 1:00PM.

I've consolidated a lot of material into a new outline:

**Ex. 5 - Deliberative Process**

...and that's as far as I got!
Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov *(See attached file: PAG2DiscussionDraft1.doc)*

PAG2DiscussionDraft1.doc

**Submit Time:** 11/10/2009 13:55:53
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Nate McMichael/OU=DC/O=USEPA/C=US@EPA CN=Jessica Wieder/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** Fw: Markey Letter

FYI -- Sue will be calling you
----- Forwarded by Sara DeCair/DC/USEPA/US on 11/10/2009 01:55 PM -----

From: Susan Stahle/DC/USEPA/US

To: Sara DeCair/DC/USEPA/US@EPA

Date: 11/10/2009 01:53 PM

Subject: Re: Fw: Markey Letter

---

right now this just includes comments from me. i'll call you momentarily to discuss.

**MARKEY CONTROL RESPONSE 11-10-2009 (ogc comments).doc** MARKEY CONTROL RESPONSE 11-10-2009 (ogc comments).doc

Susan Stahle
Air and Radiation Law Office (Rm 7502B)
Office of General Counsel
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW (ARN: MC 2344A)
Washington, D.C. 20460
ph: (202) 564-1272
fax: (202) 564-5603
stahle.susan@epa.gov

Sara DeCair---11/10/2009 11:00:29 AM---review? ----- Forwarded by Sara DeCair/DC/USEPA/US on 11/10/2009 11:00 AM -----

From: Sara DeCair/DC/USEPA/US

To: Susan Stahle/DC/USEPA/US@EPA

Date: 11/10/2009 11:00 AM

Subject: Fw: Markey Letter

---

review?
----- Forwarded by Sara DeCair/DC/USEPA/US on 11/10/2009 11:00 AM -----

From: Jessica Wieder/DC/USEPA/US

To: Emily Atkinson/DC/USEPA/US@EPA

Cc: Nate McMichael/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Mike Boyd/DC/USEPA/US@EPA, Alan Perrin/DC/USEPA/US@EPA

Date: 11/10/2009 10:34 AM

Subject: Re: Markey Letter

---

For Jon's Review....

[attachment "MARKEY CONTROL RESPONSE 11-10-2009.doc" deleted by Susan Stahle/DC/USEPA/US]

Jessica Wieder
U.S. Environmental Protection Agency
Radiation Protection Division
Center for Radiation Information
(202) 343-9201

Emily Atkinson---11/10/2009 08:59:09 AM---Excellent - thank you!

From: Emily Atkinson/DC/USEPA/US

To: Jessica Wieder/DC/USEPA/US@EPA

Date: 11/10/2009 08:59 AM

Subject: Re: Markey Letter

---

Excellent - thank you!

Jessica Wieder---11/10/2009 08:50:10 AM---All the changes have been integrated. I have to check one sentence with David or Mike. Neither of th

From: Jessica Wieder/DC/USEPA/US

To: Emily Atkinson/DC/USEPA/US@EPA

Date: 11/10/2009 08:50 AM

Subject: Re: Markey Letter

---

All the changes have been integrated. I have to check one sentence with David or Mike. Neither of them are in the office yet. I should have it to you within the hour, if not sooner. I am going to see if Jerry is in and if he can answer my question.

Jessica Wieder
U.S. Environmental Protection Agency
Radiation Protection Division
Center for Radiation Information

(202) 343-9201

Emily Atkinson---11/10/2009 08:45:48 AM---Jessica, Jon mentioned yesterday that it needs to get over to Gina's office for signature today and

From: Emily Atkinson/DC/USEPA/US

To: Jessica Wieder/DC/USEPA/US@EPA

Date: 11/10/2009 08:45 AM

Subject: Markely Letter

---

Jessica,

Jon mentioned yesterday that it needs to get over to Gina's office for signature today and before it gets over to her he will need to review it. Please let me know the status of the Markey letter and when I can expect to receive a final copy.

Thanks.
Emily

Emily Atkinson
Division Secretary
Radiation Protection Division (6608J)
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Voice: 202-343-9458
Fax: 202-343-2304
Email: atkinson.emily@epa.gov

**Submit Time:** 10/1/2009 11:18:42
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Colby Stanton/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** Hope this works!

Draft FINAL May 8 08.DOC Draft FINAL May 8 08.DOC

**From:** "Tyler A. Willis" <twillis@endyna.com>
**To:** Sara DeCair/DC/USEPA/US@EPA
**Cc:** Darrell Liles/DC/USEPA/US@EPA "Smita Siddhanti" <siddhanti@endyna.com>
**Subject:** RE: one last thing on page 13 of the PAG manual
**Submit Time:** 6/27/2011 13:53:50

Sara,

Attached are the requested documents. I did not see that your second email attachment had the deleted paragraph, so I wanted to confirm that the paragraph to be deleted was:

"The risk of injury or death to individual evacuees from transportation does not change as a function of the number of people evacuated and can be conservatively estimated using National Highway Safety Council (NHSC) statistics for motor vehicle accidents (DOT 2004). Furthermore, only four of the 50 evacuation cases in the NRC study reported traffic accidents during evacuation (NRC 2005)."

I have deleted this paragraph in the attached manual.

Let me know if you have questions.

Regards,

Tyler Willis
Senior Environmental Consultant
twillis@endyna.com
EnDyna, Inc.
7926 Jones Branch Drive, Suite 620
McLean, VA 22102
Tel: (703) 848-8842, ext. 124
Fax: (703) 848-9001
www.endyna.com

-----Original Message-----
From: DeCair.Sara@epamail.epa.gov [mailto:DeCair.Sara@epamail.epa.gov]
Sent: Monday, June 27, 2011 1:08 PM
To: twillis@endyna.com
Cc: siddhanti@endyna.com; Liles.Darrell@epamail.epa.gov
Subject: Fw: one last thing on page 13 of the PAG manual

Sorry Tyler! I deleted this paragraph, as you'll see in the updated attachment. Sorry to juggle versions but just so you know, this additional comment should be incorporated (by making the deletion).
Thanks!

Sara

(See attached file: draft PAG Manual 6-27-2011.doc)
----- Forwarded by Sara DeCair/DC/USEPA/US on 06/27/2011 01:07 PM -----

From: William Nickerson/DC/USEPA/US
To: Darrell Liles/DC/USEPA/US@EPA
Cc: Sara DeCair/DC/USEPA/US@EPA
Date: 06/27/2011 11:50 AM
Subject: one last thing on page 13 of the PAG manual

Darrell,

I'm still having trouble believing the statement on page 13 that

"The risk of injury or death to individual evacuees from transportation does not change as a function of the number of people evacuated and can be conservatively estimated using National Highway Safety Council (NHSC) statistics for motor vehicle accidents (DOT 2004). Furthermore, only four of the 50 evacuation cases in the NRC study reported traffic accidents during evacuation (NRC 2005)."

I've looked at the two references and haven't seen anything that supports the idea that individual risk does not change as a function of the number of people evacuated.

Could you please point me to some support for that statement. And also, the NHSC stats come out every year, so we might be able to update the reference to DOT 2009 or 2010.

draft PAG Manual 6-27-2011 (rev 2).doc draft PAGs FR Notice 6-27-2011 (rev 2).doc

Aw, and I just heard we can't have you work down here, it would be a nice break...
---
Sent by EPA Wireless E-Mail Services
Thomas Agee

----- Original Message -----
**From:** Thomas Agee
**Sent:** 06/30/2010 02:16 PM EDT
**To:** Sara DeCair
**Subject:** Re: PAGs - Respond with availability for Conf Call
Not a prob- just sad...CORE NAR is definitely becoming the new PAGs FOIA

Thomas Agee
Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov
Office: (202)-343-9933
Fax: (202)-343-2302

Sara DeCair---06/30/2010 02:12:25 PM---Dangit! ----------

From: Sara DeCair/DC/USEPA/US

To: Thomas Agee/DC/USEPA/US@EPA

Date: 06/30/2010 02:12 PM

Subject: Re: PAGs - Respond with availability for Conf Call

---

Dangit!
---
Sent by EPA Wireless E-Mail Services

Thomas Agee

----- Original Message -----
**From:** Thomas Agee
**Sent:** 06/30/2010 02:08 PM EDT
**To:** Sara DeCair
**Subject:** Re: PAGs - Respond with availability for Conf Call
You still have Colby on there :(

Thomas Agee
Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov
Office: (202)-343-9933
Fax: (202)-343-2302

Sara DeCair---06/30/2010 02:07:01 PM---PAGs Partners; I am hoping to set up a 60 to 90 minute conference call to discuss the PAGs Manual re

From: Sara DeCair/DC/USEPA/US

To: Andrew.Wallo@eh.doe.gov, cym3@cdc.gov, man@cdrh.fda.gov, patricia.milligan@nrc.gov, ricardo.reyes@dtra.mil, stanton.colby@epa.gov, Sara DeCair/DC/USEPA/US@EPA, stephen.domotor@eh.doe.gov, Vanessa.Quinn@dhs.gov, william.cunningham@nist.gov, walker.stuart@epa.gov, ammon.doug@epa.gov, schumann.jean@epa.gov, Ferris.John@dol.gov, druedy@endyna.com, siddhanti@endyna.com, asa4@CDC.GOV, Jack.Patterson@rss.usda.gov, tdkraus@sandia.gov, "Conklin, Craig" <craig.conklin@HQ.DHS.GOV>, "MacKinney, John A" <John.Mackinney@dhs.gov>

Cc: Alan Perrin/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Darrell Liles/DC/USEPA/US@EPA, Nate McMichael/DC/USEPA/US@EPA, Jessica Wieder/DC/USEPA/US@EPA, Thomas Agee/DC/USEPA/US@EPA

Date: 06/30/2010 02:07 PM

Subject: PAGs - Respond with availability for Conf Call

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PAGs Partners;

I am hoping to set up a 60 to 90 minute conference call to discuss the PAGs Manual revision. The Agency administration has reviewed our Jan. 2009 proposal and we're ready to get started again toward getting the revision out for public review & comment! By COB on Thursday, July 8th, please tell me which of these times you are NOT available for a call. Thank you so much, and I look forward to talking with you!

Monday, July 19, 9 to 11 am
Wednesday, July 21, 9 to 11 am or 1 to 3 pm
Thursday, July 22, 9 to 11 am

Sara
Sara D. DeCair, Health Physicist
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Center for Radiological Emergency Management
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Sara,

Here are my comments, all of which are minor. I used a track changes approach.

I think that the document is very well done, a solid piece of work. Thanks to you, Tony, and Darrell. It is structured logically and steps the reader through the subject with a minimum of repetition.
One question, and I suspect that the answer is yes. Will there be an overall Table of Contents? I suspect that there are plans for this as the 3 chapters are merged into a single draft, but thought I could ask.

I am curious on a possible reference. I cannot recall which meeting I was in, but I heard someone say that "we know now that people do so much better when you relocate only judiciously." Or something like that. Are you aware of anything in the literature that might be relevant? Jeanette Eng mentioned that she thought it important to recognize the inherent difficulties with relocation decisions. This does not change your PAG text---just thought it would be interesting to see. Maybe Jeff would enjoy researching this one.

Lee

Lee B. Veal
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-----Sara DeCair/DC/USEPA/US wrote: -----

To: Lee Veal/DC/USEPA/US@EPA, Alan Perrin/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA
From: Sara DeCair/DC/USEPA/US
Date: 11/12/2010 04:47PM
Cc: Darrell Liles/DC/USEPA/US@EPA, Tony Nesky/DC/USEPA/US@EPA
Subject: PAGs FR, Chapters 1-2-3

For Monday's 11 am PAGs meeting (I will be at home, call me? 301-270-1203) here are the threatened Chapters and FR Notice. I did drop in OW's suggestion, which we should discuss, and the FR now reflects my brilliant executive decision (breaking my arm patting myself on the back, really!) to simply refer to FRMAC's Assessment Manuals so we could cut out all the long tables, calculations & assumptions that go into DCFs and DRLs.

This made the chapters much shorter, in fact Ch. 3 is down to 11 pages. The Acronyms and References need to be checked before adding them in, and you'll notice that several references to Appendices now point to the 'historical reference' that is the 1992 PAGs Manual on our website. It is word-searchable now, which is nice....

We have yet to hear from OSRTI, and Barnes hopefully is brokering the back and forth over there so we won't have too much more work on these before final touches then the Subcommittee. I look forward to getting the Subcommittee to the table, working on editing, since they are a smart bunch and very pragmatic.

CHEERS!

S.

*(See attached file: PAGFR 11-12-10.doc) (See attached file: PAGChapter One 11-12-10.doc) (See attached file: PAGChapter2 11-10-10.doc) (See attached file: PAGChapter 3 11-12-10.doc)*

[attachment "PAGFR 11-12-10.doc" removed by Lee Veal/DC/USEPA/US]
[attachment "PAGChapter One 11-12-10.doc" removed by Lee Veal/DC/USEPA/US]
[attachment "PAGChapter2 11-10-10.doc" removed by Lee Veal/DC/USEPA/US]
[attachment "PAGChapter 3 11-12-10.doc" removed by Lee Veal/DC/USEPA/US]**PAGFR 11-19-10 LV.doc** **PAGChapter2 11-19-10 LV.doc** **PAGChapter 3 11-19-10 LV.doc** **PAGChapter One 11-19-10 LV.doc**

**Subject:** PAG Manual: Color-Coded Guide to Chapter 2 edits, cleaner version of new Chapter 2 "strawman"
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Glenna Shields/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Tony Nesky/OU=DC/O=USEPA/C=US
**Submit Time:** 8/19/2010 14:26:55

Dear Sara:

I'm attaching a color coded markup of the last "not heavily edited" version of Chapter 2 to show what sections were combined in my strawman. This color-coded markup also shows areas of text that received comparatively minor editing, ideas that should be in the shorter version but arent yet, and areas that seem to pertain more to general emergency response than to PAG implementation.

I'm also attaching a strawman of the condensed Chapter 2 in which I cleaned up some of the formatting. See you at 3.

Tony Nesky
Center for Radiation Information and Outreach
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nesky.tony@epa.gov

PAG2DiscussionDraft1.doc PAG2DiscussionDraft1.doc Chapter 2-content map--basis for edits.doc Chapter 2-content map--basis for edits.doc

Sounds good. Thanks so much for this.

Thomas Agee
Radiological Emergency Management
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Fax: (202)-343-2302

Melody Geer ---10/26/2011 04:45:41 PM---Ok; I'll do this. -----Original Message-----

From: Melody Geer <mgeer@trininc.com>
To: Thomas Agee/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA
Date: 10/26/2011 04:45 PM
Subject: RE: agenda - for approval before dissemination

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Ok; I'll do this.

-----Original Message-----
From: Agee.Thomas@epamail.epa.gov [mailto:Agee.Thomas@epamail.epa.gov]
Sent: Wednesday, October 26, 2011 4:44 PM
To: DeCair.Sara@epamail.epa.gov
Cc: Melody Geer
Subject: Re: agenda - for approval before dissemination

Sara and Melody,

I agree that it looks good, but maybe switch the order of items 5 and 6, so that we prioritize the run-through of PAGs??

I thought the idea was to use tomorrow mainly to test the PAG presentation and then use next Thursday's scheduled meeting to do a team review or practice presentation of the RadNet training??

Thomas Agee
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From: Sara DeCair/DC/USEPA/US
To: "Melody Geer" <mgeer@trininc.com>, Thomas Agee/DC/USEPA/US@EPA
Date: 10/26/2011 04:40 PM
Subject: Re: agenda - for approval before dissemination

This looks great, I hope we get to 'time-trial' at least 30 of the Pags slides via web, to get a feel for how

likely we are to meet our agenda times...
Thanks for sending this out, talk to you tomorrow!
S.
---
Sent by EPA Wireless E-Mail Services

From: Melody Geer [mgeer@trininc.com]
Sent: 10/26/2011 08:11 PM GMT
To: Sara DeCair; Thomas Agee
Subject: agenda - for approval before dissemination

Melody Geer
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**Subject:** HPS Position Statement
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**From:** CN=John Cardarelli/OU=CI/O=USEPA/C=US
**Submit Time:** 8/10/2010 11:12:55

rddpags_background_bi019-0.pdf rddpags_background_bi019-0.pdf

I've highlighted the areas in the document that address the 50-year PAG.....

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# HEALTH PHYSICS SOCIETY

*Specialists in Radiation Safety*

**Background Information on**
**"Guidance for Protective Actions Following a Radiological Terrorist Event"**
**Position Statement of the Health Physics Society***

Approved by the Scientific and Public Issues Committee

## INTRODUCTION

In 2004, the Health Physics Society's (HPS) Scientific and Public Issues Committee issued a position statement titled "GUIDANCE FOR PROTECTIVE ACTIONS FOLLOWING A RADIOLOGICAL TERRORIST EVENT." This document provides background information for that position statement and should be considered an adjunct to the position statement and not a stand-alone document.

## BACKGROUND

Except in times of war or declared national emergencies, the responsibility for the health and safety of members of the public in an emergency rests with state government officials. When management of the emergency and/or its consequences is beyond the capabilities of a state, the state can ask for assistance from the Federal Government and its agencies. For emergencies involving radioactive material or radiation, the Federal Government also provides guidance for state decision makers on appropriate protective actions for members of the public due to the presence of the radioactive material or radiation. The federal infrastructure, including protective action guidance, for responding to an accidental release of radioactive materials into the environment has been evolving for almost three decades and is well established. However, now there is a need to develop guidance for responding to an intentional release of radioactive materials, or use of radiation, in connection with a terrorist act, i.e., a radiological terrorist event.

## SCOPE

The position statement defines a radiological terrorist event as "the intentional release of radioactive material to the environment or use of a source of radiation for the purpose of harming the health or safety of the public. It includes any type of device or method used to disperse radioactive material, including conventional explosive materials (i.e., a dirty bomb) and improvised nuclear weapons." As indicated by the title, the positions and recommendations in the statement are for actions *following* the event. This position does not address protective actions that should be taken *before* the event if there is intelligence that a radiological terrorist event may occur. Therefore, the actions pertain to protecting people once there is a known contaminated area due to a dispersal event and if the dispersal event is still in progress.

## NATURE OF A RADIOLOGICAL TERRORIST EVENT

The variety of postulated methods to disperse radioactive material into the environment is limited only by the bounds of the human imagination. The National Council on Radiation Protection and Measurements (NCRP) broadly classifies terrorist incidents that could have radiological consequences into two categories. The first is the use of conventional explosives or other mechanisms to disperse radioactive materials (radiological dispersal device or RDD) and the other is the use of a nuclear weapon or improvised nuclear device (IND) (NCRP 2001).

A likely dispersal device would involve use of conventional explosive material to disperse a source of radioactive material. An explosion includes a large amount of dust and debris and a relatively small amount of very fine particles. Only the fine particles will be found much beyond the blast zone (Alvarez 2003).

Regarding dispersal devices, the NCRP concludes the exposure to individuals would be expected to be low. Thus, the harm is primarily psychosocial, and whatever low dose is received should produce no immediate adverse health effects and only a small probability of long-term health effects (NCRP 2001).

**Therefore, the HPS takes the position that it is extremely unlikely that a radiological terrorist dispersal event can disperse sufficient radioactive material for the resulting air and ground contamination to pose an immediate personal health hazard to people in the area or to first responders.**

**Further, the HPS position statement makes the recommendation that lifesaving and actions taken to secure the area from further terrorist activities should always take precedence over radiological considerations following a radiological terrorist event, with the possible exception of the area near ground zero soon after a nuclear explosion.**

## EXISTING FEDERAL AGENCY RESPONSIBILITIES FOR RESPONSE TO A NUCLEAR INCIDENT

The federal infrastructure for responding to an accidental release of radioactive materials into the environment has been evolving for several decades. Changes in the past three decades have been primarily related to emergency preparedness for an accident in a nuclear power plant. In 1975 the US Environmental Protection Agency (EPA) issued the first Protective Action Manual for a nuclear reactor accident (US EPA 1975).

In 1978, a joint task force of the EPA and US Nuclear Regulatory Commission (NRC) developed the planning basis for off-site emergency preparedness efforts considered "necessary and prudent" for power reactor facilities (NRC/EPA 1978). During the development of the planning basis, the task force received substantial input from other federal agencies and the Interorganizational Advisory Committee on Radiological Emergency Response Planning and Preparedness of the Conference of State Radiation Control Program Directors, which also included representatives of the National Association of State Directors for Disaster Preparedness and the US Civil Defense Council.

Subsequently, the planning basis has been adopted by the Federal Emergency Management Agency (FEMA), which assumed the federal lead role in off-site radiological emergency planning and preparedness responsibilities under order from President Jimmy Carter in 1979 and continues in that capacity in the Department of Homeland Security. Under regulations issued by FEMA (FEMA 1982), the EPA was given responsibilities for, among others, (1) establishing Protective Action Guides (PAGs) and (2) preparing guidance on implementing PAGs, including recommendations on protective actions, to protect members of the public in the event of a nuclear incident (a nuclear incident is defined in the discussion below). The latest document intended to respond to these two responsibilities is the "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," commonly referred to as the PAG Manual (EPA 1992).

The PAG Manual incorporated US Food and Drug Administration (FDA) recommendations, which were published in 1982, for taking protective actions in the event that an incident causes the contamination of human food or animal feeds (FDA 1982). The FDA updated these recommendations with new recommendations in 1998 (FDA 1998).

The PAG Manual also adopted FDA (FDA 1978) guidance and FEMA (FEMA 1985) policy for the use and distribution of potassium iodide (KI) in the event of a radiation emergency involving the release of radioactive iodine. FDA has also recently updated this guidance (FDA 2001) and policy (FDA 2002).

Because the events of September 11, 2001, and subsequent terrorist activities introduced the public to a threat that had not previously been thought likely, there has been a significant effort to create new Federal Government infrastructure to be responsible for the prevention of and response to these threats, such as the creation of the Department of Homeland Security. Regarding terrorist events involving radioactive materials, the prevention and crisis-management aspects of any malicious dispersal of radioactive materials or clandestine placement of a radiation source may require some new processes and infrastructure (e.g., different source security requirements and increased distribution of detection equipment), but the responsibilities for establishing recommendations to the responding state and federal agencies is well established and appropriate for responding to an RDD.

**Therefore, the HPS takes the position that protective actions and protective action guides following a radiological terrorist event should be consistent with the existing federal guidance for nuclear incidents.**

## APPROPRIATENESS OF EXISTING PAGS AND PROTECTIVE ACTIONS

The stated purpose of the EPA PAG Manual is to "assist [public] officials in establishing emergency response plans and in making decisions during a nuclear incident. It provides radiological guidance that may be used for responding to *any type* of nuclear incident or radiological emergency, except nuclear war (emphasis added)." The PAG Manual defines a nuclear incident as "an event or a series of events, either *deliberate* or accidental, leading to the release, or potential release, into the environment of radioactive materials in sufficient quantity to warrant consideration of protective actions (emphasis added)."

A terrorist event involving radioactive material, which will simply be called a radiological terrorist event in this paper, clearly falls within the intended purpose and definition of a nuclear incident covered by the PAG Manual.

As to the applicability of the PAG Manual guidance to a terrorist event, the Manual explains, "This [guidance] has been developed primarily for incidents at nuclear power facilities. Although this implementation guidance is intended to be useful for application at other facilities or uses of radioactivity, emergency response plans will require the development of additional implementation procedures when physical characteristics of the radionuclides involved are different from those considered here."

**Therefore, the HPS position statement considers the PAG Manual guidance to be appropriate and adapts the guidance to the likely characteristics of a radiological terrorist event.**

## EXISTING PROTECTIVE ACTION FRAMEWORK

The PAG Manual establishes protective actions based on the ability to control exposure to the radioactive material and the exposure pathways that are expected to exist as a nuclear incident progresses. This approach results in classifying the response to a nuclear incident into three phases, i.e., early, intermediate, and late (recovery) phase.

The early phase of a nuclear incident is from the beginning of the incident until the release of radioactive material is under control and is characterized by the need to make immediate decisions for protective actions. The intermediate phase is the period beginning after the release of radioactive material has been brought under control or has stopped and is characterized by the ability to obtain reliable radiological measurements as a basis for decision making. The late (recovery) phase is the period in which recovery actions are conducted to bring radiation levels to levels acceptable for the area to be returned to unrestricted use.

**The HPS position statement considers this framework to be generally applicable to a radiological terrorist event.**

In the case of a radiological terrorist event in which the dispersal of the radioactive material is by use of a conventional explosive device, i.e., a "dirty bomb," the early phase will be the period following the explosion until emergency responders have determined the existence and extent of the contamination and made a decision if sheltering or evacuation in the contaminated area is required for radiation exposure control. Since the most significant portion of a contaminated area from a dirty bomb will probably be localized, i.e., not much greater than the blast area of the explosive, protective actions for the early phase will be able to be taken relatively quickly and the radiological response will move into the intermediate phase, probably before all emergency response actions to the effect of the blast are completed.

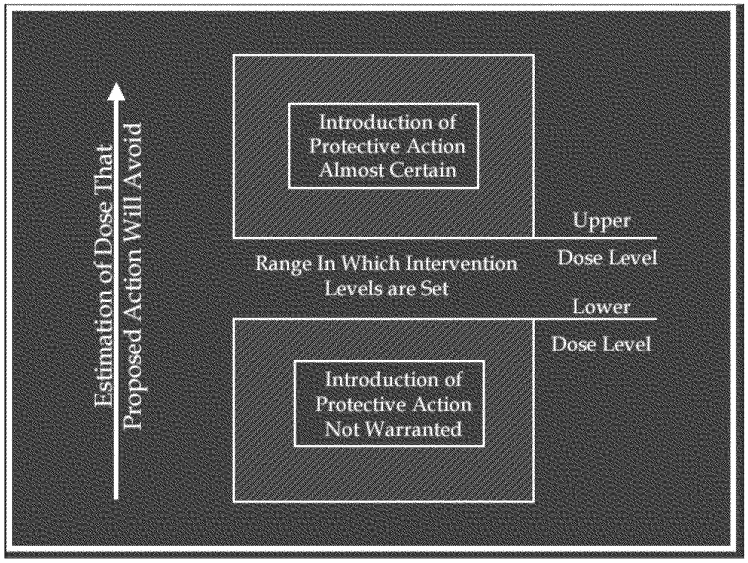
**Therefore, the HPS position statement notes that it is unlikely that this phase will be applicable to a localized dispersal event like a "dirty bomb."**

For a localized dispersal, the intermediate phase will exist as long as there are restrictions on the use of the contaminated area, and the late phase will exist while the recovery actions are underway to clean up the area to levels that allow unrestricted use of the area.

In the case of a radiological terrorist event in which the dispersal of the radioactive material is by use of a device that releases radioactive material into the atmosphere where it can be widely spread, the phases of the emergency will be similar to that for a release from a nuclear power plant or nuclear facility, with the exception that the time from initiation of the event to release of radioactivity is considered the early phase. This difference is discussed in greater detail in the "PAGs AND PROTECTIVE ACTIONS FOR THE EARLY PHASE" section below.

## EXISTING PAG FRAMEWORK

In a radiological emergency, a protective action is only protective for radiation exposures that are going to occur from the start of the protective action. There is no protection for radiation exposure already received. Therefore, the quantity of interest in deciding whether or not to invoke a protective action is how much radiation dose will be *avoided* by taking the action as compared to taking no action at all. When deciding to intervene by taking a protective action, there is a level of dose below which intervention is not appropriate. Conversely, there is a level of dose above which intervention should most certainly be done. These values of dose avoided form the lower and upper bounds of the range in which intervention should be done. A PAG should fall in the range of these bounds (see the following figure).




In the PAG Manual the EPA established four criteria that the PAGs should meet in the early and intermediate phase of the emergency. The criteria are (1) deterministic (i.e., acute) health effects should be avoided, (2) the risk of delayed health effects should not exceed a level that is judged to be adequately protective of health in an emergency situation, (3) any reduction of risk to public health achievable at acceptable cost should be done, and (4) the risk to health from a protective action should not exceed the risk to health from the dose that is avoided.

The analysis done by the EPA had the following results. For the early phase, criteria (1), i.e., avoid acute health effects, and criteria (4), i.e., the protective action should do more good than harm, serve as upper and lower bounds of the PAG region, respectively. Criterion (1) results in an upper bound of the PAG range of 0.1 Sv (10 rem) based on the assumed threshold for acute health effects in the fetus. Criteria (4) results in a lower bound of the PAG range of 0.03 mSv (3 mrem) based on the risk of the dose avoided compared to the risk of evacuation (traffic accident). The PAGs are set between these bounds based on criteria (2), i.e., they limit the risk of delayed effects on health to levels adequately protective of public health under emergency conditions. Specifically, the PAG is based on an avoided dose of 5 mSv (500 mrem), which is the acceptable annual dose to the general population from all sources from nonrecurring exposure and is also the maximum total dose to the fetus from occupational exposure of the mother.

**The HPS considers that these criteria and ranges are applicable to PAGs in the early phase following a radiological terrorist event and have recommended PAGs for the early phase consistent with this approach.**

For the *intermediate* phase, criteria (1) and criteria (4) serve as upper and lower bounds just as in the case of the *early* phase. Also, criteria (2) serves as the PAG basis for the PAG. Specifically, the PAG is based on an *avoided* dose of 50 mSv (5 rem) for a lifetime, i.e., 50 years, which results in an average annual dose of 1 mSv (100 mrem) over a lifetime. This is taken as an acceptable dose to the general population from all sources from routine (chronic), nonaccidental exposure.

**The HPS considers that these criteria and ranges are applicable to PAGs in the intermediate phase following a radiological terrorist event and have recommended PAGs for the intermediate phase consistent with this approach.**

The EPA has not established PAG criteria or specific PAGs for the *late (recovery)* phase. The basis for the HPS recommended PAGs is discussed in the "PAGs AND PROTECTIVE ACTIONS FOR THE LATE (RECOVERY) PHASE" section below.

## PAGs AND PROTECTIVE ACTIONS FOR THE EARLY PHASE

The early phase of the emergency is characterized by a plume of radioactive material dispersing in the atmosphere and depositing on the ground and structures, resulting in a contaminated area. The primary exposure pathways from this plume and contaminated area are by inhalation of radioactive materials, external exposure from the radioactive material for someone immersed in the plume, and external exposure from the contamination deposited on the ground and structures for someone standing in the contaminated area. These pathways are referred to as the inhalation, submersion, and deposition doses respectively. There are other minor exposure pathways, such as exposure from contamination on an individual's skin or clothes, but they are not significant when compared to the inhalation, submersion, and deposition pathways.

The protective actions to reduce exposure via these three pathways are actions that either move people out of the plume and contaminated area (i.e., evacuation) or simply out of the cloud (i.e., sheltering). The PAG Manual guidance was developed primarily for incidents at nuclear power

facilities. A characteristic of an incident at a nuclear power facility is that the most likely postulated scenarios take hours to develop from the first indication of plant failure to the start of a release into the environment. The EPA analysis of likely exposures from a passing plume, which is the exposure condition characterizing the *early* phase, concludes that approximately one-half the dose will be avoided by evacuating, compared to the alternative action of sheltering, assuming the evacuation is performed before the plume reaches the population. Therefore, the PAG Manual recommends evacuation as the primary protective action with sheltering as the secondary protective action.

As discussed in the "EXISTING PAG FRAMEWORK" section above, PAGs in the *early* phase are based on a *dose* to be *avoided* of 5 mSv (500 mrem) or greater. Therefore, the existing PAG Manual PAG for the *early* phase is to evacuate if the projected dose is 10 mSv (1 rem), representing an avoided dose of 5 mSv (500 mrem), with provisions to extend the evacuation action up to a projected dose of 50 mSv (5 rem) if conditions adverse to evacuation exist and up to 100 mSv (10 rem) for special groups for which evacuation puts them or the public at risk. Examples of special groups are people on medical life-support systems or institutionalized criminals. However, the PAG Manual directs that sheltering should be performed whenever it is more protective than evacuation.

In the case of a radiological terrorist event with wide dispersal of the radioactive material, the time from initiation of the event to release of radioactive material to the environment will not be a matter of hours, but will likely be minutes. Therefore, the protective action of evacuation cannot be completed before the plume reaches the population, except perhaps for distant populations if it is a very large dispersal area. An evacuation during the *early* phase of a radiological terrorist event will very probably expose people to a greater dose while trying to evacuate in a passing plume than sheltering out of the plume.

**Sheltering is likely to be more protective than evacuation in responding to a radiological terrorist event. Therefore, the HPS recommends that sheltering be the preferred protective action. The PAG for sheltering is the same as the existing evacuation PAG, i.e., 10 mSv (1 rem), with the minimum level for initiation being the same as the existing PAG, i.e., 1 mSv (100 mrem).**

The existing PAG Manual establishes levels for evacuation during hazardous conditions, which are higher than those for normal conditions. The HPS believes that the existence of a terrorist event constitutes a potential hazardous condition for evacuation considering the possibility that further terrorist activity may accompany the radiological event.

**Therefore, the HPS recommends the minimum level for initiation of evacuation be the same as the existing levels for evacuation under hazardous conditions, i.e., 50 mSv (5 rem) for the normal population and 100 mSv (10 rem) for special groups for which evacuation puts them or the public at greater risk.**

As stated in the "EXISTING FEDERAL AGENCY RESPONSIBILITIES FOR RESPONSE TO A NUCLEAR INCIDENT" section above, the PAG Manual includes a PAG in the *early* phase for consideration of administration of potassium iodide (KI) for protection of the thyroid if the release involves radioactive iodine. The FDA has recently updated this guidance and policy (US

FDA 2001, US FDA 2002). The HPS position statement does not specifically contain a PAG recommendation for administration of KI in case the release contains radioactive iodine. Radioactive iodine is unlikely to be used in a terrorist event. The varieties (i.e., isotopes) that emit radiation with sufficient energy to be detected, and therefore to incite fear, and with sufficient energy to result in an appreciable dose to a person, have relatively short half-lives, making it difficult to disperse significant quantities into the environment before it decays away. However, the HPS considers Position 2 of the position statement, which endorses the consistency with existing protective actions and protective action guides, endorses the PAGs that are contained in that guidance if the event involves radioiodine.

## PAGs AND PROTECTIVE ACTIONS FOR THE INTERMEDIATE PHASE

A contaminated area, in which people are, or were, living and working, exists during the intermediate phase, which follows the dissipation of the plume from the dispersal event.

The primary exposure pathway is from external exposure due to the contamination deposited on the ground (i.e., deposition dose). Another pathway that may exist is inhalation of radioactive material resuspended into the air from the contaminated ground (i.e., inhalation dose). Although the inhalation pathway could be significant, it should be evaluated on a case-by-case basis and is not included in the basis for the PAG. The skin and clothing contamination pathways are minor compared to the other pathways and are not included in the basis for the PAG.

The primary protective action for the intermediate phase is relocation from the contaminated area. Relocation is different from evacuation in that it is done in an orderly and planned manner such that it does not incur any significant risk in performing the protective action.

The deposition dose PAG for the intermediate phase is based on the projected dose at which it is appropriate to have people relocate from their residences for an extended period. The primary PAG of 20 mSv (2 rem) for the dose received during the first year is based on meeting two long-term "objectives," which are not receiving greater than 5 mSv (500 mrem) in any year after the first year of the incident and not receiving greater than 50 mSv (5 rem) over the 50 years following the incident. The primary PAG for the first year is based on a projected mix of radioactive nuclides released in a serious accident in a nuclear power plant. The application of these intermediate phase PAGs is an example of a situation in which the EPA cautions "emergency response plans will require the development of additional implementation procedures when physical characteristics of the radionuclides involved are different from those considered here."

For radiological terrorist events it is likely the radionuclide(s) will have a half-life longer than the "effective" half-life of the radionuclide mix, which is approximately 0.5 year for the first year, assumed for establishing the intermediate phase PAG. (After the short-lived radionuclides in the mix decay, the "effective" half-life of the remaining radionuclides is longer.) Two likely radionuclides for use in a radiological terrorist event are cobalt-60 and cesium-137, with half-lives of approximately 5.3 and 30 years, respectively. Also, in the case of a radiological terrorist event, the affected area is likely to be in a highly populated area and not a residential area. Therefore, the projection is likely to be for operation of businesses and not relocation of residents, which is the basis for the PAG Manual PAGs.

Even considering the characteristics of a radiological terrorist event that differ from a nuclear power plant accidental release, **the HPS position statement recommends the projected dose of 20 mSv (2 rem) also be applied to the projected first-year dose from a radiological terrorist event.** Although the radionuclide in a radiological terrorist event may have a half-life longer than that upon which the PAG in the PAG Manual is based, it is likely that cleanup actions will begin fairly soon after the event because the contaminated area is likely to be in a high-use/high-valued area, and because of the attention and response actions that are likely to follow a terrorist event. Therefore, reduction of contamination by cleanup methods will likely be more effective than radioactive decay and weathering effects, which are the only removal mechanisms considered by the PAG Manual. Also, in an industrial/business area, other actions such as restrictions on the hours of operation of the businesses can help reduce the projected dose as compared to the PAG Manual assumption that no restrictions or institutional controls are used.

For the long-term objectives, **the HPS position statement adopts the objective that actions should be taken to reduce the projected dose in any year after the first year of the event to 5 mSv (500 mrem).** This is consistent with the HPS position statement (HPS 2003) in which the HPS recommends, "In special (infrequent) circumstances, an effective dose up to 5 mSv (500 mrem) in a year may be permitted."

**However, the HPS position statement does not adopt the long-term PAG objective for the intermediate phase that the projected 50-year dose is less than 50 mSv (5 rem).** A 50-year dose objective is not appropriate for an "intermediate phase" PAG, but should be considered as part of the late (recovery) phase.

The PAG Manual also contains FDA guidance for protective actions and PAGs if human food or animal feeds are contaminated in the event, which is applicable in the intermediate phase. Since a radiological terrorist event is not likely to involve contamination of large rural areas, it is not likely that significant amounts of human food or animal feeds will be contaminated.

**However, in the event human food or animal feeds are contaminated, the HPS position statement adopts the FDA guidance for protective actions.**

## PAGs AND PROTECTIVE ACTIONS FOR THE LATE (RECOVERY) PHASE

The PAG Manual does not have any protective actions or PAGs for the late (recovery) phase. At the time it was issued the EPA thought that the activities that were underway to establish cleanup standards for previously contaminated sites would be able to be used for this section. However, that has not turned out to be the case.

The HPS considers that the PAG for the late (recovery) phase should be consistent with its recommendations for public exposure limits (HPS 2003) in which the HPS recommends, "Radiation exposures of the public from controllable sources should be maintained as low as reasonably achievable (ALARA), economic and social factors being taken into account" and the HPS position that "supports the establishment of an acceptable dose of radiation of 1 mSv/y (100 mrem/y) above the annual natural radiation background. At this dose, risks of radiation-induced health effects are either nonexistent or too small to be observed."

The HPS also recommends constraints be placed on a controllable source of public exposure, with 0.25 mSv (25 mrem) being appropriate in most cases, but it also recommends, "In special circumstances, an effective dose higher than 0.25 mSv in a year may be permitted." The HPS considers response and cleanup following a radiological terrorist event is a special circumstance and does not recommend a constraint below 1 mSv (100 mrem).

**Therefore, the HPS position statement recommends that continued cleanup during the late phase should be subject to the principles of ALARA, economic and social factors being taken into account, with a minimum level of continued cleanup of 1 mSv/y (100 mrem/y).**

## PROJECTED DOSE

The entire protective action and PAG framework is based upon the concept of calculating a "projected dose," which is then used to compare to the PAGs. The method of calculating a potential dose to people in the future can be complicated and has many uncertainties. These complications and uncertainties add to the complications of responding to an emergency such that effective decision making could be affected. Emergency planning has an objective of reducing the complexities that prevail during an emergency. Therefore, it is important that standardized methodologies for calculating projected doses that are used to compare to PAGs be established beforehand as part of the emergency-planning process.

The PAG Manual establishes methodologies for calculating projected doses in the early and intermediate phase. These methodologies use the information that is likely to be available during the different phases to support decision making in a time frame that is appropriate for the phase. For example, decisions in the early phase may have to be made with little data on the radiological aspects of the event. However, the methodologies for calculating a projected dose in the PAG Manual range from a simple technique using one radiation dose rate measurement to complex methods that use computer-generated dispersion equations, radiological measurements, and meteorological data. It is important for emergency managers to realize that projected doses calculated in the context of using PAGs for decision making *are not real doses to individuals*, but are part of an emergency-response framework to reduce the complexities of decision making during the emergency.

The current PAG manual methodologies are appropriate for projecting doses in a radiological terrorism event, with the exception that the factors that are used to calculate an individual's dose from an exposure involving inhalation or ingestion of radioactive materials, i.e., the "internal dose conversion factors," are based on work by the International Committee on Radiological Protection (ICRP) from 1971 as published in a 1988 EPA guidance document (EPA 1988). The ICRP has published more recent dose conversion factors that outdate the work of 1971 (ICRP 1995).

**Therefore, the HPS position statement recommends that the methods for calculating projected doses for comparison to the early and intermediate phase protective action guides should be consistent with those currently existing in the PAG Manual but should be based on the latest available dose conversion factors.**

As stated above, the PAG Manual does not contain protective actions and PAGs for the late phase. Therefore, there are no established methodologies for calculating projected doses for the late phase in the context of emergency planning. The late phase is very similar to the restoration of previously used and contaminated sites, such as those covered by the NRC in its "Decommissioning Rule." The HPS considers the same general approach as that used by the NRC, i.e., dose modeling to demonstrate compliance with an established upper limit, is appropriate for cleanup after a radiological terrorist event.

**Therefore, the HPS position statement recommends that the methods for calculating projected doses for comparison to the late phase (recovery) protective action guides should use dose-assessment computer programs or methodologies accepted by federal agencies using realistic exposure scenarios for the intended actual use of the radioactively contaminated areas.**

REFERENCES

Alvarez JL. Fact Sheet: Explosive dispersal of radioactive material. Available at: http://hps.org/hsc/factsheet.pdf. Accessed 16 January 2004.

Federal Emergency Management Agency. 47FR 10758; 11 March 1982.

Federal Emergency Management Agency. Federal policy on distribution of potassium iodide around nuclear power sites as a thyroidal blocking agent. 50 FR 30258; 24 July 1985.

Health Physics Society Position Statement. Ionizing radiation-safety standards for the general public. Revised June 2003. Available at: http://hps.org/documents/publicdose03.pdf. Accessed 16 January 2004.

International Commission on Radiological Protection. Age-dependent doses to members of the public from intake of radionuclides: Part 5 compilation of ingestion and inhalation dose coefficients. New York: Pergamon Press; ICRP Publication 72, Ann. ICRP; 1995.

National Council on Radiation Protection and Measurements. Management of terrorist events involving radioactive material. Bethesda, MD: NCRP; NCRP Report No. 138; 2001.

US Environmental Protection Agency. Manual of protective action guides and protective actions for nuclear incidents. Washington, DC: USEPA; EPA-5201/1-75-001; 1975.

US Environmental Protection Agency. Limiting values of radionuclide intake and air concentration and dose conversion factors for inhalation, submersion, and ingestion. Washington, DC: USEPA; Federal Guidance Report No. 11. EPA-520/1-88-020; September 1988.

US Environmental Protection Agency. Manual of protective action guides and protective actions for nuclear incidents. Washington, DC: USEPA; EPA 400-R-92-001; May 1992.

US Food and Drug Administration. Potassium iodide as a thyroid-blocking agent in a radiation emergency. 43 FR 58798; 15 December 1978.

US Food and Drug Administration. Accidental radioactive contamination of human food and animal feeds: Recommendations for state and local agencies. 47 FR 47073; 22 October 1982.

US Food and Drug Administration. Accidental radioactive contamination of human food and animal feeds: Recommendations for state and local agencies. 13 August 1998. Available at: http://www.fda.gov/cdrh. Accessed 16 January 2004.

US Food and Drug Administration. Guidance on use of potassium iodide as a thyroid blocking agent in radiation emergencies. 66 FR 64046; 11 December 2001.

US Food and Drug Administration. Federal policy on use of potassium iodide (KI). 67 FR 1355; 10 January 2002.

US NRC/US EPA Task Force Report on Emergency Planning. Planning basis for the development of state and local government radiological emergency response plans in support of light water nuclear power plants. NUREG 0396, EPA 520/1-78-016; 1978.

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* The Health Physics Society is a nonprofit scientific professional organization whose mission is to promote the practice of radiation safety. Since its formation in 1956, the Society has grown to approximately 6,000 scientists, physicians, engineers, lawyers, and other professionals representing academia, industry, government, national laboratories, the Department of Defense, and other organizations. Society activities include encouraging research in radiation science, developing standards, and disseminating radiation safety information. Society members are involved in understanding, evaluating, and controlling the potential risks from radiation relative to the benefits. Official position statements are prepared and adopted in accordance with standard policies and procedures of the Society. The Society may be contacted at 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101; phone: 703-790-1745; fax: 703-790-2672; email: HPS@BurkInc.com.



ED_001057C_T3_00091508

**Subject:** PAGs one-pager for you
**To:** OAR-ORIA-RPD-CREM
**Cc:**
**From:** CN=Lee Veal/OU=DC/O=USEPA/C=US
**Submit Time:** 9/30/2010 17:24:57

Dear CREM,

Here is the latest PAGs one-plus-a-bit pager. Thought this might serve you as background in case the issue arises.

Sara is our lead on this and you should feel free to chat with her.

Lee

Lee B. Veal
Director, Center for Radiological Emergency Management
Radiation Protection Division
Office of Radiation and Indoor Air
Environmental Protection Agency
1310 L Street, NW
Washington DC, 20005
Mail Code: 6608J
202-343-9448
cell 202-617-4322
----- Forwarded by Lee Veal/DC/USEPA/US on 09/30/2010 05:24 PM -----

One pager on new Agency direction 9-30-2010.doc One pager on new Agency direction 9-30-2010.doc

**Subject:** Fw: Review by Aug. 30: PAGs Ch. 1 and FR Notice
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA CN=Darrell Liles/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**From:** CN=Lee Veal/OU=DC/O=USEPA/C=US
**Submit Time:** 9/14/2010 12:30:01

Some fairly major comments from Charles....perhaps you have already seen and responded to these in the doc development, but his questions on levels are new to me.

LV

Lee B. Veal
Director, Center for Radiological Emergency Management
Radiation Protection Division
Office of Radiation and Indoor Air
Environmental Protection Agency
1200 Pennsylvania Ave., NW
Washington DC, 20460
Mail Code: 6608J
202-343-9448
cell 202-617-4322

----- Forwarded by Lee Veal/DC/USEPA/US on 09/14/2010 12:28 PM -----

From: Charles Openchowski/DC/USEPA/US

To: Susan Stahle/DC/USEPA/US@EPA

Cc: Alan Perrin/DC/USEPA/US@EPA, Carrie Wehling/DC/USEPA/US@EPA, Earl Salo/DC/USEPA/US@EPA, Elliott Zenick/DC/USEPA/US@EPA, John Michaud/DC/USEPA/US@EPA, Lee Tyner/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Mary-Kay Lynch/DC/USEPA/US@EPA, Paul Bangser/DC/USEPA/US@EPA, Richard Ossias/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA

Date: 09/14/2010 12:13 PM

Subject: Re: Fw: Review by Aug. 30: PAGs Ch. 1 and FR Notice

---

thanks, Sue -- here are my comments on Chapter 1, will try to get to the F.R. draft notice hopefully by next week -- please call if you have any questions -- thanks

**PAG Manual chapter one 9.6.10.doc** PAG Manual chapter one 9.6.10.doc

Susan Stahle---09/01/2010 01:38:46 PM---Hi Charles -- Let me apologize as I am the reason that this email did not get circulated to the app

From: Susan Stahle/DC/USEPA/US

To: Charles Openchowski/DC/USEPA/US@EPA

Cc: Alan Perrin/DC/USEPA/US@EPA, John Michaud/DC/USEPA/US@EPA, Mary-Kay Lynch/DC/USEPA/US@EPA, Earl Salo/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Elliott Zenick/DC/USEPA/US@EPA, Richard Ossias/DC/USEPA/US@EPA, Lee

Tyner/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Paul Bangser/DC/USEPA/US@EPA, Carrie Wehling/DC/USEPA/US@EPA

Date: 09/01/2010 01:38 PM

Subject: Re: Fw: Review by Aug. 30: PAGs Ch. 1 and FR Notice

---

Hi Charles --

Let me apologize as I am the reason that this email did not get circulated to the appropriate attorneys within OGC. I've been so busy with other projects that I did not realize that Sara's original email did not include WLO and SWERLO attorneys, and I did not realize I was supposed to be circulating this email within OGC on ORIA's behalf. So you can see that the reason you or anyone else in OGC did not receive the email was purely my fault. Again, I apologize for that.

For all --

I understand that ORIA would like review and comments from all applicable attorneys on the documents below. They would prefer to receive those comments/edits in written form, hopefully through the track changes format right into the document. Please send those comments/edit directly to Sara DeCair.

ORIA would appreciate receiving our comments by this Friday, but recognizing the short turnaround time, and the fact that it's a holiday weekend, they would appreciate receiving our comments as soon as possible next week.

Sara or Alan - could one of you answer Charles' question regarding projected schedule? I think we'd all be interested in knowing this. Thanks.

Susan Stahle
Air and Radiation Law Office (Rm 7502B)
Office of General Counsel
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW (ARN: MC 2344A)
Washington, D.C. 20460
ph: (202) 564-1272
fax: (202) 564-5603
stahle.susan@epa.gov

Charles Openchowski---08/31/2010 03:07:58 PM---Hi Sara, not being on your cc list, I realize you're not looking for comments from me at this point,

From: Charles Openchowski/DC/USEPA/US

To: Sara DeCair/DC/USEPA/US@EPA

Cc: Alan Perrin/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, John Michaud/DC/USEPA/US@EPA, Mary-Kay Lynch/DC/USEPA/US@EPA

Date: 08/31/2010 03:07 PM

Subject: Fw: Review by Aug. 30: PAGs Ch. 1 and FR Notice

---

Hi Sara, not being on your cc list, I realize you're not looking for comments from me at this point, but I have had a chance to read the first few pages and have a number of issues/comments -- I'm happy to go through them whenever you like -- that might make things go quicker as this goes forward.

btw, could you let me know (so I can let my management know) what your projected schedule for finalizing and moving forward on this is? thanks

From: Sara DeCair/DC/USEPA/US

To: Jean Schumann/DC/USEPA/US@EPA, Stuart Walker/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, Lisa Nanko/DC/USEPA/US@EPA, David Huber/DC/USEPA/US@EPA

Cc: Mark Mjoness/DC/USEPA/US@EPA, Helen Dawson/DC/USEPA/US@EPA, Wynne Miller/DC/USEPA/US@EPA, Alan Perrin/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Darrell Liles/DC/USEPA/US@EPA, Tony Nesky/DC/USEPA/US@EPA, Nate McMichael/DC/USEPA/US@EPA

Date: 08/13/2010 12:43 PM

Subject: Review by Aug. 30: PAGs Ch. 1 and FR Notice

---

Colleagues;

Attached are the opening chapter of the PAGs Manual, Chapter 1: Overview (actually this is a combination of the old Executive Summary and Chapter 1) and a draft of the Federal Register Notice. You'll see that both include statements -- that I've highlighted for your attention -- attempting to explain clearly what the new direction is.

The good news is, these two documents together are only 15 pages! So I hope it sounds reasonable to plan on providing me your comments by Monday, Aug. 30 (that's two full weeks). We probably will want to have a discussion about some of the language, so I'm glad to set up a conference call during the week of Aug. 23 or week of Aug. 30.

Thank you so much for your help! Write or call anytime if you have questions,

Sara
Sara D. DeCair, Health Physicist
www.epa.gov/radiation/rert/pags.html
Center for Radiological Emergency Management
U.S. Environmental Protection Agency
office (202) 343-9713
fax (202) 343-2304
decair.sara@epa.gov

[attachment "FR notice draft 8-13-2010.doc" deleted by Charles Openchowski/DC/USEPA/US]
[attachment "Chapter1PAGManual8-2-10.doc" deleted by Charles Openchowski/DC/USEPA/US]

**Subject:** Inside EPA Story
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA CN=Colby Stanton/OU=DC/O=USEPA/C=US@EPA CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA CN=Glenna Shields/OU=DC/O=USEPA/C=US@EPA CN=Nate McMichael/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Michael Kokoszka/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Jessica Wieder/OU=DC/O=USEPA/C=US
**Submit Time:** 6/18/2009 10:05:29

FYI - Of course he didn't use the part of our statement saying that the proposal hasn't been issued. The last paragraph is on the cancelled PEER meeting. - Jess

Inside EPA - 6/19/2009

- Adjust Text Size +

# NUCLEAR GUIDE MAY REVIVE FAILED EFFORT TO RELAX WATER STANDARDS

EPA's use of a controversial method to calculate the drinking water protections in its draft nuclear emergency guide is prompting some activists to accuse agency officials of trying to use the document as a vehicle for reviving a decades-old proposal to relax the agency's drinking water standards that a federal court previously rejected.

The accusations come as activists are gearing up to pressure newly confirmed Obama appointees to the agency to abandon the nuclear emergency guide, and activists say their contention that the drinking water protections are at least in part based on the old proposal bolsters their argument against the controversial draft document.

Agency officials under the Bush administration calculated the drinking water protections in the draft *Revisions to the Protective Action Guides Manual for Radiological Incidents* using radiation dose conversion factors from EPA's *Federal Guidance Report 13* (FGR-13), which is based on models from a document known as International Commission on Radiological Protection (ICRP) Publication 60, an EPA spokeswoman recently told *Inside EPA*. The draft guide has been on hold pending further review since the Obama administration halted its publication in the *Federal Register* shortly after taking office in January.

Activists have been critical of the draft guide for suggesting that emergency responders need not consider providing people with alternative sources of drinking water until contamination in their regular water supply reaches levels thousands of times higher than what the agency allows for in its formal regulations. They say FGR-13 and ICRP Publication 60 use what is commonly known as the effective dose equivalent (EDE) method of calculating radiation exposure limits. EPA also used the EDE method in a 1991 proposal to relax its drinking water standards -- called maximum contaminant levels (MCLs) -- for radioactive substances. But the agency ultimately withdrew the proposal and reverted back to its previous

calculation method after 1996 amendments to the Safe Drinking Water Act (SDWA) made relaxing MCLs illegal, the activists note.

Major industry groups, including the Nuclear Energy Institute and the National Mining Association, filed lawsuits challenging EPA's assertion that it could not relax the MCLs in light of the SDWA amendments, arguing in part that the agency's decision ignored the "best available science" and that the agency did not properly evaluate the costs and benefits of its decision.

But the U.S. Court of Appeals for the District of Columbia Circuit upheld the agency's decision in a 2003 ruling. The "anti-backsliding provision" of the SDWA amendments "would still prevent the agency from raising the MCLs" even if the "best available science" or a cost-benefit analysis suggested otherwise, the court ruled. *Relevant documents are available on InsideEPA.com.*

Activists are now accusing officials in EPA's Office of Radiation & Indoor Air (ORIA) of using the new nuclear emergency guide as a vehicle for reviving the unsuccessful 1991 proposal to use the EDE method to relax drinking water standards.

While the agency has been blocked from using the method to relax its enforceable MCL regulations, the non-binding nuclear emergency guide provides ORIA officials with a vehicle to revive the 1991 proposal and "sneak it through the back door," one activist says.

An EPA spokeswoman in a June 11 statement to *Inside EPA* maintains, however, that the nuclear emergency guide "in no way impact[s] or affect[s] regulatory drinking water standards, which exist to protect public health on a day-to-day basis." The emergency guide is "used as guidance during immediate response to radiological emergencies," the spokeswoman says.

EPA officials have defended the nuclear emergency guide similarly in the past, arguing that the drinking water protections in the document address the relatively short-term radiological exposure anticipated after a nuclear emergency. In contrast, the more stringent MCLs are based on a lifetime of exposure, agency officials have argued.

But activists remain dissatisfied with the amount of information EPA is providing about the calculations and are vowing to pressure recently confirmed Obama appointees to abandon the nuclear emergency guide. The activists' contention that ORIA officials are using the document as means of reviving the 1991 EDE proposal bolsters their arguments against the document, one activist says.

The activist group Public Employees for Environmental Responsibility (PEER) recently canceled a planned meeting with ORIA officials in protest after PEER officials complained ORIA staff did not provide them with all the background information on the nuclear emergency guide that activists had hoped to discuss during the meeting, which had been scheduled for May 26. -- *Douglas P. Guarino*

INSIDEEPA-30-24-17

Sorry, I had one more thought! I am sure that not all my PAGs propaganda below needs to be kept, but I couldn't resist..... thanks :)

Sara DeCair---06/09/2011 11:26:34 AM---(see what you think, below, rough draft) There are four primary issues that we can resolve as follow

From: Sara DeCair/DC/USEPA/US
To: Jonathan Edwards/DC/USEPA/US@EPA, Daniel Schultheisz/DC/USEPA/US@EPA
Date: 06/09/2011 11:26 AM
Subject: draft Note from Debbie to Bob?

---

(see what you think, below, rough draft)

There are four primary issues that we can resolve as follows:

**Ex. 5 - Deliberative Process**

# Ex. 5 - Deliberative Process

Emily sent the code to all so whoever gets on first can open it :)
---
Sent by EPA Wireless E-Mail Services
Nate McMichael

----- Original Message -----
**From:** Nate McMichael
**Sent:** 07/19/2010 09:28 AM EDT
**To:** Sara DeCair
**Subject:** Re: For 11 am PAGs 30-min meeting
I am going to be the host?

Nate McMichael
U.S. Environmental Protection Agency
Radiation Protection Division
Office: (202) 343-9265
Cell: (202) 236-4176

Sara DeCair---07/19/2010 09:22:59 AM---Ex. 6 - Personal Privacy Participant code - Ex. 6 - Personal Privacy

From: Sara DeCair/DC/USEPA/US

To: Nate McMichael/DC/USEPA/US@EPA

Date: 07/19/2010 09:22 AM

Subject: Re: For 11 am PAGs 30-min meeting

---

Ex. 6 - Personal Privacy
Participant code - Ex. 6 - Personal Privacy
Host code - Ex. 6 - Personal Privacy
Tx!
---
Sent by EPA Wireless E-Mail Services

Nate McMichael

----- Original Message -----
**From:** Nate McMichael
**Sent:** 07/19/2010 09:07 AM EDT
**To:** Sara DeCair
**Subject:** Re: For 11 am PAGs 30-min meeting
What is the call in number? I will call in from the EOC.

Nate McMichael
U.S. Environmental Protection Agency
Radiation Protection Division
Office: (202) 343-9265
Cell: (202) 236-4176

Sara DeCair---07/19/2010 08:52:53 AM---Hi all, I'm back! I plan to call in from home for today's 11 am

meeting on PAGs, and here are som

From: Sara DeCair/DC/USEPA/US

To: edwards.jonathan@epa.gov, veal.lee@epa.gov, perrin.alan@epa.gov, liles.darrell@epa.gov, mcmichael.nate@epa.gov, nesky.tony@epa.gov

Date: 07/19/2010 08:52 AM

Subject: For 11 am PAGs 30-min meeting

---

Hi all, I'm back!

I plan to call in from home for today's 11 am meeting on PAGs, and here are some things you probably already have, to go over today:

- Comms Plan with tactics from July 6th, which I plan to update based on today's discussions
- A one-pager for the multi-agency conference call this Thursday

Talk to you soon!

Sara[attachment "Comms Plan 7-6-2010 with subtactics.doc" deleted by Nate McMichael/DC/USEPA/US] [attachment "One pager on new Agency direction 5-21-2010.doc" deleted by Nate McMichael/DC/USEPA/US]

Dear Sara,

Thanks and welcome back from vacation!

Jon E and Darrell Liles are both out sick today. I believe that the rest of us will be available.

Lee B. Veal
Director, Center for Radiological Emergency Management
Radiation Protection Division
Office of Radiation and Indoor Air
Environmental Protection Agency
1200 Pennsylvania Ave., NW
Washington DC, 20460
Mail Code: 6608J
202-343-9448
cell 202-617-4322

Sara DeCair---07/19/2010 08:52:53 AM---Hi all, I'm back! I plan to call in from home for today's 11 am meeting on PAGs, and here are som

From: Sara DeCair/DC/USEPA/US

To: edwards.jonathan@epa.gov, veal.lee@epa.gov, perrin.alan@epa.gov, liles.darrell@epa.gov, mcmichael.nate@epa.gov, nesky.tony@epa.gov

Date: 07/19/2010 08:52 AM

Subject: For 11 am PAGs 30-min meeting

---

Hi all, I'm back!

I plan to call in from home for today's 11 am meeting on PAGs, and here are some things you probably already have, to go over today:

- Comms Plan with tactics from July 6th, which I plan to update based on today's discussions
- A one-pager for the multi-agency conference call this Thursday

Talk to you soon!

Sara[attachment "Comms Plan 7-6-2010 with subtactics.doc" deleted by Lee Veal/DC/USEPA/US]
[attachment "One pager on new Agency direction 5-21-2010.doc" deleted by Lee Veal/DC/USEPA/US]

**Subject:** Fw: Snapshot on PAGs
**To:** CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA CN=Darrell Liles/OU=DC/O=USEPA/C=US@EPA CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Alan Perrin/OU=DC/O=USEPA/C=US
**Submit Time:** 3/4/2011 14:36:27

Sorry, I should have been much more liberal on the cc line. -Alan

Alan Perrin | Radiation Protection Division | USEPA | office (202) 343-9775 | bb (202) 279-0376 | perrin.alan@epa.gov

----- Forwarded by Alan Perrin/DC/USEPA/US on 03/04/2011 02:35 PM -----

From: Alan Perrin/DC/USEPA/US
To: Mike Flynn/DC/USEPA/US@EPA
Cc: Jonathan Edwards/DC/USEPA/US@EPA
Date: 03/04/2011 02:32 PM
Subject: Fw: Snapshot on PAGs

---

Mike, we kicked this around this morning as our latest draft thinking on the path forward for PAGs and believe the following will work.

Alan Perrin | Radiation Protection Division | USEPA | office (202) 343-9775 | bb (202) 279-0376 | perrin.alan@epa.gov

----- Forwarded by Alan Perrin/DC/USEPA/US on 03/04/2011 02:31 PM -----

From: Lee Veal/DC/USEPA/US
To: Lee Veal/DC/USEPA/US@EPA
Cc: Alan Perrin/DC/USEPA/US@EPA, Darrell Liles/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA
Date: 03/04/2011 09:45 AM
Subject: Re: Snapshot on PAGs

---

Sara and Darrell,

I had the opportunity to chat with Alan and Jon last evening. Here is a path forward for us, improving on my original submission by eliminating some redundancies:

- Tuesday, March 1 - Wednesday, March 9: Prepare revised version of comment response document and PAGs Manual, due to Sara and Darrell on 3/9.
- Thursday, March 3 - Friday, March 18: Address any internal OD level actions/issues, such as changes on the footnote.
- Thursday, March 10 - Friday, March 11: CREM reviews new drafts.
- Monday, March 14: Resend materials to Subcommittee members, and ask them to brief up their chains. Request that their FRPCC leads send in show-stoppers by no later than (NLT) the morning of March 23. These members will receive information on how we addressed (or did not address) their comments and a clean PAGs draft and FR notice.
- Tuesday, March 15: Send PAGs Manual draft and supporting information to OPEI with goal of preparing for OMB submission on or before March 28. May need some top cover to make this happen within 2 weeks (OPEI may ask for 30 days?)
- Week of March 21: FRPCC show-stoppers are due on Wednesday. Collaborate with OPEI as necessary. Get decision on whether Gina will want to

reach out to OMB on this document.

- NLT Monday, March 28: OMB Submission

Lee B. Veal
Director, Center for Radiological Emergency Management
Radiation Protection Division
Office of Radiation and Indoor Air
Environmental Protection Agency
1310 L Street, NW
Washington DC, 20005
Mail Code: 6608J
202-343-9448
cell 202-617-4322

I think it's moving... Jon was going to talk abt it so offer to him (or Lee first?) Tx!
---
Sent by EPA Wireless E-Mail Services
Nate McMichael

----- Original Message -----
**From:** Nate McMichael
**Sent:** 06/29/2010 07:27 AM EDT
**To:** Sara DeCair
**Cc:** Jessica Wieder
**Subject:** Fw: Division Meeting this Wednesday, June 30
Do you need any help preparing for this? I didn't realize that the PAG manual was the theme.

Nate McMichael
U.S. Environmental Protection Agency
Radiation Protection Division
Center for Radiation Information and Outreach
Office: (202) 343-9265
Cell: (202) 236-4176
----- Forwarded by Nate McMichael/DC/USEPA/US on 06/29/2010 07:26 AM -----

From: Rafaela Ferguson/DC/USEPA/US

To: OAR-ORIA-RPD

Date: 06/28/2010 10:25 AM

Subject: Division Meeting this Wednesday, June 30

---

Good Morning All,

Just wanted to remind you that we have a Division meeting this Wednesday, June 30 from 10-10:30am in conference room 152. Topic: "Status of PAGs". See you there!

Rafie

Rafaela Ferguson
Special Assistant/Regional Coordinator
Radiation Protection Division (6608J)
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Voice: 202-343-9362
Fax: 202-343-2304
Email: ferguson.rafaela@epa.gov

**Subject:** Fw: Review & send: note to FRPCC & PAGs Subcommittee
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**From:** CN=Susan Stahle/OU=DC/O=USEPA/C=US
**Submit Time:** 5/9/2011 09:47:08

Hi -

I'm attaching my limited comments on the PAG Manual and the FR Notice. These are just clean-up type edits, but they do need to be included in both documents. They remove leftover phrases and such other type edits from what I appreciate has been multiple efforts of review and editing. I don't think they are in any way significant enough to share with the entire group so I thought I'd just send them directly to you. Let me know if you have any questions.

We should talk about how ORIA plans to respond to SWERLO's comments. I won't be able to move forward in seeking OGC concurrence until those are addressed.

**DraftPAGManual for Interagency Review 3-11-2011 (ss 050211).doc** DraftPAGManual for Interagency Review 3-11-2011 (ss 050211).doc **draft pags fr notice 4-26-2011 (ss 050211).docx** draft pags fr notice 4-26-2011 (ss 050211).docx

Susan Stahle
Air and Radiation Law Office (Rm 7502B)
Office of General Counsel
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW (ARN: MC 2344A)
Washington, D.C. 20460
ph: (202) 564-1272
fax: (202) 564-5603
stahle.susan@epa.gov
----- Forwarded by Susan Stahle/DC/USEPA/US on 05/09/2011 09:43 AM -----

From: Sara DeCair/DC/USEPA/US
To: Lee Veal/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA
Cc: Alan Perrin/DC/USEPA/US@EPA, Darrell Liles/DC/USEPA/US@EPA
Date: 04/27/2011 01:39 PM
Subject: Review & send: note to FRPCC & PAGs Subcommittee

---

Please review this for sending this week to FRPCC? {**new note: Sue is coordinating OGC review of this as we speak**} Previously Mike wanted to send it as an FYI to the ODs. Thanks!!

FRPCC and PAGs Subcommittee;

Thank you for your insightful comments and suggestions on our new PAGs Manual revision and the accompanying Federal Register notice for public review and comment. We've incorporated your comments and have attached the updated versions and responses to all your comments.

We know you are all very busy, having supported emergency response efforts in Japan while providing

advice and information here in the U.S. about the potential impacts of the releases. In light of those unexpected events, we think it's even more critical to get this updated PAGs Manual out for review than ever before.

The PAGs Subcommittee members are well-informed and can brief the FRPCC representatives on what the revision contains, and we are asking that you provide your Department or Agency's official concurrence, via email to me, in two weeks: by noon on ___date here___. This is a showstoppers-only review, with a short turnaround, to facilitate getting the document to OMB and into the Federal Register for public review and comment.

Thank you for your continued support of this important guidance,

Jon Edwards
Director, Radiation Protection Division

[attachment "DraftPAGManual for Interagency Review 3-11-2011.doc" deleted by Susan Stahle/DC/USEPA/US]

[attachment "draft pags fr notice 4-26-2011.docx" deleted by Susan Stahle/DC/USEPA/US]

[attachment "PAGs Manual Comment Responses 3-11-2011.xlsx" deleted by Susan Stahle/DC/USEPA/US] [attachment "PAGs FR Notice Comment Responses 3-11-2011.xlsx" deleted by Susan Stahle/DC/USEPA/US]

**Subject:** Revised Chapter 2 of PAGs
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA CN=Darrell Liles/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Glenna Shields/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Tony Nesky/OU=DC/O=USEPA/C=US
**Submit Time:** 10/22/2010 15:58:42

**PREDECISIONAL DRAFT DOCUMENTS--DO NOT CITE, QUOTE OR DISTRIBUTE**

Dear Sara and Darell:

Attached are three documents: a revised Chapter 2, a comparison of the former and revised contents of Chapter 2, and a scan of Sara's comments on previous versions that may help you understand the revision.

I 'll be out of the office on travel all next week, and most of the week of November 1.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

**PAGChapter2-10-22-10.doc** PAGChapter2-10-22-10.doc **Sara-markup-Augustversoins.pdf** Sara-markup-Augustversoins.pdf **CHP2toc.doc** CHP2toc.doc

Ex. 5 - Deliberative Process

Lowell G. Ralston, PhD
Radiation Protection Division
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
Washington, DC 20460

202-343-9831 voice
202-343-2305 fax
ralston.lowell@epa.gov

Scott Telofski---03/31/2011 01:54:17 PM---I calculate: I-131 (1 hr air sample) 2300 pCi/m^3

From: Scott Telofski/MTG/USEPA/US
To: Lowell Ralston/DC/USEPA/US@EPA
Cc: Bonnie Gitlin/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Ron Fraass/MTG/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Schatzi Fitz-James/DC/USEPA/US@EPA
Date: 03/31/2011 01:54 PM
Subject: Re: ACTION: PAGs for Radiological Incidents and Trigger Levels for Cs-137 Sampled in the US After JNI

---

Ex. 5 - Deliberative Process

Lowell Ralston---03/31/2011 12:49:18 PM---Take a look a Terry's table. It seems to me you can use the Ingestion DRLs for I-131 and Cs-137 in

From: Lowell Ralston/DC/USEPA/US

To: Scott Telofski/MTG/USEPA/US@EPA

Cc: Bonnie Gitlin/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Ron Fraass/MTG/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Schatzi Fitz-James/DC/USEPA/US@EPA

Date: 03/31/2011 12:49 PM

Subject: Re: ACTION: PAGs for Radiological Incidents and Trigger Levels for Cs-137 Sampled in the US After JNI

---

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Lowell G. Ralston, PhD
Radiation Protection Division
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
Washington, DC 20460

202-343-9831 voice
202-343-2305 fax
ralston.lowell@epa.gov

Ex. 5 - Deliberative Process

From: Scott Telofski/MTG/USEPA/US
To: Lowell Ralston/DC/USEPA/US@EPA

Cc: Bonnie Gitlin/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Ron Fraass/MTG/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Schatzi Fitz-James/DC/USEPA/US@EPA
Date: 03/31/2011 01:40 PM
Subject: Re: ACTION: PAGs for Radiological Incidents and Trigger Levels for Cs-137 Sampled in the US After JNI

---

# Ex. 5 - Deliberative Process

Lowell Ralston---03/31/2011 12:37:02 PM---Great! So what you're saying is: 1. For the First Year PAG: Terry calculated at DRL = 1.07E07 pCi

From: Lowell Ralston/DC/USEPA/US

To: Scott Telofski/MTG/USEPA/US@EPA

Cc: Bonnie Gitlin/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Ron Fraass/MTG/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Schatzi Fitz-James/DC/USEPA/US@EPA

Date: 03/31/2011 12:37 PM

Subject: Re: ACTION: PAGs for Radiological Incidents and Trigger Levels for Cs-137 Sampled in the US After JNI

---

# Ex. 5 - Deliberative Process

Lowell G. Ralston, PhD
Radiation Protection Division
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
Washington, DC 20460

202-343-9831 voice

202-343-2305 fax
ralston.lowell@epa.gov

Scott Telofski---03/31/2011 01:23:24 PM---Comparison of results on our Cs-137 trigger table versus Terry's spreadsheet for the DRL for the fir

From: Scott Telofski/MTG/USEPA/US
To: Lowell Ralston/DC/USEPA/US@EPA
Cc: Bonnie Gitlin/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Ron Fraass/MTG/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Schatzi Fitz-James/DC/USEPA/US@EPA
Date: 03/31/2011 01:23 PM
Subject: Re: ACTION: PAGs for Radiological Incidents and Trigger Levels for Cs-137 Sampled in the US After JNI

---

Comparison of results on our Cs-137 trigger table versus Terry's spreadsheet for the DRL for the first and second years (comparison assumptions and results in red).

[attachment "Terry's Tables FIRST and SECOND YEAR.xls" deleted by Lowell Ralston/DC/USEPA/US]

Lowell Ralston---03/31/2011 12:14:26 PM---Quick question: I assuming your dose estimates are in units of mrem per pCi/m3. not just mrem, corr

From: Lowell Ralston/DC/USEPA/US

To: Scott Telofski/MTG/USEPA/US@EPA

Cc: Bonnie Gitlin/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Ron Fraass/MTG/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Schatzi Fitz-James/DC/USEPA/US@EPA

Date: 03/31/2011 12:14 PM

Subject: Re: ACTION: PAGs for Radiological Incidents and Trigger Levels for Cs-137 Sampled in the US After JNI

---

# Ex. 5 - Deliberative Process

Lowell G. Ralston, PhD
Radiation Protection Division
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
Washington, DC 20460

202-343-9831 voice
202-343-2305 fax
ralston.lowell@epa.gov

Scott Telofski---03/31/2011 01:06:28 PM---Here is a spreadsheet. Data only need to be entered in "colored" fields (red, green or blue). Defa

From: Scott Telofski/MTG/USEPA/US

To: Lowell Ralston/DC/USEPA/US@EPA
Cc: Bonnie Gitlin/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Ron Fraass/MTG/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Schatzi Fitz-James/DC/USEPA/US@EPA
Date: 03/31/2011 01:06 PM
Subject: Re: ACTION: PAGs for Radiological Incidents and Trigger Levels for Cs-137 Sampled in the US After JNI

---

Here is a spreadsheet. Data only need to be entered in "colored" fields (red, green or blue). Default values are entered.

[attachment "Dose Calculation Spreadsheet.xlsx" deleted by Lowell Ralston/DC/USEPA/US]

Lowell Ralston---03/31/2011 05:02:10 AM---Scott, Thank you!. Would you please send me your spreadsheet(s) so I can understand/check your calc

From: Lowell Ralston/DC/USEPA/US

To: Scott Telofski/MTG/USEPA/US@EPA

Cc: Bonnie Gitlin/DC/USEPA/US@EPA, Ron Fraass/MTG/USEPA/US@EPA, Schatzi Fitz-James/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA

Date: 03/31/2011 05:02 AM

Subject: Re: ACTION: PAGs for Radiological Incidents and Trigger Levels for Cs-137 Sampled in the US After JNI

---

Scott,

Thank you!. Would you please send me your spreadsheet(s) so I can understand/check your calculations and parameter values? A second pair of eyes always helps!

Lowell

Lowell G. Ralston, PhD
Radiation Protection Division
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
Washington, DC 20460

202-343-9831 voice
202-343-2305 fax
ralston.lowell@epa.gov

Scott Telofski---03/30/2011 04:24:35 PM---Here is the table for Cs-137. Calculations are the same as those for I-131 particulates, with the e

From: Scott Telofski/MTG/USEPA/US
To: EOC Environmental Unit@EPA
Cc: Bonnie Gitlin/DC/USEPA/US@EPA, EOC Environmental Unit@EPA, Lowell Ralston/DC/USEPA/US@EPA, Ron Fraass/MTG/USEPA/US@EPA, Schatzi Fitz-James/DC/USEPA/US@EPA

Date: 03/30/2011 04:24 PM
Subject: Re: ACTION: PAGs for Radiological Incidents and Trigger Levels for Cs-137 Sampled in the US After JNI

---

Here is the table for Cs-137. **Ex. 5 - Deliberative Process**

# Ex. 5 - Deliberative Process

[attachment "Air Particulate Trigger Levels for Cs-137.docx" deleted by Lowell Ralston/DC/USEPA/US]

EOC Environmental Unit---03/30/2011 12:59:17 PM---Hi Scott: Jon Edwards has proactively requested a protective action guides table for Cs-137 similar

From: EOC Environmental Unit

To: Scott Telofski/MTG/USEPA/US@EPA

Cc: Lowell Ralston/DC/USEPA/US@EPA, EOC Environmental Unit@EPA, Ron Fraass/MTG/USEPA/US@EPA, Bonnie Gitlin/DC/USEPA/US@EPA

Date: 03/30/2011 12:59 PM

Subject: ACTION: PAGs for Radiological Incidents and Trigger Levels for Cs-137 Sampled in the US After JNI

---

Hi Scott:
Jon Edwards has proactively requested a protective action guides table for Cs-137 similar to the one you and others prepared for I-131 in the last several days. I understand you are the go to person to make this happen: - )

Please send us the Cs-137 PAG table by Noon EDT March 31 and let us know if you have questions.
Thank you!
Schatzi

Lee,
Thanks for providing this to me. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Thanks again for sharing this with me. I look forward to working with you and ORIA on these issues.....Mario

"Begin with the end in mind.....How are you going to handle your waste?" ..... Visit us at:
www.epa.gov/waste/homeland/

Mario E. Ierardi
Homeland Security Team Leader
Waste Characterization Branch
Materials Recovery and Waste Management Division (MC: 5304P)
U.S. EPA Office of Resource Conservation and Recovery
1200 Pennsylvania Ave, NW
Washington, D.C. 20460-0001

P (703) 308-8894
F (703) 308-0522
Email: ierardi.mario@epa.gov

Send couriers to:
Two Potomac Yard
5th Floor, Room N-5847
2733 South Crystal Dr
Arlington, VA 22202

Lee Veal---09/30/2010 05:23:49 PM---Dear Mario, It was so nice to see you again this week! Glad to be out of the EOC.

From: Lee Veal/DC/USEPA/US

To: Mario Ierardi/DC/USEPA/US@EPA

Cc: Sara DeCair/DC/USEPA/US@EPA

Date: 09/30/2010 05:23 PM

Subject: Fw: PAGs one-pager for you

---

Dear Mario,

It was so nice to see you again this week! Glad to be out of the EOC.

You had mentioned the optimization process during the FRPCC meeting this week. I have been thinking about that and wanted to make sure that you have our latest on the PAGs and the EPA position on optimization.

The attached file contains the one-pager that we are using for our talking points or notes. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Call me or Sara DeCair if you have any questions.

Lee

Lee B. Veal
Director, Center for Radiological Emergency Management
Radiation Protection Division
Office of Radiation and Indoor Air
Environmental Protection Agency
1310 L Street, NW
Washington DC, 20005
Mail Code: 6608J
202-343-9448
cell 202-617-4322

[attachment "One pager on new Agency direction 9-30-2010.doc" deleted by Mario Ierardi/DC/USEPA/US]

**From:** "Bowman, David" <David.Bowman@nnsa.doe.gov>
**To:** Sara DeCair/DC/USEPA/US@EPA
**Submit Time:** 8/2/2011 10:51:58
**Subject:**

Sara, the third paragraph on page 32 is ambiguous. **Ex. 5 - Deliberative Process**

# Ex. 5 - Deliberative Process

Dave

EO12866_Draft PAGs Manual 2060-ZA19 Guidance OMB_20110630.doc

**Submit Time:** 2/11/2011 15:43:55
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Darrell Liles/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** PAGs cmt responses

Darrell,

We've gotten some of the responses done tho' I think some of them will have to be more even-toned. Lowell and Neal helped me for two separate hours, and then I hit a few -- at this rate, it'll take 9.25 hrs more :-)

Can you look at the worker sections and the nomenclature notes? They are highlighted over in "Add'l" column.We'll blend spreadsheets on Tuesday as you're leaving..... whee!!

S.

PAGs Comment Responses.xlsx PAGs Comment Responses.xlsx

Thanks, Sara. This looks good - I will make some comments and make this a "path forward" paper for folks to review.

Debbie Dietrich
Associate Administrator for Homeland Security
USEPA
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Ph 202-564-6978
Fax 202-501-0026

Sara DeCair---06/09/2011 01:47:07 PM---Debbie, use any of this language as you see fit: There are four primary issues that we could resolve

From: Sara DeCair/DC/USEPA/US
To: Debbie Dietrich/DC/USEPA/US@EPA
Cc: Jonathan Edwards/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Daniel Schultheisz/DC/USEPA/US@EPA, Alan Perrin/DC/USEPA/US@EPA
Date: 06/09/2011 01:47 PM
Subject: draft points for Debbie, Bob about SOE/PLE

---

Debbie, use any of this language as you see fit:

There are four primary issues that we could resolve as follows:

**Ex. 5 - Deliberative Process**

# Ex. 5 - Deliberative Process

Sara D. DeCair, Health Physicist
www.epa.gov/radiation/rert/pags.html
Center for Radiological Emergency Management
U.S. Environmental Protection Agency
office (202) 343-9108
decair.sara@epa.gov

Okay with EnDyna until 9/30/2011

[Untitled].pdf [Untitled].pdf

Val

Valerie Daigler
U.S.EPA/OAR/ORIA
Radiation Protection Division (6608J)
202/343-9204
202/343-2302 (fax)

Sara DeCair---11/30/2010 07:59:37 AM---Val, just curious if my long-awaited support from Endyna on the PAGs is ready to roll, as we're fina

From: Sara DeCair/DC/USEPA/US

To: daigler.valerie@epa.gov

Cc: "Darrell Liles" <liles.darrell@epa.gov>

Date: 11/30/2010 07:59 AM

Subject: Ok to use Endyna?

---

Val, just curious if my long-awaited support from Endyna on the PAGs is ready to roll, as we're finally at a point again to need them. Plz let me know if there is any paperwork to do. As before, the delay is due to internal gov't discussions, not any probs with the contractor. Thank you!
S.
---
Sent by EPA Wireless E-Mail Services

Sara and Smita,

We can get some extra copies made here too.
Given that you (Sara) are on travel, can I help you with this? I have your distro from prior emails and can draft that.

Lee

Lee B. Veal
Director, Center for Radiological Emergency Management
Radiation Protection Division
Office of Radiation and Indoor Air
Environmental Protection Agency
1310 L Street, NW
Washington DC, 20005
Mail Code: 6608J
202-343-9448
cell 202-617-4322

"Smita Siddhanti" ---02/22/2011 05:48:55 PM---Hi Sara: A few thoughts and our draft agenda for the upcoming Monday meeting:

From: "Smita Siddhanti" <siddhanti@endyna.com>
To: Sara DeCair/DC/USEPA/US@EPA
Cc: Lee Veal/DC/USEPA/US@EPA, Darrell Liles/DC/USEPA/US@EPA, "'Kylie Zirbel'" <kzirbel@endyna.com>
Date: 02/22/2011 05:48 PM
Subject: Upcoming PAGs Meeting

---

Hi Sara:

A few thoughts and our draft agenda for the upcoming Monday meeting:

1. We need to send the final comment-response matrix, along with the revised edited document (which includes the responses to the comments) to the entire committee by Friday noon. This will allow them to print copies and bring with them.
2. You may need to send them a mail, informing the committee members that these documents will be sent and that they need to bring hard copies with them, otherwise they will not be able to participate effectively. You may want to make some extra copies in-house or let us know if we should bring some.
3. Since the time is too short, I think we will need to have a strong facilitator (could be you) to move each comment discussion forward to complete chapters editing.
4. The following is a suggested agenda, which is based on working through comments, which they would have received in documents sent earlier.

   9:00-9:15: General PAGs Comments
   9:15-10:00: Chapter 1 Comments
   10:00-10:45: Chapter 2 Comments
   10:45-11:00: Break
   11-12: Water PAGs
   12-1: Lunch Break
   1-1:30: Chapter 2 Comments (Cont'd)
   1:30-2:30: Chapter 3 Comments

2:30-3:00: Additional Comments/Questions/Concerns/Next Steps

We are starting to edit the document to reflect the comment responses you sent. We will start sending you parts of chapters as we finish, so you can review before we compile the final version to send out to the committee on Friday.

Hope you are enjoying the snow and elections in Chicago!

Best,
-Smita

Smita K. Siddhanti, Ph.D | Program Manager
P: 703.848.8840 | F: 703.848.9001
Cell-703-217-4800

**EnDyna, Inc.**
7926 Jones Branch Drive.
Suite 620
McLean, VA 22102
www.endyna.com

Point taken. I will check with Alan.

Jessica Wieder
U.S. Environmental Protection Agency
Radiation Protection Division
Center for Radiation Information
(202) 343-9201

Colby Stanton---11/03/2009 03:27:11 PM---See what Alan thinks. I think the question is "Why would EPA ever agree to this?" And the answer re

From: Colby Stanton/DC/USEPA/US

To: Jessica Wieder/DC/USEPA/US@EPA

Cc: Sara DeCair/DC/USEPA/US@EPA

Date: 11/03/2009 03:27 PM

Subject: Re: Cmts from Colby -- Markey responses

---

See what Alan thinks. I think the question is "Why would EPA ever agree to this?" And the answer really is the broad range of potential impacts.... But I agree, I like the answer, and it's already on the longish side....
---
Sent by EPA Wireless E-Mail Services
Jessica Wieder

----- Original Message -----
**From:** Jessica Wieder
**Sent:** 11/03/2009 03:13 PM EST
**To:** Colby Stanton
**Cc:** Sara DeCair
**Subject:** Re: Cmts from Colby -- Markey responses

I am pretty happy with the responses to 4. I am trying to stay as factual as possible about optimization without sounding defensive. Take a look. Let me know if you want us to add it in.

Jessica Wieder
U.S. Environmental Protection Agency
Radiation Protection Division
Center for Radiation Information
(202) 343-9201

Colby Stanton---11/03/2009 03:07:55 PM---Oh, sorry, I wasn't saying broad range should be in #7 - that's just where I thought of it, at the e

From: Colby Stanton/DC/USEPA/US

To: Jessica Wieder/DC/USEPA/US@EPA

Cc: "Sara DeCair" <Decair.Sara@epamail.epa.gov>

Date: 11/03/2009 03:07 PM

Subject: Re: Cmts from Colby -- Markey responses

---

Oh, sorry, I wasn't saying broad range should be in #7 - that's just where I thought of it, at the end. I guess it would belong in #4?
---
Sent by EPA Wireless E-Mail Services

Jessica Wieder

----- Original Message -----
**From:** Jessica Wieder
**Sent:** 11/03/2009 03:03 PM EST
**To:** Sara DeCair; Colby Stanton
**Cc:** Alan Perrin; Nate McMichael; Thomas Agee
**Subject:** Re: Cmts from Colby -- Markey responses
Here is the updated version - with track changes.

A question back to the group...

Question #3 - How do we want to handle the request for documentation for the drinking water PAGs development (especially with the ongoing FOIA)? Right now we are unresponsive.

A response to Colby's comments

Question #7 - Colby we decided not to include discussion on the broad range of impacts. We felt addressing our need for preparedness adequately answered the question without having to defend the optimization process.

Enjoy!

[attachment "MARKEY CONTROL RESPONSE 11-3-2009 v2.doc" deleted by Colby Stanton/DC/USEPA/US]

Nate, Thomas and Jess (your personal writing think tank)

Jessica Wieder
U.S. Environmental Protection Agency
Radiation Protection Division
Center for Radiation Information
(202) 343-9201

Sara DeCair---11/03/2009 01:35:31 PM---Next!!! ----- Forwarded by Sara DeCair/DC/USEPA/US on 11/03/2009 01:34 PM -----

From: Sara DeCair/DC/USEPA/US

To: Nate McMichael/DC/USEPA/US@EPA, Jessica Wieder/DC/USEPA/US@EPA, Thomas Agee/DC/USEPA/US@EPA

Cc: Alan Perrin/DC/USEPA/US@EPA

Date: 11/03/2009 01:35 PM

Subject: Cmts from Colby -- Markey responses

---

Next!!!
[attachment "MARKEY CONTROL RESPONSE 11-3-2009.doc" deleted by Jessica Wieder/DC/USEPA/US]

----- Forwarded by Sara DeCair/DC/USEPA/US on 11/03/2009 01:34 PM -----

From: Colby Stanton/DC/USEPA/US

To: Sara DeCair/DC/USEPA/US@EPA, Alan Perrin/DC/USEPA/US@EPA

Date: 11/03/2009 01:32 PM

Subject: Re: Time to read Markey responses on b-berry?

---

Definitely Sue; Ariadne?

**Ex. 5 - Deliberative Process**

Ex. 5 - Deliberative Process

Thanks for all the hard work!
---
Sent by EPA Wireless E-Mail Services
Sara DeCair

----- Original Message -----
**From:** Sara DeCair
**Sent:** 11/03/2009 01:16 PM EST
**To:** Colby Stanton; Alan Perrin
**Subject:** Time to read Markey responses on b-berry?

Here is a long paste -- at this point, will you take a look (and Alan, too?) and then tomorrow morning I can include people like Mike Boyd, Dana Tulis, and Jon? Who else? Sue, who is coordinating for OGC? Thomas and Nate drafted these then Jess helped edit before I did some edits. We have bets that a lot of detail will be cut on its way up... thanks for any suggestions!! (It takes a village...)

*DRAFT – MARKEY LETTER CONTROL RESPONSE to PAGs QUESTIONS*

Ex. 5 - Deliberative Process

# Ex. 5 - Deliberative Process

# Ex. 5 - Deliberative Process

# Ex. 5 - Deliberative Process

**Subject:** Fw: Division Meeting this Wednesday, June 30
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**From:** CN=Thomas Agee/OU=DC/O=USEPA/C=US
**Submit Time:** 6/28/2010 10:35:59

Wouldn't it be better to save that topic until you're actually here for the meeting?

Thomas Agee
Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov
Office: (202)-343-9933
Fax: (202)-343-2302
----- Forwarded by Thomas Agee/DC/USEPA/US on 06/28/2010 10:35 AM -----

From: Rafaela Ferguson/DC/USEPA/US

To: OAR-ORIA-RPD

Date: 06/28/2010 10:25 AM

Subject: Division Meeting this Wednesday, June 30

---

Good Morning All,

Just wanted to remind you that we have a Division meeting this Wednesday, June 30 from 10-10:30am in conference room 152. Topic: "Status of PAGs". See you there!

Rafie

Rafaela Ferguson
Special Assistant/Regional Coordinator
Radiation Protection Division (6608J)
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Voice: 202-343-9362
Fax: 202-343-2304
Email: ferguson.rafaela@epa.gov

**Submit Time:** 11/10/2010 11:18:29
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Darrell Liles/OU=DC/O=USEPA/C=US@EPA CN=Tony Nesky/OU=DC/O=USEPA/C=US@EPA CN=Nate McMichael/OU=DC/O=USEPA/C=US@EPA
**Subject:** PAGs Manual Chapter 2 for your review

Hi!

Thanks to my brave/stupid promise to Mike Flynn the other day, we've worked hard to get this draft of Chapter 2 to you on a fast track. Tony and Darrell are now focusing on Chapter 3 and latest comments on the FR and Chapter 1. Please see what you think of the attached (only 19 pages!!) and let me know what should happen next. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

We do have a standing PAGs meeting on Monday at 11 so if you can look at it by then, that would be super!

Thanks so much,

Sara

PAGChapter2 11-10-10.doc PAGChapter2 11-10-10.doc

**From:** "Kylie Zirbel" <kzirbel@endyna.com>
**To:** Sara DeCair/DC/USEPA/US@EPA Darrell Liles/DC/USEPA/US@EPA Lee Veal/DC/USEPA/US@EPA
**Cc:** <siddhanti@endyna.com>
**Subject:** updated comment sheet
**Submit Time:** 2/23/2011 10:33:44

Hi Sara and Darrell,

I have synthesized the comments provided yesterday into the comment sheet. It is attached here. Thank you!

Sincerely,

**Kylie Zirbel** | Analyst

P: 703.848.8842 x126

kzirbel@endyna.com

**EnDyna, Inc.**

7926 Jones Branch Drive.

Suite 620

McLean, VA 22102

www.endyna.com

**PAGs Comments 2-23-2011.xlsx**

John,

I've attached 2 documents. The first is an Excel spreadsheet with the comments from section 2.6-2.7. The second is the revised PAG sections 2.6-2.7. We can discuss wording of these two sections on the call.

**PAGs Comments on section 2.6 and 2.7.xlsx** PAGs Comments on section 2.6 and 2.7.xlsx

**ATT4RIBG.docx** PAGs (section 2.6-2.7 with OSHA proposed wording)..docx

Thanks,

Darrell Liles
Health Physicist
Center for Radiological Emergency Management
Environmental Protection Agency MC-6608J
1200 Pennsylvania Ave NW
Washington DC 20460-1000
Phone (202)343-9550

really? I was out of the loop on that conversation...is Chris coming to happy hour tomorrow? Or working until midnight again?

Thomas Agee
Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov
Office: (202)-343-9933
Fax: (202)-343-2302

Sara DeCair---06/30/2010 02:22:38 PM---Aw, and I just heard we can't have you work down here, it would be a nice break... ----------

From: Sara DeCair/DC/USEPA/US

To: Thomas Agee/DC/USEPA/US@EPA

Date: 06/30/2010 02:22 PM

Subject: Re: PAGs - Respond with availability for Conf Call

---

Aw, and I just heard we can't have you work down here, it would be a nice break...
---
Sent by EPA Wireless E-Mail Services
Thomas Agee

----- Original Message -----
**From:** Thomas Agee
**Sent:** 06/30/2010 02:16 PM EDT
**To:** Sara DeCair
**Subject:** Re: PAGs - Respond with availability for Conf Call
Not a prob- just sad...CORE NAR is definitely becoming the new PAGs FOIA

Thomas Agee
Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov
Office: (202)-343-9933
Fax: (202)-343-2302

Sara DeCair---06/30/2010 02:12:25 PM---Dangit! ----------

From: Sara DeCair/DC/USEPA/US

To: Thomas Agee/DC/USEPA/US@EPA

Date: 06/30/2010 02:12 PM

Subject: Re: PAGs - Respond with availability for Conf Call

---

Dangit!

---
Sent by EPA Wireless E-Mail Services

Thomas Agee

----- Original Message -----
**From:** Thomas Agee
**Sent:** 06/30/2010 02:08 PM EDT
**To:** Sara DeCair
**Subject:** Re: PAGs - Respond with availability for Conf Call
You still have Colby on there :(

Thomas Agee
Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov
Office: (202)-343-9933
Fax: (202)-343-2302

Sara DeCair---06/30/2010 02:07:01 PM---PAGs Partners; I am hoping to set up a 60 to 90 minute conference call to discuss the PAGs Manual re

From: Sara DeCair/DC/USEPA/US

To: Andrew.Wallo@eh.doe.gov, cym3@cdc.gov, man@cdrh.fda.gov, patricia.milligan@nrc.gov, ricardo.reyes@dtra.mil, stanton.colby@epa.gov, Sara DeCair/DC/USEPA/US@EPA, stephen.domotor@eh.doe.gov, Vanessa.Quinn@dhs.gov, william.cunningham@nist.gov, walker.stuart@epa.gov, ammon.doug@epa.gov, schumann.jean@epa.gov, Ferris.John@dol.gov, druedy@endyna.com, siddhanti@endyna.com, asa4@CDC.GOV, Jack.Patterson@rss.usda.gov, tdkraus@sandia.gov, "Conklin, Craig" <craig.conklin@HQ.DHS.GOV>, "MacKinney, John A" <John.Mackinney@dhs.gov>

Cc: Alan Perrin/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Darrell Liles/DC/USEPA/US@EPA, Nate McMichael/DC/USEPA/US@EPA, Jessica Wieder/DC/USEPA/US@EPA, Thomas Agee/DC/USEPA/US@EPA

Date: 06/30/2010 02:07 PM

Subject: PAGs - Respond with availability for Conf Call

---

PAGs Partners;

I am hoping to set up a 60 to 90 minute conference call to discuss the PAGs Manual revision. The Agency administration has reviewed our Jan. 2009 proposal and we're ready to get started again toward getting the revision out for public review & comment! By COB on Thursday, July 8th, please tell me which of these times you are NOT available for a call. Thank you so much, and I look forward to talking with you!

Monday, July 19, 9 to 11 am
Wednesday, July 21, 9 to 11 am or 1 to 3 pm
Thursday, July 22, 9 to 11 am

Sara
Sara D. DeCair, Health Physicist

www.epa.gov/radiation/rert/pags.html
Center for Radiological Emergency Management
U.S. Environmental Protection Agency
office (202) 343-9713
fax (202) 343-2304
decair.sara@epa.gov

I love it when you tell me I have fresh eyes.....

Lee B. Veal
Director, Center for Radiological Emergency Management
Radiation Protection Division
Office of Radiation and Indoor Air
Environmental Protection Agency
1310 L Street, NW
Washington DC, 20005
Mail Code: 6608J
202-343-9448
cell 202-617-4322

Tony Nesky---12/01/2010 10:39:17 AM---Dear Sara and Lee: Attached are the latest versions of Chapters 1,2, and 3 of the PAGs. These versi

From: Tony Nesky/DC/USEPA/US

To: Sara DeCair/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA

Cc: Glenna Shields/DC/USEPA/US@EPA

Date: 12/01/2010 10:39 AM

Subject: Chapters 1, 2,3 of the PAGs

---

Dear Sara and Lee:

Attached are the latest versions of Chapters 1,2, and 3 of the PAGs. These versions have been edited to incorporate Sara's feedback from yesterday. I'm also attaching a mark-up version of each chapter to help you find the changes.

I have done my best to give these a thorough, line by line review, but I fear that I am simply too close to the document, and that review with a pair of fresh eyes is needed. Please note that when I say "fresh eyes, " I am referring to "Lee."

I'll get any changes you need right back to you today.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

[attachment "Chapter1changes11-30-10.doc" deleted by Lee Veal/DC/USEPA/US] [attachment "Chapter 2edits11-30-10.doc" deleted by Lee Veal/DC/USEPA/US] [attachment "Chapter 3edits11-30-10.doc" deleted by Lee Veal/DC/USEPA/US] [attachment "PAGChapter1-11-30-10.doc" deleted by Lee Veal/DC/USEPA/US] [attachment "PAGChapter2-11-30-10.doc" deleted by Lee Veal/DC/USEPA/US] [attachment "PAGChapter 3 11-30-10.doc" deleted by Lee Veal/DC/USEPA/US]

**Submit Time:** 10/30/2009 13:34:46
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Susan Stahle/OU=DC/O=USEPA/C=US@EPA CN=Ariadne Goerke/OU=DC/O=USEPA/C=US@EPA CN=Wynne Miller/OU=DC/O=USEPA/C=US@EPA CN=David Huber/OU=DC/O=USEPA/C=US@EPA CN=Jean Schumann/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** FYI: Inside EPA article: "Markey Bolsters Activists' Push To Reverse Bush EPA Radiation Policies"

!
----- Forwarded by Sara DeCair/DC/USEPA/US on 10/30/2009 01:32 PM -----

From: Nate McMichael/DC/USEPA/US

To: Alan Perrin/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA

Cc: Glenna Shields/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Colby Stanton/DC/USEPA/US@EPA, Jerome Puskin/DC/USEPA/US@EPA, Mike Boyd/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, David Pawel/DC/USEPA/US@EPA, Angela Shogren/DC/USEPA/US@EPA, Julia Ortiz/DC/USEPA/US@EPA

Date: 10/30/2009 09:18 AM

Subject: Inside EPA article: "Markey Bolsters Activists' Push To Reverse Bush EPA Radiation Policies"

---

Jon & Alan,

FYI.

The following was posted today by Inside EPA:

http://www.insideepa.com/secure/docnum.asp?docnum=10292009_radiation

## Markey Bolsters Activists' Push To Reverse Bush EPA Radiation Policies

Rep. Edward Markey (D-MA) is joining environmentalists' calls for EPA to abandon controversial Bush-era radiation policies, including those limiting the need to address contamination until radiation reaches levels thousands of times higher than what the agency normally considers safe.

Markey's call, contained in an Oct. 27 letter to EPA Administrator Lisa Jackson, could bolster environmentalists who are scheduled to meet with key EPA officials Nov. 2 to discuss their long-standing concerns over the Bush radiation policies. Activists had requested the meeting in part due to concerns that staff in EPA's Office of Radiation and Indoor Air (ORIA) would not adequately brief the agency's new political leaders on the controversies surrounding the Bush policy proposals (*see related story*).

One environmental group, Public Employees for Environmental Responsibility (PEER), has also filed an Oct. 28 lawsuit under the Freedom of Information Act seeking agency documents showing "internal and external reviewers registered grave concerns about the radical relaxation of radiation exposure limits being proposed," the group said in a press release. Much of the information the group is seeking is similar to data Markey is asking Jackson to release.

In his letter, Markey, who chairs the House Energy & Environment Subcommittee, blasts the so-called protective action guide (PAG) for nuclear emergencies EPA drafted under Bush, which was made public by an award-winning series of *Inside EPA* articles last year. Markey also urges Jackson to abandon other radiation policies initiated by the Bush EPA, including a controversial radiation risk guide.

According to Markey, the Bush-era policy proposals "could weaken radiation standards and protective guidance, ignoring sound scientific recommendations and dismantling decades of EPA policies for protection of the public from ionizing radiation." Markey says that if "EPA chooses to proceed with these actions, it could put public health at risk and threatens to undermine the public's confidence in the regulator meant to protect it."

Regarding the PAG, Markey notes the Bush-era proposal "would permit radioactivity concentrations in drinking water during the intermediate phase (for 1-2 years after the release) that are orders of magnitude higher than EPA's long-held drinking water standards and suggests that government officials need not provide clean water until groundwater radioactivity is thousands of times higher than traditional Superfund guidance."

The letter also echos activists' concerns that the guide embraces a controversial cleanup approach known as "optimization," which he says "allows cleanup standards far outside EPA's traditional acceptable risk range, so high that they could result in public exposures that are the equivalent of approximately 50,000 chest X-rays, with a cancer risk that EPA itself estimates at a remarkable 1 in 4" people.

Markey also demands that EPA identify who was responsible for calculating the controversial drinking water standards in the PAG and that it explain how the calculations were done. "Please provide documentation supporting the method used and all correspondence leading to the decision to adopt this methodology," Markey says.

The letter questions why, according to the Government Accountability Office, EPA as recently as September drafted yet another guidance on using the optimization approach to respond to nuclear emergencies "when this controversial approach from the prior Administration was supposed to be under review by the new administration."

Markey asks Jackson for "the status of the PAGs review by the new EPA leadership" and to "provide a detailed timeline and any preliminary conclusions."

Marcus Peacock, the Bush EPA's deputy administrator, signed off on the PAG during the administration's waning hours in office, but newly installed Obama officials halted its planned publication in the *Federal Register* days before its scheduled release, saying they wanted to review the document.

The review was initially placed on hold pending the Senate's confirmation of Gina McCarthy as EPA's new air and radiation chief. Following her confirmation, a coalition of environmental and public health groups -- including the Natural Resources Defense Counsel and Sierra Club -- requested that McCarthy, along with several other newly-appointed EPA officials, meet with them to discuss the PAG and the other controversial radiation policies before making any decisions.

McCarthy, along with Mathy Stanislaus, the Obama EPA's waste chief, and other agency officials have since agreed to meet with the activists on Nov. 2, an activist says. The purpose of the meeting will be to discuss the PAGs and the other controversial radiation proposals, including the draft risk guide, the activist says.

In his letter, Markey raises concerns that the draft risk guide, commonly known as the "Blue Book," disregards "almost every risk figure reported" by a 2006 National Academy of Sciences panel in a document chartered by EPA known as BEIR VII. "In fact, in the great majority of cases ORIA proposed to use a lower risk figure than that recommended by BEIR VII," Markey notes.

"Adopting these lower figures, would result in relaxed regulations and a concomitant increase in public exposures to radiation and potential radiation-induced cancers relative to the adoption of BEIR VII risk values," Markey says. "This has significant ramifications for all of EPA's regulatory activities even outside of ORIA, including those under the responsibility of Office of Solid Waste and Emergency Response (OSWER) and the Office of Water (OW)."

Markey in particular echoes activists' concerns that EPA in the draft Blue Book ignores a suggestion in the 2006 NAS study that radiation from "low-energy" sources such as medical X-rays may be two to three times more dangerous than previously thought.

"Does the EPA believe it is ethical to continue to [rely on its previous assumptions regarding X-rays] when in fact it is known that" they are more dangerous than previously thought,

Markey's letter asks. "Please explain, particularly in light of the very large collective X-ray doses being received by the U.S population due to widespread use of CT scans in medicine."

An EPA spokesman says the agency "is reviewing the letter and will respond accordingly. --
*Douglas P. Guarino*

10292009_radiation

---

Nate McMichael
U.S. Environmental Protection Agency
Radiation Protection Division
Center for Radiation Information and Outreach
Office: (202) 343-9265
Cell: (202) 236-4176

**Subject:** Draft of Chapter 2
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Glenna Shields/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Tony Nesky/OU=DC/O=USEPA/C=US
**Submit Time:** 11/9/2010 14:51:18

Dear Sara:

Here is a revised Chapter 2 of the draft PAG Manual that incorporates the changes we discussed yesterday. I'm also attaching a revised Table of Contents for Chapter 2. Please see me if you have any questions.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

**Ch2toc11-9-10.doc** Ch2toc11-9-10.doc **PAGChapter2-11-9-10.doc** PAGChapter2-11-9-10.doc

**Subject:** Re: flagged spreadsheet comments for OSWER
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA CN=Colby Stanton/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**From:** CN=Thomas Agee/OU=DC/O=USEPA/C=US
**Submit Time:** 2/1/2010 11:55:23

Hey Sara and Colby,

Here are scanned copies of the dicey comments from the spreadsheets for OSWER review. I tried to put a 1-2 sentence explanation of why you guys flagged the comments. Another email with the OW spreadsheet comments will come soon.

For OSWER:

**2 Stuart Walker comments-erroneous 70 year assumption.pdf**

**assumption.pdf** 2 Stuart Walker comments-erroneous 70 year assumption.pdf - The first page (line 1049) has a comment from Stuart Walker that is misleading. Stuart mentions a risk associated with an erroneous 70-year assumption. (The second page has no meaning; I just accidentally copied both sides.)

# Ex. 5 - Deliberative Process

# Ex. 5 - Deliberative Process

Let me know if you have any questions or need me to make changes.

Best,

Thomas Agee
Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov
Office: (202)-343-9933
Fax: (202)-343-2302

Dear Darrell:

We eliminated all the other Agency's specific safety sections and moved the contamination limits section, so the numbering in Chapter 2 changed considerably. Here's the complete document with an up-to-date table of contents.

If you have any questions, feel free to ask Sara.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597

nesky.tony@epa.govPAGManual2-15-10.doc PAGManual2-15-10.doc

Sara,

Take a gander at my responses. Some of them are controversial. Do you want me to start looking at some of the others?

Darrell

-----Sara DeCair/DC/USEPA/US wrote: -----

To: Lee Veal/DC/USEPA/US@EPA, Alan Perrin/DC/USEPA/US@EPA, Darrell Liles/DC/USEPA/US@EPA
From: Sara DeCair/DC/USEPA/US
Date: 02/14/2011 11:35AM
Subject: Re: PAGs comment responses and setting up meetings

Would it be good to get Emily started on the scheduling process for these meetings? Yes, I am hurrying :)

Also, do you think it'd be a good idea to set some times SOON to sit down with Jean and Stuart for cleanup, and Sam and Wynne for water, to help put together helpful hints/websites for the users? It would be awesome to provide links, on our web site, to each state's relevant programs - do you think we can work together with OSWER and OW successfully to do this? Thanks for guidance, I am just not sure what to do first.

-----Sara DeCair/DC/USEPA/US wrote: -----

To: Lee Veal/DC/USEPA/US@EPA, Alan Perrin/DC/USEPA/US@EPA, Darrell Liles/DC/USEPA/US@EPA
From: Sara DeCair/DC/USEPA/US
Date: 02/11/2011 03:54PM
Subject: PAGs comment responses and setting up meetings

So there are around 370 comments total, including some toughies, yet most are easy to respond to - either we agree and it's a good catch, or we're clear on why it's not to be incorporated. Lowell and Neal and I knocked out about 80 of the comments this week, and we have two 1.5 hour meetings early next week to get further.

Mike asked that we start the process on setting up an ODs meeting to talk about the big issues sometime in late February. It probably doesn't have to be before (or necessarily after) the Feb. 28 Subcommittee meeting, but then I know Mike wants to talk to Gina as well, to tee up things we'll need her help with. Shall I ask Emily to start that scheduling process?

Thanks,

S.

**Copy of PAGs Comment Responses-Liles 02-14.xlsx**

**Subject:** 4 -- Fw: Comments on draft drinking water PAGS
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**From:** CN=Stuart Walker/OU=DC/O=USEPA/C=US
**Submit Time:** 7/22/2009 21:34:39

----- Forwarded by Stuart Walker/DC/USEPA/US on 07/22/2009 09:14 PM -----

From: Stuart Walker/DC/USEPA/US

To: Edward Tupin/DC/USEPA/US@EPA

Cc: Bruce Means/DC/USEPA/US@EPA, John Mackinney/DC/USEPA/US@EPA, Schatzi Fitz-James/DC/USEPA/US@EPA, Carl Pavetto/DC/USEPA/US@EPA, JoAnn Griffith/DC/USEPA/US@EPA

Date: 03/04/2004 03:59 PM

Subject: Comments on draft drinking water PAGS

---

Hi Ed, I finally was able to review ORIA's draft drinking water PAGs, and get some feedback from other OSRTI staffers. By the way, what is the status of this document?

First, here are my redline/~~strikeout~~ suggested changes and ***[explanatory comments]*** on the draft water PAGs chapter and draft appendix.

# Ex. 5 - Deliberative Process

# Ex. 5 - Deliberative Process

Edward Tupin/DC/USEPA/US@EPA

**Edward Tupin/DC/USEPA/US@EPA**

09/12/2003 08:44 AM

Stuart Walker/DC/USEPA/US@

Bruce Means/DC/USEPA/US@EPA, Charles Sands/DC/USEPA/US@EPA, Colby Stanton/DC/USEPA/US@EPA, Frank Marcinowski/DC/USEPA/US@EPA, John Mackinney/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Schatzi Fitz-James/DC/USEPA/US@EPA

Sul

Re: Request for P.

Stuart, Here is the March draft of the water PAG, which is the one OW reviewed. I also included Appendix G, which is the more detailed technical material related to water.I'll send the revised version when I have finished revising to address the comments.

(See attached file: appG-3-20-03 draft.wpd)(See attached file: Ch4-3-21-03.wpd)

Ed

Edward A. Tupin, MS, CHP
Health Physicist
Center for Radiological Emergency Preparedness, Prevention and Response
US Environmental Protection Agency
501 Third St. Mail Code 6608J
Washington, DC 20460
(202) 564-9383

**Submit Time:** 8/16/2011 16:40:47
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Kathryn Snead/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** Do you want to review before we send?

Not necessary methinks, this is short and sweet and will allow discussion if there is interest ----

PAGs short update Aug 2011.pptx

PAGs short update Aug 2011.pptx

Jon, what do you think about Liberty? They did ask for "actions." And Sara, sorry, I think we decided that the PAGs are unlikely for FY10 - but if they do, it'll be because of OAR's decision, so they'll certainly be aware of it!

Sara DeCair---11/24/2009 01:05:54 PM---Liberty RadEx? PAGs also of course, I like to act like they're about to get issued :)

From: Sara DeCair/DC/USEPA/US

To: Colby Stanton/DC/USEPA/US@EPA

Date: 11/24/2009 01:05 PM

Subject: Re: Fw: QUICK TURNAROUND ASSIGNMENT -- DUE by Noon, Monday November 30

---

Liberty RadEx? PAGs also of course, I like to act like they're about to get issued :)

Colby Stanton---11/24/2009 12:52:05 PM---Anyone have anything? The only thing I could think of was PAGs, which I'm asking Jon whether we wan

From: Colby Stanton/DC/USEPA/US

To: OAR-ORIA-RPD-CREM

Date: 11/24/2009 12:52 PM

Subject: Fw: QUICK TURNAROUND ASSIGNMENT -- DUE by Noon, Monday November 30

---

Anyone have anything? The only thing I could think of was PAGs, which I'm asking Jon whether we want to include....
----- Forwarded by Colby Stanton/DC/USEPA/US on 11/24/2009 12:51 PM -----

From: Rafaela Ferguson/DC/USEPA/US

To: Tom Peake/DC/USEPA/US@EPA, Glenna Shields/DC/USEPA/US@EPA, Colby Stanton/DC/USEPA/US@EPA, Jerome Puskin/DC/USEPA/US@EPA

Cc: Mike Boyd/DC/USEPA/US@EPA

Date: 11/24/2009 12:40 PM

Subject: QUICK TURNAROUND ASSIGNMENT -- DUE by Noon, Monday November 30

---

Hi Everyone --

The Administrator's Office is preparing a document for the White House on "big deal" items that will happen in FY 2010. OAR wants input from all of its program offices indicating things like expected date of proposed rules, expected date of final rules, and any other "big deal" action, document, or items in FY 2010. They are looking for a one to two sentence description for each item explaining the action and any other relevant information.

**Please send any items you have to me by 10:00 am Monday, November 30**. I will get them to Jon for review and approval so we can submit RPD's to Dennis O'Connor by noon.

Thanks.

Rafie

Rafaela Ferguson
Special Assistant/Regional Coordinator
Radiation Protection Division (6608J)
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Voice: 202-343-9362
Fax: 202-343-2304
Email: ferguson.rafaela@epa.gov

**Submit Time:** 6/14/2011 15:26:39
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA
**Subject:** draft response for Debbie - review/edit/send?

how about an attachment? I put in the appended table as Betsy suggested. We should send this out to the EPA group ASAP!

Matrix and Re-entry 6-14-2011.docx Matrix and Re-entry 6-14-2011.docx

---

Jon -- I would propose to get back to Debbie as follows -- (more than you need, cut as needed!)

# Ex. 5 - Deliberative Process

From: Debbie Dietrich/DC/USEPA/US

To: Mike Flynn/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA
Date: 06/14/2011 12:13 PM
Subject: Fw: Latest Re-entry Matrix & paper: NPP Exercise Follow-up -- OSRTI edits

---

I would appreciate your thoughts on this. Bob is in FL **Ex. 6 - Personal Privacy** so I'm not sure when we will get time with him. He is supposed to be back tonight and I feel like I have to get something to him no later than tomorrow in order to meet the deadline on Thursday.

I still feel that updating the Operational Guidelines may be a way to go here, but I'm not sure if OSWER's objections will impact that process. Would appreciate your thoughts.

Debbie Dietrich
Associate Administrator for Homeland Security
USEPA
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Ph 202-564-6978
Fax 202-501-0026
----- Forwarded by Debbie Dietrich/DC/USEPA/US on 06/14/2011 12:10 PM -----

From: Elizabeth Southerland/DC/USEPA/US
To: Debbie Dietrich/DC/USEPA/US@EPA, Dana Tulis/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Charles Openchowski/DC/USEPA/US@EPA, Daniel Schultheisz/DC/USEPA/US@EPA, Eric Burneson/DC/USEPA/US@EPA, John Michaud/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Juan Reyes/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Mary-Kay Lynch/DC/USEPA/US@EPA, Mike Flynn/DC/USEPA/US@EPA, Pamela Barr/DC/USEPA/US@EPA, parrish cayce <parrish.cayce@epa.gov>
Cc: Stuart Walker/DC/USEPA/US@EPA, Helen Dawson/DC/USEPA/US@EPA
Date: 06/14/2011 09:15 AM
Subject: Fw: Latest Re-entry Matrix & paper: NPP Exercise Follow-up -- OSRTI edits

---

**Ex. 5 - Deliberative Process**

----- Forwarded by Elizabeth Southerland/DC/USEPA/US on 06/14/2011 08:29 AM -----

From: Stuart Walker/DC/USEPA/US
To: Elizabeth Southerland/DC/USEPA/US@EPA
Date: 06/13/2011 08:15 PM
Subject: Fw: Latest Re-entry Matrix & paper: NPP Exercise Follow-up

---

Draft redline/strikeout changes on Re-entry paper
[attachment "Matrix and Re-entry 6-13-2011_redline.docx" deleted by Debbie Dietrich/DC/USEPA/US]

Here is a copy of the EPA cleanup levels for final and re-occupancy. I added more explanatory text.
[attachment "Comparison of EPA Risk 6 13 2011.docx" deleted by Debbie Dietrich/DC/USEPA/US]

One idea would be to take the first page of the EPA cleanup levels document (both table and two paragraphs of text) and add it to the end of the re-entry paper.
----- Forwarded by Stuart Walker/DC/USEPA/US on 06/13/2011 08:05 PM -----

From: Sara DeCair/DC/USEPA/US
To: Stuart Walker/DC/USEPA/US@EPA
Cc: Charles Openchowski/DC/USEPA/US@EPA, Daniel Schultheisz/DC/USEPA/US@EPA, Debbie Dietrich/DC/USEPA/US@EPA, Elizabeth Southerland/DC/USEPA/US@EPA, Eric Burneson/DC/USEPA/US@EPA, John Michaud/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Juan Reyes/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Mary-Kay Lynch/DC/USEPA/US@EPA, Mike Flynn/DC/USEPA/US@EPA, Pamela Barr/DC/USEPA/US@EPA, parrish.cayce@epa.gov, Tulis.Dana@epa.gov
Date: 06/13/2011 09:05 AM
Subject: Latest Re-entry Matrix & paper: NPP Exercise Follow-up

---

Here you go -- thanks for sharing what you edit on the Reoccupancy section when it's ready.

-----Stuart Walker/DC/USEPA/US wrote: -----
To: Debbie Dietrich/DC/USEPA/US@EPA
From: Stuart Walker/DC/USEPA/US
Date: 06/10/2011 04:46PM
Cc: Charles Openchowski/DC/USEPA/US@EPA, Daniel Schultheisz/DC/USEPA/US@EPA, Elizabeth Southerland/DC/USEPA/US@EPA, Eric Burneson/DC/USEPA/US@EPA, John Michaud/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Juan Reyes/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Mary-Kay Lynch/DC/USEPA/US@EPA, Mike Flynn/DC/USEPA/US@EPA, Pamela Barr/DC/USEPA/US@EPA, parrish cayce <parrish.cayce@epa.gov>, Sara DeCair/DC/USEPA/US@EPA, Tulis.Dana@epa.gov
Subject: Re: Meeting with Bob P. tomorrow on the NPP Exercise Follow-up

Can someone distribute the revised Re-entry Matrix that was handed out today, and also the paper that accompanies it so we all have the latest version?

Debbie Dietrich---06/09/2011 12:00:16 PM---Hi everyone....this is in follow-up to our meeting with Bob this past Monday re the Nuclear Power Pl

From: Debbie Dietrich/DC/USEPA/US
To: Mike Flynn/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Tulis.Dana@epa.gov, Mary-Kay Lynch/DC/USEPA/US@EPA, Elizabeth Southerland/DC/USEPA/US@EPA, Daniel Schultheisz/DC/USEPA/US@EPA, Stuart Walker/DC/USEPA/US@EPA, Charles Openchowski/DC/USEPA/US@EPA, John Michaud/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, parrish cayce <parrish.cayce@epa.gov>, Pamela Barr/DC/USEPA/US@EPA, Eric Burneson/DC/USEPA/US@EPA
Cc: Juan Reyes/DC/USEPA/US@EPA
Date: 06/09/2011 12:00 PM
Subject: Meeting with Bob P. tomorrow on the NPP Exercise Follow-up

---

Hi everyone....this is in follow-up to our meeting with Bob this past Monday re the Nuclear Power Plant exercise. As you know, we have another meeting scheduled with him on tomorrow from 12:15 to 1:00 to continue our discussion on the response to the last Deputies meeting (Statement of Conclusions is attached). If possible I would like to get together today for a brief pre-call to discuss tomorrow's meeting. I'd like to lay out a path forward for Bob on how to bring this to some sort of resolution.....we're working on something now and I hope to get it out to you this afternoon. Basically, it will be something like the following:

1. Re-entry Matrix - what final edits do we need, what are next steps, do we recommend a longer-term project to develop Operational Guidelines.

2. CERCLA Paper - any final edits, does he want to share, how to close on the issue of long-term cleanup.

3. Waste Paper - final comments, what are next steps, do we recommend a longer-term project to further develop interim storage options and coordinate with states.

4. Do we recommend that he meet with the other Agencies before he sends anything to the White House?

For Pam Barr and Eric Burneson - this is probably alot of greek to you, but the issue of the Drinking Water PAGs has come up in the context of how we make decisions on the emergency and intermediate phases so we would like for you to join us. Please feel free to call me if you would like to discuss.

I will send out a meeting invitation and number for 4:00 today. Hope everyone can at least call in. Thanks!

[attachment "2867 eWash.pdf" deleted by Stuart Walker/DC/USEPA/US]

Debbie Dietrich
Associate Administrator for Homeland Security
USEPA
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Ph 202-564-6978
Fax 202-501-0026[attachment "Matrix and Re-entry 6-10-2011.docx" deleted by Stuart Walker/DC/USEPA/US]

**Subject:** Predecisional Draft Chapter 3 for PAG Manual
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Glenna Shields/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Tony Nesky/OU=DC/O=USEPA/C=US
**Submit Time:** 11/10/2010 19:07:44

**PREDECISIONAL DRAFT DOCUMENT FOR INTERNAL DISCUSSION. DO NOT CITE, QUOTE OR DISTRIBUTE WITHOUT AUTHOR'S PERMISSION**

Dear Sara:

Attached are a draft of a revised Chapter 3, a new table-of-contents for Chapter 3, and a map to edits based on the former Table of Contents.

I do not plan on coming in on Friday, but would be happy to do so if you need me. My personal cell phone number is on the CRIO white board. Please call me if you want me to come in.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Chapter 3tn-11-10-10.doc Chapter 3tn-11-10-10.doc MapofeditstoChapter3.doc MapofeditstoChapter3.doc Chapter 3TOC11-10-10.doc Chapter 3TOC11-10-10.doc

It's an EOC rule.... CW has a week off of night classes, they're on a break, so he will join us!

Thomas Agee---06/30/2010 02:25:20 PM---really? I was out of the loop on that conversation...is Chris coming to happy hour tomorrow? Or work

From: Thomas Agee/DC/USEPA/US

To: Sara DeCair/DC/USEPA/US@EPA

Date: 06/30/2010 02:25 PM

Subject: Re: PAGs - Respond with availability for Conf Call

---

really? I was out of the loop on that conversation...is Chris coming to happy hour tomorrow? Or working until midnight again?

Thomas Agee
Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov
Office: (202)-343-9933
Fax: (202)-343-2302

Sara DeCair---06/30/2010 02:22:38 PM---Aw, and I just heard we can't have you work down here, it would be a nice break... ----------

From: Sara DeCair/DC/USEPA/US

To: Thomas Agee/DC/USEPA/US@EPA

Date: 06/30/2010 02:22 PM

Subject: Re: PAGs - Respond with availability for Conf Call

---

Aw, and I just heard we can't have you work down here, it would be a nice break...
---
Sent by EPA Wireless E-Mail Services
Thomas Agee

----- Original Message -----
**From:** Thomas Agee
**Sent:** 06/30/2010 02:16 PM EDT
**To:** Sara DeCair
**Subject:** Re: PAGs - Respond with availability for Conf Call
Not a prob- just sad...CORE NAR is definitely becoming the new PAGs FOIA

Thomas Agee
Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov

Office: (202)-343-9933
Fax: (202)-343-2302

Sara DeCair---06/30/2010 02:12:25 PM---Dangit! ----------

From: Sara DeCair/DC/USEPA/US

To: Thomas Agee/DC/USEPA/US@EPA

Date: 06/30/2010 02:12 PM

Subject: Re: PAGs - Respond with availability for Conf Call

---

Dangit!
---
Sent by EPA Wireless E-Mail Services

Thomas Agee

----- Original Message -----
**From:** Thomas Agee
**Sent:** 06/30/2010 02:08 PM EDT
**To:** Sara DeCair
**Subject:** Re: PAGs - Respond with availability for Conf Call
You still have Colby on there :(

Thomas Agee
Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Email: agee.thomas@epa.gov
Office: (202)-343-9933
Fax: (202)-343-2302

Sara DeCair---06/30/2010 02:07:01 PM---PAGs Partners; I am hoping to set up a 60 to 90 minute conference call to discuss the PAGs Manual re

From: Sara DeCair/DC/USEPA/US

To: Andrew.Wallo@eh.doe.gov, cym3@cdc.gov, man@cdrh.fda.gov, patricia.milligan@nrc.gov, ricardo.reyes@dtra.mil, stanton.colby@epa.gov, Sara DeCair/DC/USEPA/US@EPA, stephen.domotor@eh.doe.gov, Vanessa.Quinn@dhs.gov, william.cunningham@nist.gov, walker.stuart@epa.gov, ammon.doug@epa.gov, schumann.jean@epa.gov, Ferris.John@dol.gov, druedy@endyna.com, siddhanti@endyna.com, asa4@CDC.GOV, Jack.Patterson@rss.usda.gov, tdkraus@sandia.gov, "Conklin, Craig" <craig.conklin@HQ.DHS.GOV>, "MacKinney, John A" <John.Mackinney@dhs.gov>

Cc: Alan Perrin/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Darrell Liles/DC/USEPA/US@EPA, Nate McMichael/DC/USEPA/US@EPA, Jessica Wieder/DC/USEPA/US@EPA, Thomas Agee/DC/USEPA/US@EPA

Date: 06/30/2010 02:07 PM

Subject: PAGs - Respond with availability for Conf Call

---

PAGs Partners;

I am hoping to set up a 60 to 90 minute conference call to discuss the PAGs Manual revision. The Agency administration has reviewed our Jan. 2009 proposal and we're ready to get started again toward getting the revision out for public review & comment! By COB on Thursday, July 8th, please tell me which of these times you are NOT available for a call. Thank you so much, and I look forward to talking with you!

Monday, July 19, 9 to 11 am
Wednesday, July 21, 9 to 11 am or 1 to 3 pm
Thursday, July 22, 9 to 11 am

Sara
Sara D. DeCair, Health Physicist
www.epa.gov/radiation/rert/pags.html
Center for Radiological Emergency Management
U.S. Environmental Protection Agency
office (202) 343-9713
fax (202) 343-2304
decair.sara@epa.gov

Here is the updated version - with track changes.

# Ex. 5 - Deliberative Process

Enjoy!

MARKEY CONTROL RESPONSE 11-3-2009 v2.doc MARKEY CONTROL RESPONSE 11-3-2009 v2.doc

Nate, Thomas and Jess (your personal writing think tank)

Jessica Wieder
U.S. Environmental Protection Agency
Radiation Protection Division
Center for Radiation Information
(202) 343-9201

Sara DeCair---11/03/2009 01:35:31 PM---Next!!! ----- Forwarded by Sara DeCair/DC/USEPA/US on 11/03/2009 01:34 PM -----

From: Sara DeCair/DC/USEPA/US

To: Nate McMichael/DC/USEPA/US@EPA, Jessica Wieder/DC/USEPA/US@EPA, Thomas Agee/DC/USEPA/US@EPA

Cc: Alan Perrin/DC/USEPA/US@EPA

Date: 11/03/2009 01:35 PM

Subject: Cmts from Colby -- Markey responses

---

Next!!!
[attachment "MARKEY CONTROL RESPONSE 11-3-2009.doc" deleted by Jessica Wieder/DC/USEPA/US]

----- Forwarded by Sara DeCair/DC/USEPA/US on 11/03/2009 01:34 PM -----

From: Colby Stanton/DC/USEPA/US

To: Sara DeCair/DC/USEPA/US@EPA, Alan Perrin/DC/USEPA/US@EPA

Date: 11/03/2009 01:32 PM

Subject: Re: Time to read Markey responses on b-berry?

---

Definitely Sue; Ariadne?

# Ex. 5 - Deliberative Process

Thanks for all the hard work!
---
Sent by EPA Wireless E-Mail Services
Sara DeCair

----- Original Message -----
**From:** Sara DeCair
**Sent:** 11/03/2009 01:16 PM EST
**To:** Colby Stanton; Alan Perrin
**Subject:** Time to read Markey responses on b-berry?
Here is a long paste -- at this point, will you take a look (and Alan, too?) and then tomorrow morning I can include people like Mike Boyd, Dana Tulis, and Jon? Who else? Sue, who is coordinating for OGC?

Thomas and Nate drafted these then Jess helped edit before I did some edits. We have bets that a lot of detail will be cut on its way up... thanks for any suggestions!! (It takes a village...)

*DRAFT – MARKEY LETTER CONTROL RESPONSE to PAGs QUESTIONS*

# Ex. 5 - Deliberative Process

# Ex. 5 - Deliberative Process

# Ex. 5 - Deliberative Process

What is the call in number? I will call in from the EOC.

Nate McMichael
U.S. Environmental Protection Agency
Radiation Protection Division
Office: (202) 343-9265
Cell: (202) 236-4176

Sara DeCair---07/19/2010 08:52:53 AM---Hi all, I'm back! I plan to call in from home for today's 11 am meeting on PAGs, and here are som

From: Sara DeCair/DC/USEPA/US

To: edwards.jonathan@epa.gov, veal.lee@epa.gov, perrin.alan@epa.gov, liles.darrell@epa.gov, mcmichael.nate@epa.gov, nesky.tony@epa.gov

Date: 07/19/2010 08:52 AM

Subject: For 11 am PAGs 30-min meeting

---

Hi all, I'm back!

I plan to call in from home for today's 11 am meeting on PAGs, and here are some things you probably already have, to go over today:

- Comms Plan with tactics from July 6th, which I plan to update based on today's discussions
- A one-pager for the multi-agency conference call this Thursday

Talk to you soon!

Sara[attachment "Comms Plan 7-6-2010 with subtactics.doc" deleted by Nate McMichael/DC/USEPA/US] [attachment "One pager on new Agency direction 5-21-2010.doc" deleted by Nate McMichael/DC/USEPA/US]

Sara and Darrell,

I had the opportunity to chat with Alan and Jon last evening. Here is a path forward for us, improving on my original submission by eliminating some redundancies:

- Tuesday, March 1 - Wednesday, March 9: Prepare revised version of comment response document and PAGs Manual, due to Sara and Darrell on 3/9.
- Thursday, March 3 - Friday, March 18: Address any internal OD level actions/issues, such as changes on the footnote.
- Thursday, March 10 - Friday, March 11: CREM reviews new drafts.
- Monday, March 14: Resend materials to Subcommittee members, and ask them to brief up their chains. Request that their FRPCC leads send in show-stoppers by no later than (NLT) the morning of March 23. These members will receive information on how we addressed (or did not address) their comments and a clean PAGs draft and FR notice.
- Tuesday, March 15: Send PAGs Manual draft and supporting information to OPEI with goal of preparing for OMB submission on or before March 28. May need some top cover to make this happen within 2 weeks (OPEI may ask for 30 days?)
- Week of March 21: FRPCC show-stoppers are due on Wednesday. Collaborate with OPEI as necessary. Get decision on whether Gina will want to reach out to OMB on this document.
- NLT Monday, March 28: OMB Submission

Lee B. Veal
Director, Center for Radiological Emergency Management
Radiation Protection Division
Office of Radiation and Indoor Air
Environmental Protection Agency
1310 L Street, NW
Washington DC, 20005
Mail Code: 6608J
202-343-9448
cell 202-617-4322

Alan and Lee---my apologies if I've overlooked any subsequent emails from the one below but these drafts get sent to Mike Flynn and has he gotten back to us? (I believe he's headed out on annual leave at the end of the week)...Thanks, Jon

-----Sara DeCair/DC/USEPA/US wrote: -----

To: Alan Perrin/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA
From: Sara DeCair/DC/USEPA/US
Date: 08/03/2010 12:01PM
cc: Nate McMichael/DC/USEPA/US@EPA, Tony Nesky/DC/USEPA/US@EPA, Darrell Liles/DC/USEPA/US@EPA
Subject: PAGs Chapter 1: Overview and FR Notice

Lee and Alan;

Attached are the updated Chapter 1: Overview and FR Notice with your input incorporated. Please take a quick look and send them up to Mike Flynn? Thank you!!

Sara

*(See attached file: FR notice draft 8-2-2010.doc) (See attached file: Chapter1PAGManual8-2-10.doc) (See attached file: Comms Plan 8-2-2010 with subtactics.doc)*

PS I've also included the latest Comms Plan with tactics in it, and the correct footer date. :)

**FR notice draft 8-2-2010.doc** **Chapter1PAGManual8-2-10.doc** **Comms Plan 8-2-2010 with subtactics.doc**

Sara,

Jon request the PAGs meetings resume on an every other week schedule starting October 18. I have just now sent out a meeting request from his calendar.

Emily

Emily Atkinson
Division Secretary
Radiation Protection Division (6608J)
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Voice: 202-343-9458
Fax: 202-343-2304
Email: atkinson.emily@epa.gov

Sara DeCair---10/04/2010 11:08:45 AM---Emily, I think my recurring meeting with managers on PAGs (was every other Monday at 11) has ende

From: Sara DeCair/DC/USEPA/US

To: atkinson.emily@epa.gov

Date: 10/04/2010 11:08 AM

Subject: Recurring PAGs meeting - set a new one?

---

Emily,

I think my recurring meeting with managers on PAGs (was every other Monday at 11) has ended. Can you check with Lee whether she wants to start that again? I think it's a good idea. Then if you can find a time and schedule them for the next 6 months or so, that would be great! 30 minutes is good. Thank you,

S.

**Subject:** Draft of PAG Chapter 2
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Glenna Shields/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Tony Nesky/OU=DC/O=USEPA/C=US
**Submit Time:** 11/10/2010 10:06:15

Dear Sara:

The attached draft of Chapter 2 incorporates the changes you made yesterday. Enjoy!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.govPAGChapter2-11-10-10.doc PAGChapter2-11-10-10.doc

**Subject:** Fw: Radiation News Clips, June 30, 2009
**From:** CN=Colby Stanton/OU=DC/O=USEPA/C=US
**Submit Time:** 6/30/2009 15:59:52
**To:** "Sara DeCair" <Decair.Sara@epamail.epa.gov>

---
Sent by EPA Wireless E-Mail Services
Jonathan Edwards

----- Original Message -----
**From:** Jonathan Edwards
**Sent:** 06/30/2009 03:46 PM EDT
**To:** Elizabeth Cotsworth; Alan Perrin
**Cc:** Colby Stanton
**Subject:** Re: Radiation News Clips, June 30, 2009

One of the things I found interesting about that part of the article is that the OW AA wasn't mentioned.

Of course the reference to OSWER AA seems to underscore that their concerns regarding long term cleanup levels remains on par with drinking water guidance and that they believe they may be able to get traction at EPA regarding DHS document.

---
Sent from my BlackBerry Wireless Handheld (www.BlackBerry.net)
Elizabeth Cotsworth

----- Original Message -----
**From:** Elizabeth Cotsworth
**Sent:** 06/30/2009 03:14 PM EDT
**To:** Alan Perrin
**Cc:** Jonathan Edwards; Colby Stanton
**Subject:** Fw: Radiation News Clips, June 30, 2009

Seeing the Inside EPA article here underscores the value of initiating the PAGS scheduling with Gina asap.We can always ask for the mtg to be scheduled for later rather than sooner, but at least its scheduled! Also, since there is a reference to engaging Mathy Stanislas, the DHS document issues needs to be fleshed out into a briefing so that we can engage OSWER and get that part of the question up to the AAs also.

----- Forwarded by Elizabeth Cotsworth/DC/USEPA/US on 06/30/2009 03:10 PM -----

From: Michael Kokoszka/DC/USEPA/US

To:

Date: 06/30/2009 02:30 PM

Subject: Radiation News Clips, June 30, 2009

---

# Radiation News Clips
## June 30, 2009

### Radioactive Waste

Evaporation campaign frees up Hanford tank space (Tri-City Herald)
http://www.tri-cityherald.com/915/story/631360.html
Hanford workers have evaporated enough excess water from radioactive waste in underground tanks to free up space nearly equivalent to a new tank.

French radioactive waste to double by 2030-Andra (Reuters)
http://www.guardian.co.uk/business/feedarticle/8584941
France's highly radioactive waste will more than double by 2030 mainly as spent fuel derived from nuclear reactors mounts up, the French national radioactive waste management agency (Andra) said on Tuesday.

## Safety and Security

Bruce nuclear plant unsafe, workers say (The Star [Canada])
http://www.thestar.com/news/ontario/article/658118
Nearly half a tonne of steel plummeted 20 metres to the ground from atop a Bruce Power plant crane last month, narrowly missing workers below and raising safety concerns at the nuclear facility, the Star has learned.

Activists Seek Internal Comments On EPA Nuclear Emergency Guide (Inside EPA)
http://www.insideepa.com/secure/search_results.asp
Environmentalists are seeking all internal and external communications related to the Bush EPA's development of a draft guide for responding to risks from nuclear emergencies under the Freedom of Information Act (FOIA) as part of an ongoing effort to pressure the Obama administration to abandon the controversial document.

Exelon says tritium detected at Oyster Creek reactor 'anomaly' (Daily Herald)
http://www.dailyherald.com/story/?id=303792
Exelon Corp. said a water sample at the Oyster Creek reactor in New Jersey that showed detectable levels of tritium, a radioactive isotope present in reactors, is an anomaly.

## Health

Oncologist Defends His Work at a V.A. Hospital (New York Times)
http://www.nytimes.com/2009/06/30/health/30veterans.html?scp=4&sq=radiation%20safety&st=csePHILADELPHIA — The radiation oncologist whom regulators accuse of mishandling scores of radioactive seed implants at the Philadelphia veterans' hospital told a Congressional panel on Monday that while he "could have done better" with some implants, his patients over all received effective treatment for their prostate cancer.

## Nuclear Power

Big Alaska Looks to Small Nuclear (New York Times)
http://greeninc.blogs.nytimes.com/2009/06/30/big-alaska-looks-to-small-nuclear/?scp=2&sq=nuclear&st=cse
In a quest to lower energy prices, some municipalities in the oil-rich state of Alaska are looking to small-scale nuclear power.

Should renewable energy include nuclear? (Christian Science Monitor)
http://www.csmonitor.com/2009/0629/p06s10-woeu.html
Berlin - A new global effort that aims to make renewable energy more accessible to every country in the

world will launch on July 1st.

Ontario's race to build new nuclear units at the Darlington Nuclear Station has turned into a slow stroll. (Exchange)
http://www.exchangemagazine.com/morningpost/2009/week27/Tuesday/063003.htm
Toronto - A communications report by Ontario Clean Air Alliance, released soon following Energy Minister George Smitherman announcement that the province has indefinitely postponed any decision on building new nuclear units until the federal government decides what it will do with the troubled Atomic Energy of Canada Ltd. (AECL).

Deal to build nuclear facility is dead (Augusta Chronicle)
http://chronicle.augusta.com/stories/2009/06/30/met_529350.shtml
The U.S. Energy Department made official Monday its plan to scrap a Bush administration initiative that could have brought a major nuclear fuel reprocessing facility to South Carolina.

## Nuclear Weapons

North Korea trying to enrich uranium, South says (Washington Post – Reuters)
http://www.washingtonpost.com/wp-dyn/content/article/2009/06/30/AR2009063000753.html
SEOUL (Reuters) - North Korea appears to be enriching uranium, potentially giving the state that has twice tested a plutonium-based nuclear device another path to making atomic weapons, South Korea's defense minister said on Tuesday.

FRANCE: Ambiguous on Nuclear Disarmament (IPS)
http://www.ipsnews.net/news.asp?idnews=47426
France and Britain are the two countries in Western Europe that are nuclear weapon states. While French official policy is that stockpiles should be reduced and testing stopped, the government of President Nicolas Sarkozy has not indicated a commitment to total nuclear disarmament.

## Science

Obese Get Higher Doses of Radiation for X-Rays (Forbes)
http://www.forbes.com/feeds/hscout/2009/06/30/hscout628513.html
People who are overweight and obese are usually given higher-than-normal doses of radiation in order to obtain usable X-ray images, even though the long-term effects are unknown, new research contends.

---

**Note: When you set up an out-of-office automated reply, please exclude the Radiation Clips from reply. You can do this by selecting the "Exceptions" tab and typing "[clips]" in the "Do not reply if the subject line contains this phrase" box. This will save the editors from deleting so many out-of-office replies. Thank you!**

**Questions or Comments? Contact: Nate McMichael (301.203.9265) or Alan Perrin (202.343.9775).**

**Subject:** PAG Chapters 1,2,3
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Glenna Shields/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Tony Nesky/OU=DC/O=USEPA/C=US
**Submit Time:** 11/29/2010 19:28:05

Dear Sara:

Here are Chapters 1,2,and 3 with comments and documents that show the changes in each chapter. I'm also attaching a scan of Jon and Alan's comments. I am not able to answer some of Jon's, let's go over them tomorrow.

I have not had time to go over the FR notice yet. Let's do the Manual first

.**Chapter1edits.doc** Chapter1edits.doc **Chapter2edits.doc** Chapter2edits.doc **Chapter3edits.doc** Chapter3edits.doc **PAGChapter1-11-29-10.doc** PAGChapter1-11-29-10.doc **PAGChapter2-11-29-10.doc** PAGChapter2-11-29-10.doc [attachment "PAGChapter2 11-10-10.doc" deleted by Tony Nesky/DC/USEPA/US] [attachment "PAGChapter 3 11-12-10.doc" deleted by Tony Nesky/DC/USEPA/US] **PAGChapter 3 11-29-10.doc** PAGChapter 3 11-29-10.doc [attachment "PAGChapter One 11-12-10.doc" deleted by Tony Nesky/DC/USEPA/US]

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

It'll be a race then!

Talk to you at 11

Nate McMichael
U.S. Environmental Protection Agency
Radiation Protection Division
Office: (202) 343-9265
Cell: (202) 236-4176

Sara DeCair---07/19/2010 09:32:07 AM---Emily sent the code to all so whoever gets on first can open it :) ----------

From: Sara DeCair/DC/USEPA/US

To: Nate McMichael/DC/USEPA/US@EPA

Date: 07/19/2010 09:32 AM

Subject: Re: For 11 am PAGs 30-min meeting

---

Emily sent the code to all so whoever gets on first can open it :)
---
Sent by EPA Wireless E-Mail Services
Nate McMichael

----- Original Message -----
**From:** Nate McMichael
**Sent:** 07/19/2010 09:28 AM EDT
**To:** Sara DeCair
**Subject:** Re: For 11 am PAGs 30-min meeting
I am going to be the host?

Nate McMichael
U.S. Environmental Protection Agency
Radiation Protection Division
Office: (202) 343-9265
Cell: (202) 236-4176

Sara DeCair---07/19/2010 09:22:59 AM---Ex. 6 - Personal Privacy Participant code - Ex. 6 - Personal Privacy

From: Sara DeCair/DC/USEPA/US

To: Nate McMichael/DC/USEPA/US@EPA

Date: 07/19/2010 09:22 AM

Subject: Re: For 11 am PAGs 30-min meeting

---

Ex. 6 - Personal Privacy
Participant code - Ex. 6 - Personal Privacy

Host code - Ex. 6 - Personal Privacy
Tx!
---
Sent by EPA Wireless E-Mail Services

Nate McMichael

----- Original Message -----
**From:** Nate McMichael
**Sent:** 07/19/2010 09:07 AM EDT
**To:** Sara DeCair
**Subject:** Re: For 11 am PAGs 30-min meeting
What is the call in number? I will call in from the EOC.

Nate McMichael
U.S. Environmental Protection Agency
Radiation Protection Division
Office: (202) 343-9265
Cell: (202) 236-4176

Sara DeCair---07/19/2010 08:52:53 AM---Hi all, I'm back! I plan to call in from home for today's 11 am meeting on PAGs, and here are som

From: Sara DeCair/DC/USEPA/US

To: edwards.jonathan@epa.gov, veal.lee@epa.gov, perrin.alan@epa.gov, liles.darrell@epa.gov, mcmichael.nate@epa.gov, nesky.tony@epa.gov

Date: 07/19/2010 08:52 AM

Subject: For 11 am PAGs 30-min meeting

---

Hi all, I'm back!

I plan to call in from home for today's 11 am meeting on PAGs, and here are some things you probably already have, to go over today:

- Comms Plan with tactics from July 6th, which I plan to update based on today's discussions
- A one-pager for the multi-agency conference call this Thursday

Talk to you soon!

Sara[attachment "Comms Plan 7-6-2010 with subtactics.doc" deleted by Nate McMichael/DC/USEPA/US] [attachment "One pager on new Agency direction 5-21-2010.doc" deleted by Nate McMichael/DC/USEPA/US]

**From:** "Kylie Zirbel" <kzirbel@endyna.com>
**To:** Sara DeCair/DC/USEPA/US@EPA
**Cc:** Darrell Liles/DC/USEPA/US@EPA Lee Veal/DC/USEPA/US@EPA <siddhanti@endyna.com>
**Subject:** RE: Navy Nuke Comments on Draft EPA PAG Manual
**Submit Time:** 5/10/2011 09:27:34

Hi Sara,

Good to hear from you again! I have attached a revised version of the Draft PAG Manual in addition to the Comment Matrix. Please note that these comments were in the comment matrix. However, the comments regarding the footnotes were originally noted as EPA disagreeing or agreeing with no change. I revised the matrix to say agree and made the requested changes but saved the previous version for reference in case it is needed in the future.

Let me know any additional changes you may have. Thank you!

Sincerely,

Kylie Zirbel

-----Original Message-----
From: DeCair.Sara@epamail.epa.gov [mailto:DeCair.Sara@epamail.epa.gov]
Sent: Tuesday, May 10, 2011 8:11 AM
To: kzirbel@endyna.com; siddhanti@endyna.com
Cc: Liles.Darrell@epamail.epa.gov; Veal.Lee@epamail.epa.gov
Subject: Navy Nuke Comments on Draft EPA PAG Manual

Kylie, could you add comments 1 and 3 to our comment matrix and list the resolution as "agree" -- and incorporate them into a May 2011 version of the Manual? We just might have a couple more tweaks in the next day or two, so stay tuned? Thank you so much!

Sara
----- Forwarded by Sara DeCair/DC/USEPA/US on 05/10/2011 08:07 AM -----

From: "Nickel, Lee A CIV SEA 08 NR" <lee.a.nickel1@navy.mil>
To: Sara DeCair/DC/USEPA/US@EPA
Date: 05/06/2011 08:42 AM
Subject: FW: Comments on Draft EPA PAG Manual

Sara,

Thanks for clearing up my questions the other day. I wanted to resend my earlier email that had our prior comments so you had it. The comments that I did not see incorporated or addressed in the excel file are comments 1 and

3. Since the paragraph locations changed for comment 3, I retyped them below.

Lee

Ex. 5 - Deliberative Process

-----Original Message-----
From: Nickel, Lee A CIV SEA 08 NR
Sent: Wednesday, February 09, 2011 10:07
To: 'DeCair.Sara@epamail.epa.gov'
Subject: Comments on Draft EPA PAG Manual

Sara,

Good talking to you yesterday!

As we discussed, the changes to the PAG manual that I am proposing are below. I wanted to provide comment 2 since I knew you were working on the manual today. However, I am sure you are aware that it could change following our discussion this afternoon.

Please let me know if you have any questions or concerns about the language.

Thanks again,

Lee

Lee A. Nickel
Naval Nuclear Propulsion Program
Director, Emergency Planning
(202) 781-6107 (w)
(202) 281-8595 (c)

**Ex. 5 - Deliberative Process**

# Ex. 5 - Deliberative Process

Copy of PAGs Comment Sheet with Responses 5-10-2011.xlsx DraftPAGManual for Interagency Review 5-10-11.doc

**Submit Time:** 5/22/2012 15:39:51
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** PAG Manual and FR Notice

Clean versions of the PAG Manual and FR Notice of Availability. Should I print a copy for Mike, so he can see how exciting the cover is?

S.

**Draft 2012 PAG Manual 5-22-2012.doc** Draft 2012 PAG Manual 5-22-2012.doc

**Draft PAGs FR 5-22-2012.doc** Draft PAGs FR 5-22-2012.doc

**From:** Brielle Welzer <bwelzer@endyna.com>
**To:** Sara DeCair/DC/USEPA/US@EPA
**Subject:** RE: Minor edits -- then we're done (!!)
**Submit Time:** 6/29/2012 21:12:06

Hi Sara,

Here is the next updated version - with the edits

- page numbers fixed
- section 3.6 has been added (there's something very strange about this table of contents - I think it needs to be redone)
- on page 42 those quotes have been re-inserted (changes not accepted)
- and AMS is removed from C-1.

Recommendation: the text is squished together. Especially in the Table of Contents and Chapter Key Points we should slightly increase the space between each sentence. Right now the spaces between paragraphs look very large in comparison to the squished paragraphs. I can try this out and send you a copy - but for now, here is the 4th version.

Thanks!

- Brie

---

**From:** Sara DeCair [DeCair.Sara@epamail.epa.gov]
**Sent:** Friday, June 29, 2012 4:30 PM
**To:** Brielle Welzer
**Subject:** Minor edits -- then we're done (!!)

Cool -- I am going through page by page to look for problems, too. In the PDF:

On page iii, there are weird page numbers, 143 and 210.

Do the sections jump from 3.5 to 3.7?

# Ex. 5 - Deliberative Process

That's all I see! If I could have a clean Word copy and PDF again, then we can both split for the day, eh??

S.

Brielle Welzer ---06/29/2012 03:59:57 PM---Hi Sara, Here are all of those updates:

From: Brielle Welzer <bwelzer@endyna.com>
To: Sara DeCair/DC/USEPA/US@EPA
Date: 06/29/2012 03:59 PM
Subject: RE: Dang - one more

---

Hi Sara,

Here are all of those updates:

- the two text edits (Footnote 7, and 2.6)
- updated the font on the new paragraph (so sorry about that!)
- updated text "F-6" to "E6"
and made one correction to the table of contents.

Here is the word doc and the PDF.

I'm going over the entire doc right now - but wanted to send you this update in case you need to get it out the door quickly and head on home. If I find anything, I'll email you updated versions, of course.

Also - I'm always a big fan of simply viewing PDFs at 150% but I will look into the font issue. It's a good thing to consider.

Thanks!

- Brie

---

**From:** Sara DeCair [DeCair.Sara@epamail.epa.gov]
**Sent:** Friday, June 29, 2012 2:39 PM
**To:** Brielle Welzer
**Subject:** Dang - one more

I'm going to keep finding these things (and people keep sending me comments, now is SO not the time to be sending me comments!!) but this is an easy one:

On p. 33, change the reference to Table F-6 in the 1992 PAG Manual (which doesn't exist, oops) to Table E-6.

Thanks![attachment "Draft 2012 PAG Manual 6-1-2012 v3.doc" deleted by Sara DeCair/DC/USEPA/US] [attachment "Draft 2012 PAG Manual 6-1-2012 v3.pdf" deleted by Sara DeCair/DC/USEPA/US] **Draft 2012 PAG Manual 6-1-2012 v4.doc** **Draft 2012 PAG Manual 6-1-2012 v4.pdf**

How does this look for the 2 rem first year explanation?

# Ex. 5 - Deliberative Process

If that works, then the attached document is the updated version of the FAQs. All that is missing is the link for TF, but that should be a simple copy and paste once/if you get it.

**FAQs All November 2011 6_18_2012.docx**
2011 6_18_2012.docx

FAQs All November

William D. Sacks
U.S. Environmental Protection Agency
Radiation Protection Division
202.343.9707

**Subject:** draft PAGs and FR Notice for quick look, conveying to mgmt
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** "Lee Veal cell" <veal.lee@epa.gov> CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Submit Time:** 5/21/2012 09:36:06

Lee, Alan, Jon,

Here is the draft smash-up of the PAGs, SOE papers and the RDD-IND guide. EnDyna is cleaning up the Table of Contents, footnotes and smoothing out how the sections are numbered with latest versions of the SOE papers.

That cleaned up version should be to me by COB today. In the meantime, I think Alan had some good ideas about the timing of Mike, Debbie, and Gina seeing copies of this as we speed through an intra-agency nod and plan to engage OMB. I'm working on a one - pager to facilitate those conversations.

I'm on a webinar from 11:30 to 1:30 today, but otherwise call or write anytime with feedback on this! Thank you,

Sara

Draft PAGs FR 5-21-2012.doc Draft PAGs-Combined Document 5-18-2012.doc

**Subject:** Fw: Minor edits -- then we're done (!!)
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**Submit Time:** 6/29/2012 17:45:45
**To:** perrin.alan@epa.gov

Hm! Look ok?
---
Sent by EPA Wireless E-Mail Services

---

**From:** Brielle Welzer [bwelzer@endyna.com]
**Sent:** 06/29/2012 09:39 PM GMT
**To:** Sara DeCair
**Subject:** RE: Minor edits -- then we're done (!!)

Hi Sara,

Here are the tables with 10 point font. And better spacing throughout the document (Table of Contents, chapter titles, etc.) See if this works as a start - for less squinting.

Thanks!

- Brie

---

**From:** Sara DeCair [DeCair.Sara@epamail.epa.gov]
**Sent:** Friday, June 29, 2012 5:18 PM
**To:** Brielle Welzer
**Subject:** RE: Minor edits -- then we're done (!!)

Yeah, I think that might be the approach, maybe an outline view along the left side in Adobe? I'm sure there is some neat way to do that.

And if you can think about how most cleanly to increase the tables text font to 10 without trashing the page fit, that'll get one guy off my back ;)

S.

Brielle Welzer ---06/29/2012 05:15:21 PM---Hi Sara, Document Usability/Readability:

From: Brielle Welzer <bwelzer@endyna.com>
To: Sara DeCair/DC/USEPA/US@EPA
Date: 06/29/2012 05:15 PM
Subject: RE: Minor edits -- then we're done (!!)

---

Hi Sara,

Document Usability/Readability:

One more thing - it doesn't seem like I can easily insert (go back) options - for when jumping back to the original location. In websites, we add (top) links so that people can jump up to the top....

But it would be very nice to be able to pull down a document guide that shows the Table of Contents next to whatever section we're reading - so the reader could jump from there. I'm not sure if this is possible - but it would certainly make for easier doc. review. I'll find out if that kind of drop down document guide is available (for example, with a separate scroll button).

- Brie

---

**From:** Sara DeCair [DeCair.Sara@epamail.epa.gov]
**Sent:** Friday, June 29, 2012 4:30 PM
**To:** Brielle Welzer
**Subject:** Minor edits -- then we're done (!!)

Cool -- I am going through page by page to look for problems, too. In the PDF:

On page iii, there are weird page numbers, 143 and 210.

Do the sections jump from 3.5 to 3.7?

# Ex. 5 - Deliberative Process

That's all I see! If I could have a clean Word copy and PDF again, then we can both split for the day, eh??

S.

Brielle Welzer ---06/29/2012 03:59:57 PM---Hi Sara, Here are all of those updates:

From: Brielle Welzer <bwelzer@endyna.com>
To: Sara DeCair/DC/USEPA/US@EPA
Date: 06/29/2012 03:59 PM
Subject: RE: Dang - one more

---

Hi Sara,

Here are all of those updates:

- the two text edits (Footnote 7, and 2.6)
- updated the font on the new paragraph (so sorry about that!)
- updated text "F-6" to "E6"

and made one correction to the table of contents.

Here is the word doc and the PDF.

I'm going over the entire doc right now - but wanted to send you this update in case you need to get it out the door quickly and head on home. If I find anything, I'll email you updated versions, of course.

Also - I'm always a big fan of simply viewing PDFs at 150% but I will look into the font issue. It's a good thing to consider.

Thanks!

- Brie

---

**From:** Sara DeCair [DeCair.Sara@epamail.epa.gov]
**Sent:** Friday, June 29, 2012 2:39 PM
**To:** Brielle Welzer
**Subject:** Dang - one more

I'm going to keep finding these things (and people keep sending me comments, now is SO not the time to be sending me comments!!) but this is an easy one:

On p. 33, change the reference to Table F-6 in the 1992 PAG Manual (which doesn't exist, oops) to Table E-6.

Thanks![attachment "Draft 2012 PAG Manual 6-1-2012 v3.doc" deleted by Sara DeCair/DC/USEPA/US] [attachment "Draft 2012 PAG Manual 6-1-2012 v3.pdf" deleted by Sara DeCair/DC/USEPA/US] **Draft 2012 PAG Manual 6-1-2012 v5.doc** **Draft 2012 PAG Manual 6-1-2012 v5.pdf**

**Submit Time:** 4/19/2012 16:37:18
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** Updated FR, PAGs -- cmts incorporated

Lee and Alan,

Here is a clean (ish) copy of the FR Notice for a PAGs document combined with SOE papers. When the SOE papers are complete, the latest versions of those will have to be dropped in. Comments from OGC, OSRTI, and OW were considered and incorporated in most cases.

Alan, I don't know if you think it'd be useful to write back to OSRTI or OW about how we incorporated some, but not all, of their comments. Since there will presumably one last look before this is ready to show to OMB, maybe it's not needed.

In the attached, I accepted the little comments and left highlights for you to see the bigger items. Thanks for letting me know what's next!

Sara
cell 202-738-2871

**Draft PAGs-Combined Document - 4-19-12.doc** Draft PAGs-Combined Document - 4-19-12.doc**Draft PAGs FR 04-17-2012.doc** Draft PAGs FR 04-17-2012.doc

**Subject:** pags example
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**From:** CN=Alan Perrin/OU=DC/O=USEPA/C=US
**Submit Time:** 7/10/2012 10:46:33

PAG_v1.docx PAG_v1.docxPAG_v1.pdf PAG_v1.pdf

~~~~~~~~~~~~~
Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376
~~~~~~~~~~~~~

**Submit Time:** 4/11/2012 16:15:56
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** twillis@endyna.com
**Cc:** siddhanti@endyna.com
**Subject:** Fw: Revised PAGs Manual and FRN

Wow - have never seen only one comment from Stuart. Might be one or two more inputs from other staff, but for now this is it. Very strange! (good?)

S.
----- Forwarded by Sara DeCair/DC/USEPA/US on 04/11/2012 04:11 PM -----

From: Barnes Johnson/DC/USEPA/US
To: Alan Perrin/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA
Cc: Phyllis Anderson/DC/USEPA/US@EPA, Bruce Means/DC/USEPA/US@EPA, Stuart Walker/DC/USEPA/US@EPA, Thea Williams/DC/USEPA/US@EPA, Jennifer Wilbur/DC/USEPA/US@EPA
Date: 04/11/2012 12:08 PM
Subject: Fw: Revised PAGs Manual and FRN

---

Here are our very brief comments. Thanks!

**Barnes Johnson** | U.S. Environmental Protection Agency | Superfund | Tel 703 603 8960 | Fax 703 603 9146 | johnson.barnes@epa.gov
----- Forwarded by Barnes Johnson/DC/USEPA/US on 04/11/2012 12:07 PM -----

From: Stuart Walker/DC/USEPA/US
To: Barnes Johnson/DC/USEPA/US@EPA
Cc: Bruce Means/DC/USEPA/US@EPA, Helen Dawson/DC/USEPA/US@EPA, James Woolford/DC/USEPA/US@EPA, Jennifer Wilbur/DC/USEPA/US@EPA, Phyllis Anderson/DC/USEPA/US@EPA, Thea Williams/DC/USEPA/US@EPA
Date: 04/11/2012 10:36 AM
Subject: Re: Fw: Revised PAGs Manual and FRN

---

Yes, here are the two revised documents (FR Notice and PAG Manual).
**Draft_PAGs-FR_3-27-12_cleanStuart_redline_4_11_12.docx** Draft_PAGs-FR_3-27-12_cleanStuart_redline_4_11_12.docx**Draft_PAGs-Combined-Doc_3-27-12_clean_Stuart_redline_4_11_12.docx** Draft_PAGs-Combined-Doc_3-27-12_clean_Stuart_redline_4_11_12.docx

This is the sentence in the FR Notice that talks about replacing the DHS PAGs.

# Ex. 5 - Deliberative Process

Barnes Johnson---04/10/2012 04:23:33 PM---perfect, can you make that change and Ill get it over to ORIA? thanks. Barnes Johnson | U.S. Envi

From: Barnes Johnson/DC/USEPA/US
To: Stuart Walker/DC/USEPA/US@EPA
Cc: Bruce Means/DC/USEPA/US@EPA, Helen Dawson/DC/USEPA/US@EPA, James Woolford/DC/USEPA/US@EPA, Jennifer Wilbur/DC/USEPA/US@EPA, Phyllis Anderson/DC/USEPA/US@EPA, Thea Williams/DC/USEPA/US@EPA
Date: 04/10/2012 04:23 PM
Subject: Re: Fw: Revised PAGs Manual and FRN

---

perfect, can you make that change and Ill get it over to ORIA? thanks.

**Barnes Johnson** | U.S. Environmental Protection Agency | Superfund | Tel 703 603 8960 | Fax 703 603 9146 | johnson.barnes@epa.gov

Stuart Walker---04/10/2012 04:21:06 PM---I think that is a good idea. The only reason I limited the text in my comments is I know that the i

From: Stuart Walker/DC/USEPA/US
To: Barnes Johnson/DC/USEPA/US@EPA
Cc: Bruce Means/DC/USEPA/US@EPA, Helen Dawson/DC/USEPA/US@EPA, James Woolford/DC/USEPA/US@EPA, Jennifer Wilbur/DC/USEPA/US@EPA, Phyllis Anderson/DC/USEPA/US@EPA, Thea Williams/DC/USEPA/US@EPA
Date: 04/10/2012 04:21 PM
Subject: Re: Fw: Revised PAGs Manual and FRN

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Ex. 5 - Deliberative Process

-----Barnes Johnson/DC/USEPA/US wrote: -----
To: Stuart Walker/DC/USEPA/US@EPA
From: Barnes Johnson/DC/USEPA/US
Date: 04/10/2012 12:56PM
Cc: Bruce Means/DC/USEPA/US@EPA, Helen Dawson/DC/USEPA/US@EPA, James Woolford/DC/USEPA/US@EPA, Jennifer Wilbur/DC/USEPA/US@EPA, Phyllis Anderson/DC/USEPA/US@EPA, Thea Williams/DC/USEPA/US@EPA
Subject: Re: Fw: Revised PAGs Manual and FRN

Ex. 5 - Deliberative Process

**Barnes Johnson** | U.S. Environmental Protection Agency | Superfund | Tel 703 603 8960 | Fax 703 603 9146 | johnson.barnes@epa.gov

Stuart Walker---04/10/2012 10:53:32 AM---Barnes, I have revised the comments on the FR notice to reflect the preference for public comment by

From: Stuart Walker/DC/USEPA/US
To: Barnes Johnson/DC/USEPA/US@EPA
Cc: Bruce Means/DC/USEPA/US@EPA, Helen Dawson/DC/USEPA/US@EPA, James Woolford/DC/USEPA/US@EPA, Jennifer Wilbur/DC/USEPA/US@EPA, Phyllis Anderson/DC/USEPA/US@EPA, Thea Williams/DC/USEPA/US@EPA
Date: 04/10/2012 10:53 AM
Subject: Fw: Revised PAGs Manual and FRN

---

Barnes,

I have revised the comments on the FR notice to reflect the preference for public comment by removing that as a concern and restoring the text that seeks public comment on all provisions of the PAG. This also means I have no comments on the Outline for the PAG.
*(See attached file: Draft_PAGs-Combined-Doc_3-27-12_clean_Stuart_redline_4_9_12.docx)(See attached file: Draft_PAGs-FR_3-27-12_cleanStuart_redline_4_9_12.docx)*

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

----- Forwarded by Stuart Walker/DC/USEPA/US on 04/09/2012 09:15 PM -----

From: Barnes Johnson/DC/USEPA/US
To: Stuart Walker/DC/USEPA/US@EPA
Cc: Bruce Means/DC/USEPA/US@EPA, Helen Dawson/DC/USEPA/US, James Woolford/DC/USEPA/US@EPA, Jennifer Wilbur/DC/USEPA/US@EPA, Phyllis Anderson/DC/USEPA/US@EPA, Thea Williams/DC/USEPA/US@EPA
Date: 04/09/2012 04:36 PM
Subject: Re: Fw: Revised PAGs Manual and FRN

---

Dear Stuart,

Thanks for your comments. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Thanks,

**Barnes Johnson** | U.S. Environmental Protection Agency | Superfund | Tel 703 603 8960 | Fax 703 603 9146 | johnson.barnes@epa.gov

Stuart Walker---04/02/2012 07:16:54 PM---Barnes, Attached are my redline/strikeout edits on the three ORIA word documents, with some explana

From: Stuart Walker/DC/USEPA/US
To: Barnes Johnson/DC/USEPA/US@EPA
Cc: Bruce Means/DC/USEPA/US@EPA, Helen Dawson/DC/USEPA/US@EPA, James Woolford/DC/USEPA/US@EPA, Jennifer Wilbur/DC/USEPA/US@EPA, Phyllis Anderson/DC/USEPA/US@EPA, Thea Williams/DC/USEPA/US@EPA
Date: 04/02/2012 07:16 PM
Subject: Re: Fw: Revised PAGs Manual and FRN

---

Barnes,

Attached are my redline/~~strikeout~~ edits on the three ORIA word documents, with some explanatory comments in the margins. I am out of the office working most of Tuesday then on leave for spring break. If you need to reach me my cell is 202-262-9986.

[attachment "PAGs_outline_3-27-12_stuart_redline_4_2_12.docx" deleted by Stuart

Walker/DC/USEPA/US] [attachment "Draft_PAGs-FR_3-27-12_cleanStuart_redline_4_2_12.docx" deleted by Stuart Walker/DC/USEPA/US] [attachment "Draft_PAGs-Combined-Doc_3-27-12_clean_Stuart_redline_4_2_12.docx" deleted by Stuart Walker/DC/USEPA/US]

# Ex. 5 - Deliberative Process

Barnes Johnson---03/29/2012 02:55:08 PM---Here you go; this time with the attachments! Barnes Johnson | U.S. Environmental Protection Agency

From: Barnes Johnson/DC/USEPA/US
To: Phyllis Anderson/DC/USEPA/US@EPA, Bruce Means/DC/USEPA/US@EPA, Helen Dawson/DC/USEPA/US, Stuart Walker/DC/USEPA/US@EPA
Cc: James Woolford/DC/USEPA/US@EPA, Thea Williams/DC/USEPA/US@EPA, Jennifer Wilbur/DC/USEPA/US@EPA
Date: 03/29/2012 02:55 PM
Subject: Fw: Revised PAGs Manual and FRN

---

Here you go; this time with the attachments!

**Barnes Johnson** | U.S. Environmental Protection Agency | Superfund | Tel 703 603 8960 | Fax 703 603 9146 | johnson.barnes@epa.gov
----- Forwarded by Barnes Johnson/DC/USEPA/US on 03/29/2012 02:53 PM -----

From: Alan Perrin/DC/USEPA/US
To: Debbie Dietrich/DC/USEPA/US@EPA, Barnes Johnson/DC/USEPA/US@EPA, Larry Stanton/DC/USEPA/US@EPA, Dana Tulis/DC/USEPA/US@EPA, Elizabeth Southerland/DC/USEPA/US@EPA, Eric Burneson/DC/USEPA/US@EPA, John Michaud/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA
Cc: James Woolford/DC/USEPA/US@EPA, Mike Flynn/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA
Date: 03/28/2012 01:17 PM
Subject: Revised PAGs Manual and FRN

---

Intra-agency colleagues and PAGs reviewers,

# Ex. 5 - Deliberative Process

The revised draft Federal Register Notice and Planning Guidance and Protective Action Guides for Radiological Incidents manual and the associated draft revision of its Federal Register Notice of Availability for Public Comment are attached. Since the language in the PAGs and Deputies papers has already been approved at a high level, great care was taken to minimize edits, however some edits were made to purge personal pronouns, rationalize internal references (e.g., this paper) and remove

inconsistencies in terminology. The majority of new text in this revision functions to introduce the inclusion of new chapters/sections within the document Overview, and to provide bridging language that accommodates the fit and feel of the newly added papers.

We know we still have formatting issues; that and items like the TOC, layout of the Matrix, and pagination will be addressed after this review is complete, so please ignore those details for now. Instead, I hope you'll provide feedback especially on the new title, references to the new document itself within the text, connecting language and any suggestions to provide additional clarity on the new sections.

Please provide your **concurrence/comments** via email to me and to Sara DeCair, by **noon on Friday, April 6**. I'm sending the draft documents in pdf format showing all edits that have been made and in a clean version that incorporates those edits. If you have comments or suggestions, please reflect them directly in the clean document. Let us know if you have any concerns, and thank you for providing your input.

[attachment "PAGs_outline_3-27-12.docx" deleted by Stuart Walker/DC/USEPA/US] [attachment "Draft_PAGs-FR_3-27-12_edits.pdf" deleted by Stuart Walker/DC/USEPA/US] [attachment "Draft_PAGs-FR_3-27-12_clean.docx" deleted by Stuart Walker/DC/USEPA/US] [attachment "Draft_PAGs-Combined-Doc_3-27-12_edits.pdf" deleted by Stuart Walker/DC/USEPA/US] [attachment "Draft_PAGs-Combined-Doc_3-27-12_clean.docx" deleted by Stuart Walker/DC/USEPA/US]

Regards, Alan
~~~~~~~~~~~~~~
Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376
*(See attached file: Draft_PAGs-Combined-Doc_3-27-12_clean_Stuart_redline_4_9_12.docx)*
*(See attached file: Draft_PAGs-FR_3-27-12_cleanStuart_redline_4_9_12.docx)*

[attachment "Draft_PAGs-Combined-Doc_3-27-12_clean_Stuart_redline_4_9_12.docx" removed by Stuart Walker/DC/USEPA/US]
[attachment "Draft_PAGs-FR_3-27-12_cleanStuart_redline_4_9_12.docx" removed by Stuart Walker/DC/USEPA/US]
~~~~~~~~~~~~~~

**Subject:** FR & Manual just FYI, plz bring copies of outline?
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Submit Time:** 3/20/2012 19:19:21

I plan to list my talkies/questions from looking at the FR and Manual again in the morning. It still is pretty rough, but getting there.

If you bring copies of the Outline-Plan thing, I can just have questions listed for these other ugly docs. No need to print now, just another tree killed!

Cheers,

S.**Draft PAGs FR Notice - 03-20-2012sdd.docm** **Draft PAGs Combined Document - 03-20-2012sdd.doc**

**Subject:** FR and PAGs for intra-agency review
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Submit Time:** 3/26/2012 13:10:15

Lee and Alan, here is a draft note and cleaned-up drafts based on your review. Who should send it out? I think me -- or better, Jon?

Intra-agency PAGs reviewers;

Attached are draft edited Federal Register and PAGs updates, based on the most recent guidance from Debbie on publication of a document that combines the PAGs Manual update and the SOE papers. To facilitate this very short review timeframe, we've hidden many of the formatting redline/strikeout features, so you can focus on the wording edits. Since the PAGs and SOE papers language was approved at such a high level, great care was taken to leave the language unchanged, except where it conflicted.

Items like Table of Contents, layout of the Matrix, and pagination will be addressed after this review is complete, so please ignore those details for now. Instead, please provide feedback especially on the new title, and any suggestions to provide clarity on the new sections.

Please provide your concurrence via email by noon on Monday, April 2nd. Please let us know if you have any concerns, and thank you for providing your input.

*signed, *Draft PAGs Combined Document - 03-26-2012.doc Draft PAGs FR Notice - 03-26-2012.docm

**Subject:** Fw: FOR REVIEW: Draft Federal Register Notice and Radiation Guidance
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**From:** CN=Alan Perrin/OU=DC/O=USEPA/C=US
**Submit Time:** 5/29/2012 19:06:28

~~~~~~~~~~~~~
Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376

----- Forwarded by Alan Perrin/DC/USEPA/US on 05/29/2012 07:06 PM -----

From: John Michaud/DC/USEPA/US
To: Debbie Dietrich/DC/USEPA/US@EPA
Cc: Alan Perrin/DC/USEPA/US@EPA, Charles Openchowski/DC/USEPA/US@EPA
Date: 05/29/2012 05:44 PM
Subject: Re: FOR REVIEW: Draft Federal Register Notice and Radiation Guidance

---

Debbie --

Thanks for sending us the revised PAG Manual and accompanying Federal Register notice. We are sending along some comments and suggestions for you, keeping in mind that this came in as many folks were getting ready to leave for the long weekend, so we have not had a chance to coordinate with everyone in OGC who might have an interest and still meet today's deadline. We appreciate that a number of our comments on previous versions of the PAG Manual and FR notice have been addressed, and note that some others have not been -- we would be happy to discuss and work through those, as well as the new comments we've made in the attached.

Thanks

2012 PAG Manual 5-22-2012 OGC comments.doc 2012 PAG Manual 5-22-2012 OGC comments.doc

2012 PAG Manual FR Notice 5-22-2012 OGC comments.doc

comments.doc 2012 PAG Manual FR Notice 5-22-2012 OGC comments.doc

John R. Michaud
Deputy Associate General Counsel
Solid Waste and Emergency Response Law Office
Office of General Counsel
U.S. EPA, Washington, D.C.
Mail Code: 2366A
tel: 202-564-5518
fax: 202-564-5531
email: michaud.john@epa.gov
~~~~~~~~~~~~~

Debbie Dietrich---05/23/2012 02:26:13 PM---Intra-agency colleagues and PAGs reviewers, This is in follow-up to Alan Perrin's email of March 28,

From: Debbie Dietrich/DC/USEPA/US
To: Lisa Feldt/DC/USEPA/US@EPA, Larry Stanton/DC/USEPA/US@EPA, Dana Tulis/DC/USEPA/US@EPA, James Woolford/DC/USEPA/US@EPA, Barnes Johnson/DC/USEPA/US@EPA, Pamela Barr/DC/USEPA/US@EPA, Eric Burneson/DC/USEPA/US@EPA, David Travers/DC/USEPA/US@EPA, John Michaud/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, Mike Flynn/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA
Cc: Juan Reyes/DC/USEPA/US@EPA, Lisa Nanko/DC/USEPA/US@EPA, Cayce Parrish/DC/USEPA/US@EPA
Date: 05/23/2012 02:26 PM
Subject: FOR REVIEW: Draft Federal Register Notice and Radiation Guidance

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Intra-agency colleagues and PAGs reviewers,

This is in follow-up to Alan Perrin's email of March 28, 2012 and my more recent message of May 17, 2012. Attached for your review is a proposed federal register notice and radiation guidance that has been drafted as a result of Principal Level Exercise (PLE) 3-10.

Since your last review of the PAG Manual and FR Notice in early April (Alan's email), an agreement was reached between EPA, DHS and the White House to incorporate the DHS 2008 RDD/IND Planning Guide into the PAG Manual, in effect, merging the Deputies' PLE Cleanup paper and the RDD/IND Late Phase guidance. Attached are draft versions of the slightly expanded combined Manual and the FR Notice for your review and concurrence.

Since the language in the PAGs and the Deputies' PLE papers has already been approved at a high level, very few changes have been made. Since the last review: most comments received were incorporated; some text was updated to provide bridging language between the Deputies' cleanup paper and the 2008 RDD/IND Late Phase guidance. It is good news that, with this merged document, users will end up with a single guidance for radiological incidents once the PAG Manual is finalized.

I apologize for the current review time frame! EPA is being asked to meet some very demanding external deadlines, unfortunately that means our internal deadlines must be equally demanding. **Please provide your office's consolidated concurrence/comments via email not later than 4:00 pm on Tuesday, May 29, to Alan Perrin with a cc to me**. We are meeting with the Deputy Administrator at 1 pm the following day (5/30) to discuss any remaining issues. Let me know if you have any concerns, and thank you for providing your input on such a short schedule.

[attachment "Draft PAGs FR 5-22-2012.doc" deleted by John Michaud/DC/USEPA/US] [attachment "Draft 2012 PAG Manual 5-22-2012.doc" deleted by John Michaud/DC/USEPA/US]

---

Debbie Dietrich
Associate Administrator for Homeland Security
USEPA
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Ph 202-564-6978
Fax 202-501-0026

**From:** "Tyler A. Willis" <twillis@endyna.com>
**To:** Sara DeCair/DC/USEPA/US@EPA
**Subject:** RE: Make new document out of this?
**Submit Time:** 5/22/2012 17:02:03

See attached. Let me know if you need more help.

Regards,

**Tyler A. Willis**

**Senior Environmental Consultant**
twillis@endyna.com

**EnDyna, Inc.**
7926 Jones Branch Drive, Suite 620
McLean, VA 22102
Tel: (703) 848-8842, ext. 124
Fax: (703) 848-9001
www.endyna.com

**From:** Sara DeCair [mailto:DeCair.Sara@epamail.epa.gov]
**Sent:** Tuesday, May 22, 2012 2:43 PM
**To:** twillis@endyna.com
**Subject:** Make new document out of this?

Tyler,

I assume dropping this into a new Word doc might let the file corruption thing go away -- I hope!!

We did away with any double spaces after periods, and cut a bunch of Oxford commas. (Good news when these are the level of edits I'm getting!) So if you'll do a last skim for formatting trouble that I often cause, and send me back a new version, I'd be very grateful!

Thanks so much!

Sara

*(See attached file: Draft Planning Guidance and PAGs 5-22-2012.doc)*Draft Planning Guidance and PAGs 5-22-2012 - EnDyna.doc

**Subject:** Protective Action Guides (PAG) Manual
**To:** Dominic_J._Mancini Ex. 6 - Personal Privacy
**Cc:** Margo_Schwab Ex. 6 - Personal Privacy Chad_S_Whiteman Ex. 6 - Personal Privacy CN=Debbie Dietrich/OU=DC/O=USEPA/C=US@EPA CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA CN=Gina McCarthy/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Mike Flynn/OU=DC/O=USEPA/C=US
**Submit Time:** 12/4/2012 13:48:32

Dom,

We've addressed the interagency comments you provided, and have attached an updated redline/strikeout version of the PAG Manual and the associated Federal Register notice below.

# Ex. 5 - Deliberative Process

To provide responses to the comments you provided, we produced a comment response spreadsheet, also attached, where you'll find a rationale for each comment's disposition. As you will see, we have incorporated a significant number of the comments (highlighted in green in the table).

Thank you for expediting the completion of this review. As you know, our state partners have been anticipating this revision for several years. Please call if you have any questions.

Mike

PAG Manual redline 11-27-2012.docx PAG Manual redline 11-27-2012.docxPAGS Comment Responses Dec 4 2012.xlsx 2012.xlsx PAGS Comment Responses Dec 4 2012.xlsxPAGs Manual FR redline 11-27-12.docx PAGs Manual FR redline 11-27-12.docx

Mike Flynn, Director
Office of Radiation and Indoor Air
U.S. Environmental Protection Agency
Phone: (202) 343-9356

**Submit Time:** 3/27/2012 17:06:02
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** New - note and FR, Planning Guidance and PAGs

**Lee and Alan, here is a draft note and cleaned-up drafts based on your review.**

Intra-agency PAGs reviewers;

Attached are draft edited Federal Register Notice and PAGs document updates, based on guidance from Debbie on publication of a document that combines the PAGs Manual update and the SOE papers. To facilitate this very short review timeframe, we've hidden many of the formatting redline/strikeout features, so you can focus on the wording edits. Since the PAGs and SOE papers language was approved already at a high level, great care was taken to leave the language unchanged, except where it conflicted.

Items like Table of Contents, layout of the Matrix, and pagination will be addressed after this review is complete, so please ignore those details for now. Instead, please provide feedback especially on the new title, references to the new document itself within the text, and any suggestions to provide clarity on the new sections.

Please provide your concurrence via email by noon on Wednesday, April 9th. Please let us know if you have any concerns, and thank you for providing your input.

Respectfully,

Alan Perrin, Deputy Director
Radiation Protection Division

Draft PAGs Combined Document - 03-27-2012.doc Draft PAGs Combined Document - 03-27-2012.docDraft PAGs FR Notice - 03-27-2012.docm Draft PAGs FR Notice - 03-27-2012.docm

**Submit Time:** 11/28/2012 16:50:21
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** draft note from Mike to Dom

How does this sound? Thanks for suggestions! (Would a shorter, FYI-type note have to go from Mike to his OD friends? Or can we wait til we hear back from OMB?)

S.

Dom,

We've incorporated most of the interagency comments you provided in the attached redline/strikeout version of the PAG Manual and associated Federal Register notice. Per our discussion a couple weeks ago, we added a clearer request for input on drinking water and listed other organizations that have provided emergency guidelines, with links.

We also made many edits to balance and clarify authorities mentioned, and direct readers to the National Response Framework for information on which agencies have roles and responsibilities in emergency response. In Chapter 4, the Late Phase, we were careful to incorporate as many suggestions as we could without changing the agreed-upon content from the SOE/PLE papers.

To provide responses to the comments you provided, we produced a comment response spreadsheet, also attached, where you'll find a rationale for each comment's disposition. Most are highlighted green, where the comment was incorporated. Just a few are highlighted yellow, where we couldn't agree with the suggestion.

Thank you for expediting the completion of this review. As you know, our state partners have been anticipating this revision for several years. Please call if you have any questions,

Mike

PAGs FR redline 10-25-2012.docx PAGs FR redline 10-25-2012.docx

PAG Manual redline 11-27-2012.docx PAG Manual redline 11-27-2012.docx

PAGS Comment Responses Nov 28 2012.xlsx PAGS Comment Responses Nov 28 2012.xlsx

**Submit Time:** 10/17/2012 10:56:18
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Connie Gillam/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** Link checking task

Connie --

Thank you for checking these links and letting me know if any of them don't look like a good information source, or is broken. I appreciate it!

Sara

**PAG Manual with OMB cmts incorp 10-17-2012 1100 am.docx** PAG Manual with OMB cmts incorp 10-17-2012 1100 am.docx

**Subject:** Edits to PAG Manual
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:** Glenna Shields/DC/USEPA/US@EPA CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Tony Nesky/OU=DC/O=USEPA/C=US
**Submit Time:** 7/13/2012 12:52:39

Dear Sara:

Attached are two documents: my "clean" edits of the 7-11-12 PAG Manual and "Show Changes" version of it so that you can zoom in on what I changed. Most of it was just ensuring consistency of bullet formats. There are some things to call to your attention:

- In 4.22, there were multiple subheaders with the same title in the same section--for example, both section a and c were "Licensed Commerical LLRW Disposal Facilities" The earlier section was a bullet list, while the later one was the complete write-up. You can't have multiple subheaders with the same name under the same section, so I solved this by making the bullet lists sidebars to the write-up. No text was changed.
- In Section 3.5.3, Correction Actions to Reduce Levels of Contamination, some of the writing was really awkward. I changed it slightly, but kept as many of the author's orginial expressions as possible, so I think he/she would recognize the edited text as his own.
- There are repetitive statements and some organizational issues in Chapters 3 and 4. I made comments with suggested alternatives, but didn't change the text.
- And you know we have to talk about that re-entry table.....

Take a look at changes and let's talk at your earliest convenience(which will happen to be after I get some lunch).

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.govPAG Manual-7-11-2012-SHOWCHANGES.docx PAG Manual-7-11-2012-SHOWCHANGES.docxDraft 2012 PAG Manual 7-11-2012--tonyedits.docx Draft 2012 PAG Manual 7-11-2012--tonyedits.docx

**Subject:** Fw: PAG Manual and Cmt Spreadsheet
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** "Lee Veal cell" <veal.lee@epa.gov>
**Cc:**
**Submit Time:** 11/19/2012 08:49:05

FYI --

If you wanted to take a look at these, that'd be great, but I expect that Alan will be listening for next instructions from Mike or Debbie. If you do have time to look at the comment response spreadsheet, I'd be particularly interested in whether there is a better way to say 'yay' or 'nay' on any of the comments. I did try to explain the responses. And you'll see I only did color-coding for the SOE/PLE category (so far), but is there a slicker way to make this useful for us? Margo?

PS Dad and I just tried the Holunderbluten jelly and WOW! It smells and tastes so good -- flowery and yummy! I knew you weren't making it up :) Thank you!

S.

-----Forwarded by Sara DeCair/DC/USEPA/US on 11/19/2012 08:43AM -----
To: Alan Perrin/DC/USEPA/US@EPA
From: Sara DeCair/DC/USEPA/US
Date: 11/16/2012 05:52PM
Subject: PAG Manual and Cmt Spreadsheet

Alan,

The attached redline version of the PAG Manual still shows what our OW, OGC, and OSWER partners discussed in mid-October meetings and finished with the Oct. 18 version. (Since then, the SOE/PLE edits were pulled out, but going back to this version allowed us to get closer to what OMB was encouraging.)

In yellow highlights in the attached, in Chapter 4 only, are the very few minor edits we've done since then, per our conversation with OMB. Our OW, OSWER, and OGC partners can be pointed to those for quick review early next week.

The comment response spreadsheet, attached below, shows our responses to several categories of comments and can be sorted by topic area or sections/line numbers in the Manual. You'll note that the green (for suggestions that were incorporated) and yellow (for changes that would be unacceptable) highlights are only applied to the SOE/PLE category of comments and responses. Just for now, that is our focal point and color-coding can be added to rest of the spreadsheet as needed for discussions with Margo.

Note! This does not yet include the additional statement OW is working on, to refer readers to existing organizations that have provided various emergency water guidelines. We should get that Monday and will incorporate it in yellow highlight in the Overview and Chapter 3, as appropriate.

Thank you!

Sara

*(See attached file: PAG Manual with OMB cmts incorp NEW HIGHLITED 11-16-2012.docx)*

*(See attached file: PAGS Comment Responses Nov 16 2012.xlsx)***PAG Manual with OMB cmts incorp NEW HIGHLITED 11-16-2012.docx** **PAGS Comment Responses Nov 16 2012.xlsx**

**From:** "Schwab, Margo" Ex. 6 - Personal Privacy
**To:** Alan Perrin/DC/USEPA/US@EPA
**Cc:** "Whiteman, Chad" Ex. 6 - Personal Privacy > Lee Veal/DC/USEPA/US@EPA Sara DeCair/DC/USEPA/US@EPA Jonathan Edwards/DC/USEPA/US@EPA "Jones, Lisa M." Ex. 6 - Personal Privacy
**Subject:** RE: Meet on PAGs as soon as possible
**Submit Time:** 7/12/2012 16:55:05

Alan – would you please make sure that the appropriate people provide the information in the attached spread sheet for security clearance? Once you have completed the spreadsheet, you can send it directly to Lisa Jones (cc in this email). We will be meeting in the NEOB, 10th floor (10103).

Margo

**From:** Alan Perrin [mailto:Perrin.Alan@epamail.epa.gov]
**Sent:** Wednesday, July 11, 2012 3:35 PM
**To:** Schwab, Margo
**Cc:** Whiteman, Chad; Lee Veal; Sara DeCair; Jonathan Edwards
**Subject:** RE: Meet on PAGs as soon as possible
**Importance:** High

Margo,

Please schedule our meeting with Dom Mancini (and appropriate OMB staff) for the **11-12 slot on July 19**. The principals from EPA will be Debbie Dietrich, Associate Administrator for Homeland Security, and Mike Flynn, Director of the Office of Radiation and Indoor Air; they will be accompanied by appropriate EPA staff.

I will get the time blocked out on EPA calendars and assume you will take care of the calendars at OMB and find a room for us to get together. Please let me know what information you need from EPA attendees for building access. Thank you for helping to quickly arrange this meeting. -Alan

~~~~~~~~~~~~~
Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376

Inactive hide details for "Schwab, Margo" ---07/11/2012 11:55:47 AM---At this point Thursday July 19th seems like the only poss"Schwab, Margo" ---07/11/2012 11:55:47 AM---At this point Thursday July 19th seems like the only possibility before July 20th . 9:30-10:30, 11-

From: "Schwab, Margo" Ex. 6 - Personal Privacy
~~~~~~~~~~~~~

To: Sara DeCair/DC/USEPA/US@EPA, "Whiteman, Chad"
Ex. 6 - Personal Privacy
Cc: Alan Perrin/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA
Date: 07/11/2012 11:55 AM
Subject: RE: Meet on PAGs as soon as possible

---

At this point Thursday July 19th seems like the only possibility before July 20th . 9:30-10:30, 11-12 and 2-4:30 are currently open.

**From:** Sara DeCair [mailto:DeCair.Sara@epamail.epa.gov]
**Sent:** Wednesday, July 11, 2012 7:35 AM
**To:** Schwab, Margo; Whiteman, Chad; Schwab, Margo
**Cc:** Alan Perrin; Lee Veal
**Subject:** Meet on PAGs as soon as possible

Margo and Chad,

Per my voice message, we are hoping to set up a meeting to discuss the PAG Manual. Following Gina McCarthy's conversation with Dom last Friday, she indicated that the next step was for us to provide a more detailed briefing to OMB on the PAG Manual revision, since we're confident that inter-agency comments have been addressed. In fact, the recent addition of SOE/PLE exercise products make it a much more complete and useful guidance that is ready for public review and comment.

Who is our point of contact (for calendars and scheduling) so that Debbie Dietrich, Mike Flynn, and and few of us staffers can come over as soon as possible? Debbie leaves the country on July 20th so we're under a bit of pressure, but I'm sure we can find a mutually agreeable time to sit down this week or next.

Thanks so much for providing a contact, and I look forward to talking with you!

Sara

desk 202-343-9108

cell 202-738-2871image001.gif Copy of Waves 1-10-12 - Copy of WAVES_20_Excel_Template_V1 8 9.xls

**Subject:** Pags: Additional Edits.
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**Submit Time:** 7/3/2012 13:37:53
**To:** perrin.alan@epa.gov

Hiya, good that she keeps improving it or scary how many things can go wrong? We notice different challenges in Word versions because of the old Word we use at work... Pdf solves that, natch.
Have fun,
S.
---
Sent by EPA Wireless E-Mail Services

---

**From:** Brielle Welzer [bwelzer@endyna.com]
**Sent:** 07/03/2012 05:18 PM GMT
**To:** Sara DeCair
**Subject:** Additional Edits.

Hi Sara,

I was reviewing what I sent yesterday - and realize that there was still an issue with the tables falling off the page - here is an updated version - which also includes an updated Table of Contents - with a slight change in formatting to make it easier to read.

Please let me know if you need any of my changes reversed/revised.

Thanks!

- Brie

Draft 2012 PAG Manual 6-1-2012 v6.doc

Lee, would you have any time to talk tomorrow morning? I will be in and available between 8 and 11 am -- my desk phone is 202-343-9108. Thanks!

S.

"Nickel, Lee A CIV SEA 08 NR" ---08/28/2012 06:32:17 PM---DO NOT FORWARD - DRAFT Sara,

From: "Nickel, Lee A CIV SEA 08 NR" <lee.a.nickel1@navy.mil>
To: Sara DeCair/DC/USEPA/US@EPA
Date: 08/28/2012 06:32 PM
Subject: PAG Manual - DRAFT Comments

---

DO NOT FORWARD - DRAFT

Sara,

I wanted to discuss the DRAFT comments on the EPA PAGs below with you.
Are you available tomorrow morning?

**Ex. 5 - Deliberative Process**

Thanks,

Lee
(202) 781-6107

DO NOT FORWARD - DRAFT

**Ex. 5 - Deliberative Process**

# Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

**Submit Time:** 10/23/2012 15:55:15
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** New Manual markup with only agreed upon changes

See if this work for going back to OMB, and I'll finish the comment response spreadsheet and put together a one-pager for our meeting with OMB. Thanks!

S.

**PAG Manual with OMB and EPA cmts incorp 10-23-2012.docx**

PAG Manual with OMB and EPA cmts incorp 10-23-2012.docx

**Subject:** PAGs - cleaner version, needs better Ch. 4 Key Points
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Submit Time:** 5/21/2012 17:12:20

In case you just finished reviewing this morning's version, here's another one ;-)

-----Forwarded by Sara DeCair/DC/USEPA/US on 05/21/2012 05:11PM -----
To: Lee Veal/DC/USEPA/US@EPA, Daniel Schultheisz/DC/USEPA/US@EPA, Tony Nesky/DC/USEPA/US@EPA
From: Sara DeCair/DC/USEPA/US
Date: 05/21/2012 05:07PM
Subject: PAGs - cleaner version, needs better Ch. 4 Key Points

*(See attached file: Draft Planning Guidance and PAGs 5-21-2012.doc)*

Lee, Dan, and Tony,

I threw together a few Key Points for the new and improved Chapter 4 (it's even a respectable length for a Chapter now) but really could use your help on making these Key Points a little smarter. Any ideas? Thank you!

S.

**Draft Planning Guidance and PAGs 5-21-2012.doc**

Thanks for the e-docs. I sort of avoid the parallel, just got comfortable with a bit of flex and overlap -- anyway, I restructured the one-pager with a proposed path forward on page 2. Will be running through with Jon around 1 pm, Mike later today or tomorrow morning (but we will need to get product, at least the one-pager to Debbie, et al today). Take a look if you have time, comments needed and welcome. Alan

**PAGs_outline_3-20-12.docx** PAGs_outline_3-20-12.docx

~~~~~~~~~~~~~~

Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376

Sara DeCair---03/20/2012 09:36:19 AM---Alan, I hear there is a parallel path - let me know if you need me to get on the phone for any steps

From: Sara DeCair/DC/USEPA/US
To: "Alan Perrin" <Perrin.Alan@epamail.epa.gov>, "Lee Veal" <veal.lee@epa.gov>
Date: 03/20/2012 09:36 AM
Subject: Drafts!! PAGs Docs

---

Alan, I hear there is a parallel path - let me know if you need me to get on the phone for any steps today!
Here are drafts, may be kinda ugly...
Thx
Sara
---
Sent by EPA Wireless E-Mail Services

---

**From:** "Tyler A. Willis" [twillis@endyna.com]
**Sent:** 03/20/2012 09:29 AM AST
**To:** Sara DeCair
**Subject:** PAGs Docs

Sara,

Attached are the documents you sent us with the edits and a read through. Give me a call or send an email if you like.

Regards,

**Tyler A. Willis**
**Senior Environmental Consultant**
twillis@endyna.com

**EnDyna, Inc.**
7926 Jones Branch Drive, Suite 620
~~~~~~~~~~~~~~

McLean, VA 22102
Tel: (703) 848-8842, ext. 124
Fax: (703) 848-9001
www.endyna.com
[attachment "Draft PAGs FR Notice - 03-20-12.doc" deleted by Alan Perrin/DC/USEPA/US] [attachment "Draft PAGs Combined Document - 03-20-12.doc" deleted by Alan Perrin/DC/USEPA/US]

**Subject:** PAGs/SOE proposal
**To:** CN=Debbie Dietrich/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Mike Flynn/OU=DC/O=USEPA/C=US@EPA CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Alan Perrin/OU=DC/O=USEPA/C=US
**Submit Time:** 3/20/2012 17:45:56

Debbie,

Here is a draft proposal for publishing the SOE/PLE papers as part of the PAGs for discussion at tomorrow's 1 p.m. meeting. It includes some brief background, an outline of the proposed document and a proposal for moving the package forward. Please let me know if you have any questions.

By the way, ORIA may have to call in to the meeting tomorrow because of time/space difficulties. -Alan

PAGs_outline_3-20-12.docx PAGs_outline_3-20-12.docx

~~~~~~~~~~~~~

Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376
~~~~~~~~~~~~~

**Subject:** Re: Fw: Rad PAGs
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Submit Time:** 9/26/2012 15:31:45

Jon and Alan, see what you think of my new draft responses to the second section of Navy Nuke comments. Though I intended the responses to be for our internal use only, sending this document around might result in it being read by our NNPP colleagues. I hope that the language is frank enough and yet diplomatic to get the points across. I suggest that we sit down with Lee Nickel and discuss these as soon as we can. It will help!

I may have introduced formatting heck which Alan will love (!!!) so... sorry about that. Thanks for letting me know what I can do next to move this forward.

S.

-----Jonathan Edwards/DC/USEPA/US wrote: -----
To: Alan Perrin/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA
From: Jonathan Edwards/DC/USEPA/US
Date: 09/26/2012 02:29PM
Subject: Fw: Rad PAGs

FYI
----- Forwarded by Jonathan Edwards/DC/USEPA/US on 09/26/2012 02:28 PM -----

From: Debbie Dietrich/DC/USEPA/US
To: Bob Perciasepe/DC/USEPA/US@EPA
Cc: Mike Flynn/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA
Date: 09/26/2012 11:18 AM
Subject: Fw: Rad PAGs

---

Bob, I talked to Chuck Donell and he forwarded the Naval Reactor comments below. We are currently reviewing and will let you know how we propose to resolve. These are the only comments Chuck has received from OMB but he is going to go back and see if he can get the full set of comments. Once we've reviewed, he would like to discuss these with us.

Debbie Dietrich
Associate Administrator for Homeland Security
USEPA
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Ph 202-564-6978
Fax 202-501-0026
----- Forwarded by Debbie Dietrich/DC/USEPA/US on 09/26/2012 11:16 AM -----

From: "Donnell, Chuck" Ex. 6 - Personal Privacy
To: Debbie Dietrich/DC/USEPA/US@EPA
Cc: "Tribble, Ahsha" Ex. 6 - Personal Privacy
Date: 09/26/2012 09:13 AM
Subject: Rad PAGs

---

Debbie:

The Navy Reactors comments are attached as discussed. I received them from OIRA on 9/21 with the caveat that they were still assimilating all of the comments and would pass them along when complete. I will reach back out to them later this week to see if we can get the full set of responses.

In the meantime, please take a look at these and let's discuss path forward once you have had the opportunity to review them.

Thanks,
Chuck*(See attached file: DOD - TAB B NR Comments on PAGs.docx)*

[attachment "DOD - TAB B NR Comments on PAGs.docx" removed by Sara DeCair/DC/USEPA/US]Navy Nuke comment responses draft 9-26-2012.docx

This version includes the link for Turbo FRMAC and some changes that Jess made to the '2 rem first year' question.

# Ex. 5 - Deliberative Process

FAQs All November 2011 6_19_2012.docx
2011 6_19_2012.docx

FAQs All November

William D. Sacks
U.S. Environmental Protection Agency
Radiation Protection Division
202.343.9707

I'll get back to Margo. Thank you.
---
Alan Perrin
EPA Wireless
Lee Veal

----- Original Message -----
**From:** Lee Veal
**Sent:** 07/11/2012 01:15 PM EDT
**To:** Sara DeCair; Alan Perrin; Virginia Stradford
**Subject:** Fw: SCHEDULE CHECK: Meet on PAGs as soon as possible
Looks like the 11 - 12 or 2 to 430 work for Debbie.
Lee B. Veal
Director, Center for Radiological Emergency Management
Radiation Protection Division
U.S. Environmental Protection Agency
Office 202 343 9448
Cell. 202 617 4322
Lisa Nanko

----- Original Message -----
**From:** Lisa Nanko
**Sent:** 07/11/2012 12:55 PM EDT
**To:** Virginia Stradford; Lee Veal
**Cc:** "Debbie Dietrich" <dietrich.debbie@epa.gov>
**Subject:** Re: SCHEDULE CHECK: Meet on PAGs as soon as possible
Lee - I'm forwarding your request to Caroline Brown. She can check Debbie's schedule. (I'm in training.)

Lisa
Lisa Nanko
Environmental Scientist
Office of Homeland Security
Administrator's Office
U.S. Environmental Protection Agency
office: 202-564-0195
cell: 202-302-1102
Virginia Stradford

----- Original Message -----
**From:** Virginia Stradford
**Sent:** 07/11/2012 12:35 PM EDT
**To:** Lee Veal
**Cc:** Alan Perrin; Lisa Nanko; Sara DeCair
**Subject:** Re: SCHEDULE CHECK: Meet on PAGs as soon as possible
Hi Lee,

Mike is available on July 19 at either of these times.

Thanks.

-Ginny

Lee Veal---07/11/2012 11:55:11 AM---Good morning Virginia, Alan, and Lisa, OMB has responded to Sara's request for a meeting to discuss

From: Lee Veal/DC/USEPA/US
To: Virginia Stradford/DC/USEPA/US@EPA, Alan Perrin/DC/USEPA/US@EPA, Lisa Nanko/DC/USEPA/US@EPA
Cc: Sara DeCair/DC/USEPA/US@EPA
Date: 07/11/2012 11:55 AM
Subject: SCHEDULE CHECK: Meet on PAGs as soon as possible

---

Good morning Virginia, Alan, and Lisa,

OMB has responded to Sara's request for a meeting to discuss the PAG and radiation guidance document with some possible times.
I understand that Mike Flynn and Debbie Dietrich were planning to attend with some staff from here.

Do any of their suggested times work for Mike, Debbie, and RPD?
Those times are: Thursday, July 19, at 9:30-10:30 am, 11-12 am, or 2-4:40 pm
Location: New Executive Office Building, OMB offices (plan on a bit of travel time, say 15-20 minutes before and after)

Lee

Lee B. Veal
Director, Center for Radiological Emergency Management
Radiation Protection Division
Office of Radiation and Indoor Air
Environmental Protection Agency
202-343-9448
cell 202-617-4322
----- Forwarded by Lee Veal/DC/USEPA/US on 07/11/2012 11:49 AM -----

From: "Schwab, Margo" Ex. 6 - Personal Privacy
To: Sara DeCair/DC/USEPA/US@EPA, "Whiteman, Chad"
Ex. 6 - Personal Privacy
Cc: Alan Perrin/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA
Date: 07/11/2012 11:32 AM
Subject: RE: Meet on PAGs as soon as possible

---

At this point Thursday July 19th seems like the only possibility before July 20th . 9:30-10:30, 11-12 and 2-4:30 are currently open.

**From:** Sara DeCair [mailto:DeCair.Sara@epamail.epa.gov]
**Sent:** Wednesday, July 11, 2012 7:35 AM
**To:** Schwab, Margo; Whiteman, Chad; Schwab, Margo
**Cc:** Alan Perrin; Lee Veal
**Subject:** Meet on PAGs as soon as possible

Margo and Chad,

Per my voice message, we are hoping to set up a meeting to discuss the PAG Manual. Following Gina McCarthy's conversation with Dom last Friday, she indicated that the next step was for us to provide a more detailed briefing to OMB on the PAG Manual revision, since we're confident that inter-agency comments have been addressed. In fact, the recent addition of SOE/PLE exercise products make it a much more complete and useful guidance

that is ready for public review and comment.

Who is our point of contact (for calendars and scheduling) so that Debbie Dietrich, Mike Flynn, and and few of us staffers can come over as soon as possible? Debbie leaves the country on July 20th so we're under a bit of pressure, but I'm sure we can find a mutually agreeable time to sit down this week or next.

Thanks so much for providing a contact, and I look forward to talking with you!

Sara

desk 202-343-9108
cell 202-738-2871

**Subject:** 2 pger
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**From:** CN=Alan Perrin/OU=DC/O=USEPA/C=US
**Submit Time:** 5/22/2012 15:59:13

Process Path for PAGs 5-22-2012_v2.docx Process Path for PAGs 5-22-2012_v2.docx

~~~~~~~~~~~~~~

Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376
~~~~~~~~~~~~~~

**Submit Time:** 5/30/2012 16:14:23
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Daniel Schultheisz/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** Check this out?

See Waste section -- for item (h) do you want it to be 'criteria' or 'considerations' ??

Also see Key points again, I only changed one. This is a test to see if you can find the changes!

Also I'm still editing, then proofing tomorrow with Alan and calling other offices on their comments. Thanks for checking to see if this time it's right!

S.

Draft 2012 PAG Manual 5-30-2012.doc Draft 2012 PAG Manual 5-30-2012.doc

Margo,

Please schedule our meeting with Dom Mancini (and appropriate OMB staff) for the **11-12 slot on July 19**. The principals from EPA will be Debbie Dietrich, Associate Administrator for Homeland Security, and Mike Flynn, Director of the Office of Radiation and Indoor Air; they will be accompanied by appropriate EPA staff.

I will get the time blocked out on EPA calendars and assume you will take care of the calendars at OMB and find a room for us to get together. Please let me know what information you need from EPA attendees for building access. Thank you for helping to quickly arrange this meeting. -Alan

~~~~~~~~~~~~~
Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376

"Schwab, Margo" ---07/11/2012 11:55:47 AM---At this point Thursday July 19th seems like the only possibility before July 20th . 9:30-10:30, 11-

From: "Schwab, Margo" Ex. 6 - Personal Privacy
To: Sara DeCair/DC/USEPA/US@EPA, "Whiteman, Chad" Ex. 6 - Personal Privacy
Cc: Alan Perrin/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA
Date: 07/11/2012 11:55 AM
Subject: RE: Meet on PAGs as soon as possible

---

At this point Thursday July 19th seems like the only possibility before July 20th . 9:30-10:30, 11-12 and 2-4:30 are currently open.

**From:** Sara DeCair [mailto:DeCair.Sara@epamail.epa.gov]
**Sent:** Wednesday, July 11, 2012 7:35 AM
**To:** Schwab, Margo; Whiteman, Chad; Schwab, Margo
**Cc:** Alan Perrin; Lee Veal
**Subject:** Meet on PAGs as soon as possible

Margo and Chad,

Per my voice message, we are hoping to set up a meeting to discuss the PAG Manual. Following Gina McCarthy's conversation with Dom last Friday, she indicated that the next step was for us to provide a more detailed briefing to OMB on the PAG Manual revision, since we're confident that inter-agency comments have been addressed. In fact, the recent addition of SOE/PLE exercise products make it a much more complete and useful guidance that is ready for public review and comment.

Who is our point of contact (for calendars and scheduling) so that Debbie Dietrich, Mike Flynn, and and few of us staffers can come over as soon as possible? Debbie leaves the country on July 20th so we're under a bit of pressure, but I'm sure we can find a mutually agreeable time to sit down this week or next.

Thanks so much for providing a contact, and I look forward to talking with you!

Sara
~~~~~~~~~~~~~

desk 202-343-9108
cell 202-738-2871

Hope I didn't mess it up :-)

**PAGs_outline_3-21-2012.docx** PAGs_outline_3-21-2012.docx

Alan Perrin---03/21/2012 03:35:51 PM---Thanks! ~~~~~~~~~~~~~~

From: Alan Perrin/DC/USEPA/US
To: Sara DeCair/DC/USEPA/US@EPA
Date: 03/21/2012 03:35 PM
Subject: files

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[attachment "PAGs_outline_3-21-12.docx" deleted by Sara DeCair/DC/USEPA/US] [attachment "PAG-PLE_bullets.docx" deleted by Sara DeCair/DC/USEPA/US]

Thanks!
~~~~~~~~~~~~~~
Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376
~~~~~~~~~~~~~~

**Submit Time:** 5/31/2012 14:20:20
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** current draft

Draft PAGs FR 5-30-2012.doc Draft PAGs FR 5-30-2012.docDraft 2012

PAG Manual 5-31-2012.doc Draft 2012 PAG Manual 5-31-2012.doc

Nicely done.

Lee B. Veal
Director, Center for Radiological Emergency Management
Radiation Protection Division
Office of Radiation and Indoor Air
Environmental Protection Agency
202-343-9448
cell 202-617-4322

Alan Perrin---05/23/2012 02:00:45 PM---Debbie, Here are the files, the draft FR Notice and the draft PAGs Manual, ready to be distributed f

From: Alan Perrin/DC/USEPA/US
To: Debbie Dietrich/DC/USEPA/US@EPA
Cc: Mike Flynn/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA
Date: 05/23/2012 02:00 PM
Subject: PAG files

---

Debbie,

Here are the files, the draft FR Notice and the draft PAGs Manual, ready to be distributed for review.

A suggested distribution list includes the addresses you used in your "heads-up" note along with the additional names mentioned earlier today:

Lisa Feldt, Larry Stanton, Dana Tulis, James Woolford, Barnes Johnson, Pamela Barr, Eric Berneson, David Travers, John Michaud, Susan Stahle, Mike Flynn, Jonathan Edwards

A note follows that you might use with the distribution (please feel free to modify). Let us know if there is anything else we can do. -Alan

---

Intra-agency colleagues and PAGs reviewers,

Since your last review of the PAG Manual and FR Notice in early April, an agreement was struck between Bob Perciasepe and Jane Lute of DHS to incorporate the 2008 RDD/IND Planning Guide into the PAG Manual, in effect, merging the Deputies' PLE Cleanup paper and the RDD/IND Late Phase guidance. Attached are draft versions of the slightly expanded combined Manual and the FR Notice for your review and concurrence.

Since the language in the PAGs and the Deputies' PLE papers has already been approved at a high level, very few changes have been made. Since the last review: most comments received were incorporated; some text was updated to provide bridging language between the Deputies' cleanup paper and the 2008 RDD/IND Late Phase guidance. It is good news that, with this merged document, users will end up with a single guidance for radiological incidents once the PAG Manual is finalized.

I apologize for the current review time frame! EPA is being asked to meet some very demanding external deadlines, unfortunately that means our internal deadlines must be equally demanding. **Please provide your office's consolidated concurrence/comments via email not later than 4:00 pm on Tuesday, May 29, to Alan Perrin with a cc to me**. We are meeting with the Deputy Administrator at 1 pm the following day (5/30) to discuss any remaining issues. Let me know if you have any concerns, and thank you for providing your input on such a short schedule.

Sincerely,

Debbie
{signature block}

[attachment "Draft PAGs FR 5-22-2012.doc" deleted by Lee Veal/DC/USEPA/US] [attachment "Draft 2012 PAG Manual 5-22-2012.doc" deleted by Lee Veal/DC/USEPA/US]

---

~~~~~~~~~~~~~
Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376
~~~~~~~~~~~~~

**From:** Brielle Welzer <bwelzer@endyna.com>
**To:** Sara DeCair/DC/USEPA/US@EPA
**Subject:** RE: Dang - one more
**Submit Time:** 6/29/2012 19:58:28

Hi Sara,

Here are all of those updates:

- the two text edits (Footnote 7, and 2.6)
- updated the font on the new paragraph (so sorry about that!)
- updated text "F-6" to "E6"
and made one correction to the table of contents.

Here is the word doc and the PDF.

I'm going over the entire doc right now - but wanted to send you this update in case you need to get it out the door quickly and head on home. If I find anything, I'll email you updated versions, of course.

Also - I'm always a big fan of simply viewing PDFs at 150% but I will look into the font issue. It's a good thing to consider.

Thanks!

- Brie

---

**From:** Sara DeCair [DeCair.Sara@epamail.epa.gov]
**Sent:** Friday, June 29, 2012 2:39 PM
**To:** Brielle Welzer
**Subject:** Dang - one more

I'm going to keep finding these things (and people keep sending me comments, now is SO not the time to be sending me comments!!) but this is an easy one:

On p. 33, change the reference to Table F-6 in the 1992 PAG Manual (which doesn't exist, oops) to Table E-6.

Thanks!**Draft 2012 PAG Manual 6-1-2012 v3.doc** **Draft 2012 PAG Manual 6-1-2012 v3.pdf**

**Subject:** pag manual
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**From:** CN=Alan Perrin/OU=DC/O=USEPA/C=US
**Submit Time:** 7/18/2012 11:53:39

**Draft 2012 PAG Manual 7-18-2012.pdf** Draft 2012 PAG Manual 7-18-2012.pdf**Draft 2012 PAG Manual 7-18-2012.docx** Draft 2012 PAG Manual 7-18-2012.docx

The Word file will probably print better than the pdf.

~~~~~~~~~~~~~~
Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376
~~~~~~~~~~~~~~

**Submit Time:** 7/13/2012 16:04:53
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA CN=Daniel Schultheisz/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Tony Nesky/OU=DC/O=USEPA/C=US@EPA
**Subject:** PAG Manual - see if these edits are okay

Tony made some great edits and was careful to highlight any places where adherence to the approved versions may have to take priority over improvements. See what you think of my responses, and if you have any suggestions, let's get them to Tony by Monday. We're good to meet with OMB on Thursday with or without these edits, but I'd like to get your input before proceeding further with document production.

Thank you, Tony!!

S.

PAG Manual-7-11-2012-TONYCHANGES.docx PAG Manual-7-11-2012-TONYCHANGES.docx

**From:** Bani Bhattacharya <bbhattacharya@endyna.com>
**To:** Sara DeCair/DC/USEPA/US@EPA
**Subject:** PAGs comments spreadsheet EnDyna 8Oct2012
**Submit Time:** 10/8/2012 20:54:00

Hi Sara,

Attached is the spreadsheet for your kind perusal. I have marked things in red if the information was missing or needed some clarification. Also, I've placed most of the comments from the summary document into relevant sections within the spreadsheet. A few were generic or general comments pertaining to a chapter than a section within a chapter.

Regards,
Bani Bhattacharya

EnDyna, Inc.
7926 Jones Branch Drive
Suite 620
McLean, VA 22102
Tel: 703 848 8842 Ext: 124
Fax: 703 848 9001

www.endyna.comPAGS Comments 8Oct2012 EnDyna.xlsx

**Subject:** Fw: FOR REVIEW: Draft Federal Register Notice and Radiation Guidance
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**From:** CN=Alan Perrin/OU=DC/O=USEPA/C=US
**Submit Time:** 5/29/2012 18:31:40

~~~~~~~~~~~~~
Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376

----- Forwarded by Alan Perrin/DC/USEPA/US on 05/29/2012 06:31 PM -----

From: Susan Stahle/DC/USEPA/US
To: Alan Perrin/DC/USEPA/US@EPA
Cc: Brian Doster/DC/USEPA/US@EPA
Date: 05/29/2012 05:00 PM
Subject: Fw: FOR REVIEW: Draft Federal Register Notice and Radiation Guidance

---

Hi Alan --

**Ex. 5 - Attorney Client -- Deliberative Process**

Please make the following correcting edits you will see on page 3 of the attached document. If the same changes were made in the 2012 PAG Manual itself, please make these changes there as well.

Draft PAGs FR 5-22-2012 (ss 052912).doc Draft PAGs FR 5-22-2012 (ss 052912).doc

Susan Stahle
Air and Radiation Law Office (Rm 7502B)
Office of General Counsel
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW (ARN: MC 2344A)
Washington, D.C. 20460
ph: (202) 564-1272
fax: (202) 564-5603
stahle.susan@epa.gov
----- Forwarded by Susan Stahle/DC/USEPA/US on 05/29/2012 04:54 PM -----

From: Debbie Dietrich/DC/USEPA/US
To: Lisa Feldt/DC/USEPA/US@EPA, Larry Stanton/DC/USEPA/US@EPA, Dana Tulis/DC/USEPA/US@EPA, James Woolford/DC/USEPA/US@EPA, Barnes Johnson/DC/USEPA/US@EPA, Pamela Barr/DC/USEPA/US@EPA, Eric Burneson/DC/USEPA/US@EPA, David Travers/DC/USEPA/US@EPA, John Michaud/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, Mike Flynn/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA
Cc: Juan Reyes/DC/USEPA/US@EPA, Lisa Nanko/DC/USEPA/US@EPA, Cayce Parrish/DC/USEPA/US@EPA
Date: 05/23/2012 02:26 PM
Subject: FOR REVIEW: Draft Federal Register Notice and Radiation Guidance

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~~~~~~~~~~~~~

Intra-agency colleagues and PAGs reviewers,

This is in follow-up to Alan Perrin's email of March 28, 2012 and my more recent message of May 17, 2012. Attached for your review is a proposed federal register notice and radiation guidance that has been drafted as a result of Principal Level Exercise (PLE) 3-10.

Since your last review of the PAG Manual and FR Notice in early April (Alan's email), an agreement was reached between EPA, DHS and the White House to incorporate the DHS 2008 RDD/IND Planning Guide into the PAG Manual, in effect, merging the Deputies' PLE Cleanup paper and the RDD/IND Late Phase guidance. Attached are draft versions of the slightly expanded combined Manual and the FR Notice for your review and concurrence.

Since the language in the PAGs and the Deputies' PLE papers has already been approved at a high level, very few changes have been made. Since the last review: most comments received were incorporated; some text was updated to provide bridging language between the Deputies' cleanup paper and the 2008 RDD/IND Late Phase guidance. It is good news that, with this merged document, users will end up with a single guidance for radiological incidents once the PAG Manual is finalized.

I apologize for the current review time frame! EPA is being asked to meet some very demanding external deadlines, unfortunately that means our internal deadlines must be equally demanding. **Please provide your office's consolidated concurrence/comments via email not later than 4:00 pm on Tuesday, May 29, to Alan Perrin with a cc to me**. We are meeting with the Deputy Administrator at 1 pm the following day (5/30) to discuss any remaining issues. Let me know if you have any concerns, and thank you for providing your input on such a short schedule.

Draft PAGs FR 5-22-2012.doc

Draft PAGs FR 5-22-2012.docDraft 2012

PAG Manual 5-22-2012.doc

Draft 2012 PAG Manual 5-22-2012.doc

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Debbie Dietrich
Associate Administrator for Homeland Security
USEPA
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Ph 202-564-6978
Fax 202-501-0026

**Submit Time:** 3/14/2012 10:29:40
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** siddhanti@endyna.com twillis@endyna.com
**Cc:**
**Subject:** old and new PAGs parts to smash together

Smita and Tyler --

Hopefully this numeric naming convention will make the order clear. I will walk around today with a paper copy of the FR Notice and Overview so I can figure out what the main changes are. Otherwise, we're advised not to change any language! (We'll see how clunky that looks soon, won't we?)

Let me know at any time if you have a question! Many thanks,

Sara
202-343-9108

**1 - draft PAGs FR Notice 6-27-2011.doc** 1 - draft PAGs FR Notice 6-27-2011.doc**2 - draft PAGs Overview Early Intermediate 6-27-2011.doc** **2011.doc** 2 - draft PAGs Overview Early Intermediate 6-27-2011.doc**3 - Re-Entry_Matrix_07212011.docx** 3 - Re-Entry_Matrix_07212011.docx**4 - EPA Revised Draft-Late Phase 3-6-12.docx** 4 - EPA Revised Draft-Late Phase 3-6-12.docx**ATTX6G6N.docx** 5 - Waste Disposal 7-22-2011final.docx

**Submit Time:** 11/21/2012 10:26:59
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** *new* draft note from Mike to OW, OGC and OSWER

Alan -- per Mike's notes to his colleagues on Oct. 18 and then on Oct. 31, here are a few more clarifying words to remind people where we've been, and where we're going.... Copies of Mike's previous emails are on your chair. And here are the addressees if that is helpful for Mike. I traded Phil for Pam and added Lisa Christ.

Thx!

To: Debbie Dietrich/DC/USEPA/US, Dana Tulis/DC/USEPA/US, Barnes Johnson/DC/USEPA/US, Lorie Schmidt/DC/USEPA/US, John Michaud/DC/USEPA/US, Phil Oshida/DC/USEPA/US,
Cc: Jonathan Edwards/DC/USEPA/US, Alan Perrin/DC/USEPA/US, Lee Veal/DC/USEPA/US, DeCair.Sara@epa.gov, Peter Grevatt/DC/USEPA/US, Susan Stahle/DC/USEPA/US, David Travers/DC/USEPA/US, Lisa Christ/DC/USEPA/US,

S.

From: Mike Flynn/DC/USEPA/US

To: Debbie Dietrich/DC/USEPA/US@EPA, Dana Tulis/DC/USEPA/US@EPA, Barnes Johnson/DC/USEPA/US@EPA, Pamela Barr/DC/USEPA/US@EPA, Lorie Schmidt/DC/USEPA/US@EPA, John Michaud/DC/USEPA/US@EPA

Cc: Jonathan Edwards/DC/USEPA/US@EPA, Alan Perrin/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA, Sara DeCair/DC/USEPA/US@EPA, Peter Grevatt/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, David Travers/DC/USEPA/US@EPA

Colleagues;

The attached redline version of the PAG Manual reflects our meetings in mid-October ending with the Oct. 18 version. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process In yellow highlights in the attached document are the very few minor edits we've done since then, per our conversation with OMB. We're asking that you take a quick look at those highlighted changes to make sure they are okay with your programs.

As always, this draft is close-hold and should not be shared broadly inside the Agency or outside the Agency at all. Thanks for getting back to us as soon as you can, or at the latest by 4 pm on Tuesday, Nov. 27th so we can prepare for conversations with Bob, Gina, and OMB with our passback.

Thank you!

Mike

**PAG Manual with OMB cmts incorp NEW HIGHLIGHTED 11-21-2012.docx** PAG Manual with OMB cmts incorp NEW HIGHLIGHTED 11-21-2012.docx

**Subject:** Fw: OGWDW comments Re: FOR REVIEW: Draft Federal Register Notice and Radiation Guidance
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**From:** CN=Alan Perrin/OU=DC/O=USEPA/C=US
**Submit Time:** 5/29/2012 18:31:16

~~~~~~~~~~~~~~
Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376

----- Forwarded by Alan Perrin/DC/USEPA/US on 05/29/2012 06:31 PM -----

From: Pamela Barr/DC/USEPA/US
To: Debbie Dietrich/DC/USEPA/US@EPA, Alan Perrin/DC/USEPA/US@EPA
Cc: Barnes Johnson/DC/USEPA/US@EPA, Cayce Parrish/DC/USEPA/US@EPA, Dana Tulis/DC/USEPA/US@EPA, David Travers/DC/USEPA/US@EPA, Eric Burneson/DC/USEPA/US@EPA, James Woolford/DC/USEPA/US@EPA, John Michaud/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, Juan Reyes/DC/USEPA/US@EPA, Larry Stanton/DC/USEPA/US@EPA, Lisa Feldt/DC/USEPA/US@EPA, Lisa Nanko/DC/USEPA/US@EPA, Mike Flynn/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA
Date: 05/29/2012 06:15 PM
Subject: OGWDW comments Re: FOR REVIEW: Draft Federal Register Notice and Radiation Guidance

---

Alan,
Thank you for the opportunity for a final review of the draft PAG Guidance and FRN soliciting public comment on the guidance.

I have attached the FRN with our proposed language. **Ex. 5 - Deliberative Process**

# Ex. 5 - Deliberative Process

Draft PAGs FR 5-22-2012_OGWDW.docx Draft PAGs
FR 5-22-2012_OGWDW.docx

We have one other minor comment on the PAG Guidance. On page 35, section 3.5.1 Monitoring & Characterization of Contaminants, the 1st sentence shoudl read ...maximum ~~contaminate~~ contaminant level (MCL).

Pamela S. Barr
Acting Director
Office of Groundwater and Drinking Water
Room 2331A EPA East
U.S. Environmental Protection Agency
1200 Pennsylvania Ave.
Washington, DC 20460
~~~~~~~~~~~~~~

phone: 564-3752 fax: 564-3758
barr.pamela@epa.gov

Debbie Dietrich---05/23/2012 02:26:11 PM---Intra-agency colleagues and PAGs reviewers, This is in follow-up to Alan Perrin's email of March 28,

From: Debbie Dietrich/DC/USEPA/US
To: Lisa Feldt/DC/USEPA/US@EPA, Larry Stanton/DC/USEPA/US@EPA, Dana Tulis/DC/USEPA/US@EPA, James Woolford/DC/USEPA/US@EPA, Barnes Johnson/DC/USEPA/US@EPA, Pamela Barr/DC/USEPA/US@EPA, Eric Burneson/DC/USEPA/US@EPA, David Travers/DC/USEPA/US@EPA, John Michaud/DC/USEPA/US@EPA, Susan Stahle/DC/USEPA/US@EPA, Mike Flynn/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA
Cc: Juan Reyes/DC/USEPA/US@EPA, Lisa Nanko/DC/USEPA/US@EPA, Cayce Parrish/DC/USEPA/US@EPA
Date: 05/23/2012 02:26 PM
Subject: FOR REVIEW: Draft Federal Register Notice and Radiation Guidance

---

Intra-agency colleagues and PAGs reviewers,

This is in follow-up to Alan Perrin's email of March 28, 2012 and my more recent message of May 17, 2012. Attached for your review is a proposed federal register notice and radiation guidance that has been drafted as a result of Principal Level Exercise (PLE) 3-10.

Since your last review of the PAG Manual and FR Notice in early April (Alan's email), an agreement was reached between EPA, DHS and the White House to incorporate the DHS 2008 RDD/IND Planning Guide into the PAG Manual, in effect, merging the Deputies' PLE Cleanup paper and the RDD/IND Late Phase guidance. Attached are draft versions of the slightly expanded combined Manual and the FR Notice for your review and concurrence.

Since the language in the PAGs and the Deputies' PLE papers has already been approved at a high level, very few changes have been made. Since the last review: most comments received were incorporated; some text was updated to provide bridging language between the Deputies' cleanup paper and the 2008 RDD/IND Late Phase guidance. It is good news that, with this merged document, users will end up with a single guidance for radiological incidents once the PAG Manual is finalized.

I apologize for the current review time frame! EPA is being asked to meet some very demanding external deadlines, unfortunately that means our internal deadlines must be equally demanding. **Please provide your office's consolidated concurrence/comments via email not later than 4:00 pm on Tuesday, May 29, to Alan Perrin with a cc to me**. We are meeting with the Deputy Administrator at 1 pm the following day (5/30) to discuss any remaining issues. Let me know if you have any concerns, and thank you for providing your input on such a short schedule.

[attachment "Draft PAGs FR 5-22-2012.doc" deleted by Pamela Barr/DC/USEPA/US] [attachment "Draft 2012 PAG Manual 5-22-2012.doc" deleted by Pamela Barr/DC/USEPA/US]

---

Debbie Dietrich
Associate Administrator for Homeland Security
USEPA
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Ph 202-564-6978
Fax 202-501-0026

**Subject:** Re: Link to request Turbo FRMAC
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=William Sacks/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Submit Time:** 6/19/2012 08:47:34

Cool -- thank you! So what's next?

-----William Sacks/DC/USEPA/US wrote: -----
To: Sara DeCair/DC/USEPA/US@EPA
From: William Sacks/DC/USEPA/US
Date: 06/19/2012 08:36AM
Subject: Re: Link to request Turbo FRMAC

This version includes the link for Turbo FRMAC and some changes that Jess made to the '2 rem first year' question.

---

# Ex. 5 - Deliberative Process

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*(See attached file: FAQs All November 2011 6_19_2012.docx)*

---

William D. Sacks
U.S. Environmental Protection Agency
Radiation Protection Division
202.343.9707

[attachment "FAQs All November 2011 6_19_2012.docx" removed by Sara DeCair/DC/USEPA/US]

**From:** Melody Geer <mgeer@trininc.com>
**To:** Sara DeCair/DC/USEPA/US@EPA Rafaela Ferguson/DC/USEPA/US@EPA Lowell Ralston/DC/USEPA/US@EPA Jennifer Mosser/DC/USEPA/US@EPA Harriet Croke/R5/USEPA/US@EPA Jack Barnette/R5/USEPA/US@EPA Shelly Rosenblum/R9/USEPA/US@EPA Suzanne Beimer/LV/USEPA/US@EPA
**Subject:** first pass at splitting TF from everything else
**Submit Time:** 5/31/2012 18:37:03

Attached are two "notes" - one for the TF presentation and one for the "wrap-up" presentation. Comments are appreciated.

Melody

Melody Geer

Trinity Engineering Associates

mgeer@trininc.com<mailto:mgeer@trininc.com>

724-473-0650

980-241-2724 (cell)

Notes for how it all fits together presentation 053112.docx Notes for TurboFRMAC2011 presentation 053112.docx

I can't force myself to start on your new iteration just yet ...

Meanwhile, a few comments/edits on the last iteration:

**pags_adp-cmmts_5-21.doc** pags_adp-cmmts_5-21.doc

~~~~~~~~~~~~~
Alan Perrin, Deputy Director
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office (202) 343-9775 | bb (202) 279-0376

Sara DeCair---05/21/2012 05:12:22 PM---From: Sara DeCair/DC/USEPA/US To: Alan Perrin/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA

From: Sara DeCair/DC/USEPA/US
To: Alan Perrin/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA
Date: 05/21/2012 05:12 PM
Subject: PAGs - cleaner version, needs better Ch. 4 Key Points

---

In case you just finished reviewing this morning's version, here's another one ;-)

-----Forwarded by Sara DeCair/DC/USEPA/US on 05/21/2012 05:11PM -----
To: Lee Veal/DC/USEPA/US@EPA, Daniel Schultheisz/DC/USEPA/US@EPA, Tony Nesky/DC/USEPA/US@EPA
From: Sara DeCair/DC/USEPA/US
Date: 05/21/2012 05:07PM
Subject: PAGs - cleaner version, needs better Ch. 4 Key Points

*(See attached file: Draft Planning Guidance and PAGs 5-21-2012.doc)*

Lee, Dan, and Tony,

I threw together a few Key Points for the new and improved Chapter 4 (it's even a respectable length for a Chapter now) but really could use your help on making these Key Points a little smarter. Any ideas?
Thank you!

S.

[attachment "Draft Planning Guidance and PAGs 5-21-2012.doc" deleted by Alan Perrin/DC/USEPA/US]
~~~~~~~~~~~~~

Current draft with a couple fixes (since yesterday) -- I think this may be close to ready for the table at OMB. Please let me know if you see anything that needs to be modified prior to that meeting. Thx, Alan

Draft 2012 PAG Manual 7-11-2012.pdf Draft 2012 PAG Manual 7-11-2012.pdfDraft 2012 PAG Manual 7-11-2012.docx Draft 2012 PAG Manual 7-11-2012.docx

~~~~~~~~~~~~~

Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376

Sara DeCair---07/10/2012 03:11:21 PM---Alan, This is the same PAGs Manual version you sent to me, with a file name that helps me keep track

From: Sara DeCair/DC/USEPA/US
To: Alan Perrin/DC/USEPA/US@EPA, Lee Veal/DC/USEPA/US@EPA
Cc: Jessica Wieder/DC/USEPA/US@EPA
Date: 07/10/2012 03:11 PM
Subject: PAGs and FR for pending OMB meeting, doc design to start

---

Alan,

This is the same PAGs Manual version you sent to me, with a file name that helps me keep track of it on my computer. It has a few good edits in addition to the DHS deletion and NRC additional evacuation paragraphs. The FR Notice is unchanged from a couple weeks ago and Ray Lee says it looks good. So these would be helpful for an OMB meeting that hopefully will be scheduled this week!

Meanwhile, I'm asking Glenna's group to work with Information Experts on document design and readability improvements per EPA requirements so we'll be ready to roll.

Thanks,

S.

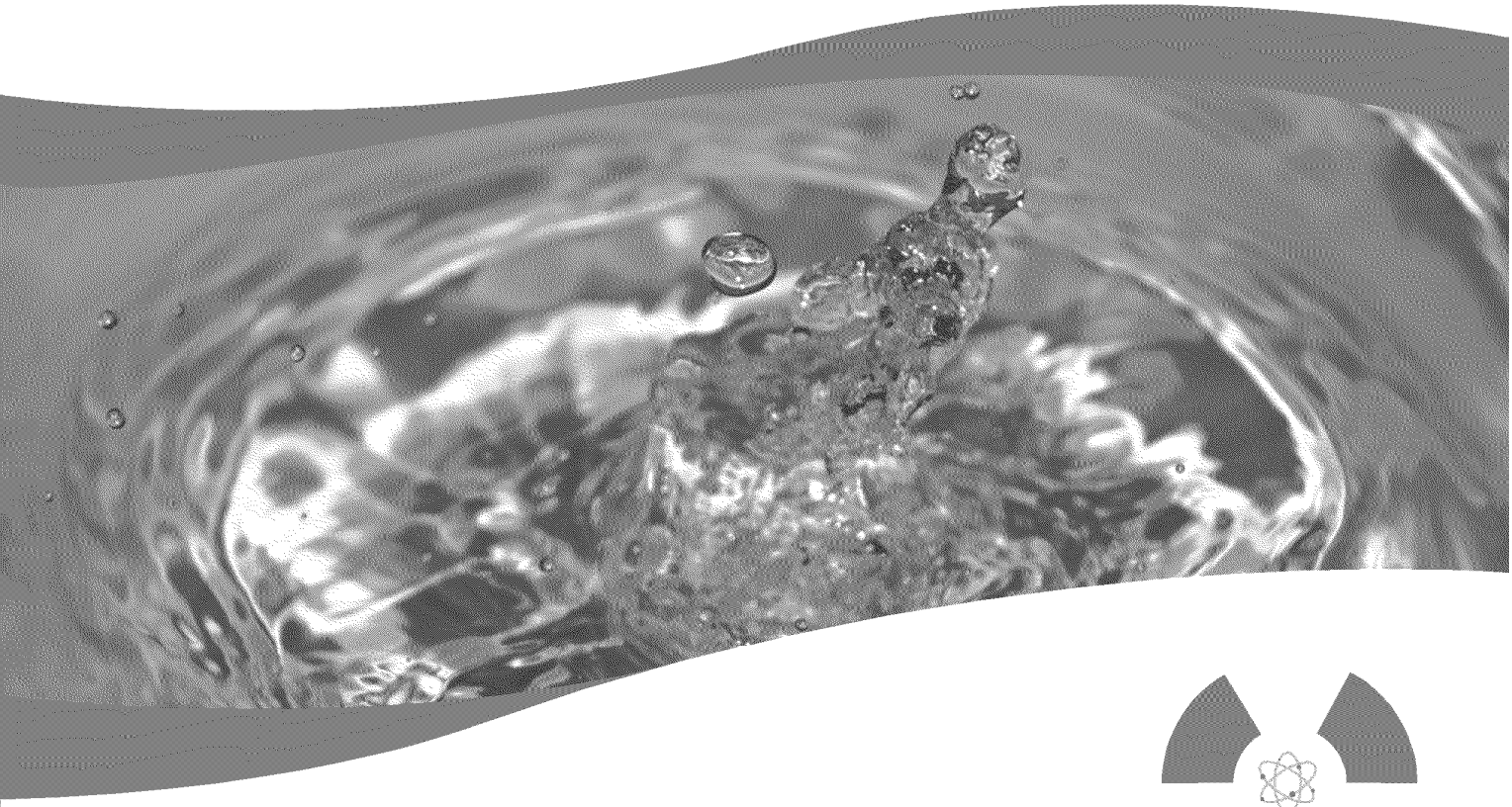
[attachment "Draft 2012 PAG Manual 7-10-2012.docx" deleted by Alan Perrin/DC/USEPA/US]
[attachment "Draft PAGs FR 6-28-2012.doc" deleted by Alan Perrin/DC/USEPA/US]
~~~~~~~~~~~~~

United States
Environmental Protection
Agency

Office of Radiation and Indoor Air
National Air and Radiation
Environmental Laboratory

EPA 402-R-07-007
January 2008
www.epa.gov/narel

# Radiological Laboratory Sample Analysis Guide for Incidents of National Significance – Radionuclides in Water



EPA 402-R-07-007
www.epa.gov
January 2008
Revision 0

# Radiological Laboratory Sample Analysis Guide for Incidents of National Significance — Radionuclides in Water

U.S. Environmental Protection Agency
Office of Air and Radiation
Office of Radiation and Indoor Air
National Air and Radiation Environmental Laboratory
Montgomery, AL 36115

Recycled/Recyclable
Printed with Soy/Canola Ink on paper that contains at least 50% recycled fiber

# Preface

The document describes the likely analytical decision paths that would be required by personnel at a radioanalytical laboratory following a radiological or nuclear incident, such as that caused by a terrorist attack. EPA's responsibilities, as outlined in the *National Response Plan Nuclear/ Radiological Incident Annex*, include response and recovery actions to detect and identify radioactive substances and to coordinate federal radiological monitoring and assessment activities. This document was developed to provide guidance to those radioanalytical laboratories that will support EPA's response and recovery actions following a radiological or nuclear Incident of National Significance (INS).

The need to ensure adequate laboratory infrastructure to support response and recovery actions following an INS has been recognized by a number of federal agencies. The Integrated Consortium of Laboratory Networks (ICLN), created through a memorandum of understanding in 2005 by ten federal agencies, consists of existing and emerging laboratory networks across the Federal Government. ICLN is designed to provide a national infrastructure with a coordinated and operational system of laboratory networks that provide timely, high quality, and interpretable results for early detection and effective consequence management of acts of terrorism and other events requiring an integrated laboratory response. It also designates responsible federal agencies (RFAs) to provide laboratory support across response phases for chemical, biological, and radiological agents. To meet its RFA responsibilities for environmental and drinking water samples, EPA is developing the Environmental Laboratory Response Network (eLRN). As an RFA for radiological agents, eLRN will be responsible for monitoring, surveillance, and remediation, and will share responsibility for incident response with the Department of Energy. As part of eLRN, EPA's Office of Radiation and Indoor Air is leading an initiative to ensure that sufficient environmental radioanalytical capability and competency exists across a core set of laboratories to carry out EPA's designated RFA responsibilities.

Three radioanalytical scenarios, responding to two different public health questions, address the immediate need to determine the concentration of known or unknown radionuclides in water. The scenarios are based upon the radionuclides that probably would be released by a radiological dispersion device or those that may be released intentionally into the drinking water supply. The first analytical scenario assesses whether water samples pose immediate threats to human health and warrant implementation of protective measures specific to radiation concerns. The second assesses whether specific water sources (samples) are potable based on current national drinking water standards. The third situation assumes that the radioactive contaminants are known, and a shortened version of the first two analytical scenarios is used to help expedite the analysis process. Use of established analytical schemes will increase the laboratory efficiency so that large numbers of samples can be analyzed in a timely manner. The use of the analytical schemes and the associated measurement quality objectives also will ensure that the radioanalytical data produced will be of known quality appropriate for the intended incident response decisions.

As with any technical endeavor, actual radioanalytical projects may require particular methods or techniques to meet specific measurement quality objectives. The document cannot address a complete catalog of analytical methodologies or potential radionuclides. Radiochemical methods to support response and recovery actions following a radiological or nuclear INS can be found in



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*Standardized Analytical Methods for Environmental Restoration following Homeland Security Events, Revision 3* (EPA 600-R-07-015).

Detailed guidance on recommended radioanalytical practices may be found in current editions of the *Multi-Agency Radiological Laboratory Analytical Protocols Manual* (MARLAP) and the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM), both referenced in this document. EPA is developing companion documents for air and soil samples. Familiarity with Chapters 2 and 3 of MARLAP will be of significant benefit to the users of this guide.

Comments on this document, or suggestions for future editions, should be addressed to:

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Office of Radiation and Indoor Air
National Air and Radiation Environmental Laboratory
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This report was prepared for the National Air and Radiation Environmental Laboratory of the Office of Radiation and Indoor Air, United States Environmental Protection Agency. It was prepared by Environmental Management Support, Inc., of Silver Spring, Maryland, under contract 68-W-03-038, work assignments 21 and 35, managed by David Garman. Mention of trade names or specific applications does not imply endorsement or acceptance by EPA.



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## Acknowledgments

This manual was developed by the National Air and Radiation Environmental Laboratory (NAREL) of EPA's Office of Radiation and Indoor Air (ORIA).

Dr. John Griggs served as project lead for this document. Several individuals provided valuable support and input to this document throughout its development. Special acknowledgment and appreciation are extended to Dr. Keith McCroan, ORIA/NAREL; Ms. Lindsey Bender, ORIA/ Radiation Protection Division (RPD); Dr. Lowell Ralston and Mr. Edward Tupin, CHP, both of ORIA/RPD; Ms. Schatzi Fitz-James, Office of Emergency Management, Homeland Security Laboratory Response Center; and Mr. David Garman, ORIA/NAREL. Numerous other individuals both inside and outside of EPA provided peer review of this document, and their suggestions contributed greatly to the quality and consistency of the final document. Technical support was provided by Dr. N. Jay Bassin, Dr. Anna Berne, Dr. Carl V. Gogolak, Dr. Robert Litman, Dr. David McCurdy, and Mr. Robert Shannon of Environmental Management Support, Inc.



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# Acronyms, Abbreviations, Units, and Symbols

*(Excluding chemical symbols and formulas)*

" ..... alpha particle
" ..... probability of a Type I decision error
AAL ..... analytical action level
ADL ..... analytical decision level
AS ..... alpha spectrometry
$ ..... beta particle
$ ..... probability of a Type II decision error
Bq ..... becquerel (dps)
CERCLA .... Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("Superfund")
CFR ..... *Code of Federal Regulations*
cm ..... centimeter
cpm ..... counts per minute
d ..... day
DL ..... discrimination limit
DOE ..... United States Department of Energy
DP ..... decay product(s)
dpm ..... disintegrations per minute
dps ..... disintegrations per second
DQO ..... data quality objective
DRP ..... discrete radioactive particle
DWC ..... derived water concentration
$e^-$ ..... electron
$E_{\$max}$ ..... maximum energy of the beta-particle emission
EDD ..... electronic data deliverable
EPA ..... United States Environmental Protection Agency
( ..... gamma ray
g ..... gram
Ge ..... germanium semiconductor
GM ..... Geiger-Muller detector
GP ..... gas proportional
GPC ..... gas proportional counting/counter
GS ..... gamma spectrometry
Gy ..... gray
h ..... hour
$H_0$ ..... null hypothesis
$H_1$ ..... alternative hypothesis
HPGe ..... high-purity germanium [detector]
IC ..... Incident Commander
ICC ..... Incident Command Center
IND ..... improvised nuclear device (i.e., nuclear bomb)
INS ..... incident information significance
keV ..... thousand electron volts
L ..... liter



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LBGR ..... lower bound of the gray region
LEPD ..... low energy photon detector
LS ..... liquid scintillation
LSC ..... liquid scintillation counter/counting
MARLAP .... *Multi-Agency Radiological Laboratory Analytical Protocols Manual*
MARSSIM ... *Multi-Agency Radiation Survey and Site Investigation Manual*
MCL ..... maximum contaminant level
MeV ..... million electron volts
mg ..... milligram ($10^{-3}$ g)
mL ..... milliliter ($10^{-3}$ L)
mrem ..... millirem ($10^{-3}$ rem)
µg ..... microgram ($10^{-6}$ g)
µR ..... microroentgen
MDC ..... minimum detectable concentration
min ..... minute
MQO ..... measurement quality objective
NaI(Tl) ..... thallium-activated sodium iodide detector
$n_{MR}$ ..... relative required method uncertainty
PAG ..... protective action guide
pCi ..... picocurie ($10^{-12}$ Ci)
QA ..... quality assurance
QC ..... quality control
R ..... roentgen
rad ..... radiation absorbed dose
RDD ..... radiological dispersion device (i.e., "dirty bomb")
RDL ..... required detection limit
REGe ..... reverse electrode germanium [detector]
rem ..... roentgen equivalent man
s ..... second
SDWA ..... Safe Drinking Water Act
SOP ..... standard operating procedure
Sv ..... sievert
TEDA ..... triethylenediamine
TEDE ..... total effective dose equivalent
UBGR ..... upper bound of the gray region
$u_{MR}$ ..... required method uncertainty
y ..... year



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## Radiometric and General Unit Conversions

| To Convert | To | Multiply by | To Convert | To | Multiply by |
|---|---|---|---|---|---|
| years (y) | seconds (s)<br>minutes (min)<br>hours (h)<br>days (d) | $3.16 \times 10^{7}$<br>$5.26 \times 10^{5}$<br>$8.77 \times 10^{3}$<br>$3.65 \times 10^{2}$ | s<br>min<br>h<br>d | y | $3.17 \times 10^{-8}$<br>$1.90 \times 10^{-6}$<br>$1.14 \times 10^{-4}$<br>$2.74 \times 10^{-3}$ |
| disintegrations per second (dps) | becquerels (Bq) | 1 | Bq | dps | 1 |
| Bq<br>Bq/kg<br>Bq/m$^3$<br>Bq/m$^3$ | picocuries (pCi)<br>pCi/g<br>pCi/L<br>Bq/L | 27.0<br>$2.70 \times 10^{-2}$<br>$2.70 \times 10^{-2}$<br>$10^{3}$ | pCi<br>pCi/g<br>pCi/L<br>Bq/L | Bq<br>Bq/kg<br>Bq/m$^3$<br>Bq/m$^3$ | $3.70 \times 10^{-2}$<br>37.0<br>37.0<br>$10^{-3}$ |
| microcuries per milliliter (: Ci/mL) | pCi/L | $10^{9}$ | pCi/L | : Ci/mL | $10^{-9}$ |
| disintegrations per minute (dpm) | : Ci<br>pCi | $4.50 \times 10^{-7}$<br>$4.50 \times 10^{-1}$ | pCi | dpm | 2.22 |
| gallons (gal) | liters (L) | 3.78 | L | gal | 0.264 |
| gray (Gy) | rad | $10^{2}$ | rad | Gy | $10^{-2}$ |
| roentgen equivalent man (rem) | sievert (Sv) | $10^{-2}$ | Sv | rem | $10^{2}$ |

Note: Traditional units are used throughout this document instead of SI units. Protective Action Guides (PAGs) and their derived concentrations appear in official documents in the traditional units and are in common usage. Conversion to SI units will be aided by the unit conversions in this table. Conversions are exact to three significant figures, consistent with their intended application.



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# I. INTRODUCTION

This guide deals with the analysis of water samples that may have been contaminated as the result of a radiological or nuclear event, such as a radiological dispersion device (RDD), improvised nuclear device (IND), or an intentional release of radioactive materials into a drinking water supply. In the event of a major incident that releases radioactive materials to the environment, EPA will turn to selected radioanalytical laboratories to support its response and recovery activities. In order to expedite sample analyses and data feedback, the laboratories will need guidance on EPA's expectations.

A response to a radiation release to the environment likely will occur in three phases: "early," "intermediate," and "recovery." Each phase of an incident response will require different and distinct radioanalytical resources to address the different consequences, priorities, and requirements of each phase. Some of the more important radioanalytical laboratory resources germane to incident response and recovery consist of radionuclide identification and quantification capability, sample load capacity, sample processing turnaround time, quality of analytical data, and data transfer capability.

The early phase begins at the initial event and lasts for three or four days, during which data are scarce, and pre-planned dispersion models are used. During this phase, responders are primarily concerned with evacuating people, sheltering them in place, or restricting use of specific water supplies. The purpose of the actions and evaluations taken during the early phase is to minimize exposure and to prevent acute health effects. The Protective Action Guides (PAGs) for radiological emergencies require evacuation of a population if the projected short-term total effective radiation dose equivalent[1] (TEDE) exceeds 5 rem.[2] The nominal trigger for sheltering is 1–5 rem over four days (projected avoided total effective dose). The radioanalytical resource requirements (field or fixed laboratory) for this early phase may vary significantly depending on the timeframe, source term radionuclide and the extent of the contamination.

The intermediate phase begins when no more radiation releases are expected, and the source term contamination radionuclides have been qualitatively identified. In this phase, radionuclide concentrations, extent of the contaminated zone, and matrices (air, water, soil) required for analysis may not be well defined. The radioanalytical resources needed will depend on the radionuclide analytical action levels (AAL) developed for the various media important to human exposure. The AAL may change depending upon the stage of the event, the appropriate PAGs, or risk values. The radionuclide derived water concentrations (DWCs) are based on the PAGs or risk values. For the intermediate phase, PAGs have been established to limit the projected radiation doses for different exposure periods; not to exceed 2-rem TEDE over the first year, 500-mrem TEDE during the second year, or 5 rem over the next 50 years (including the first and second years of the incident). In addition, radionuclide concentration limits for food and water as regulated by the Food and Drug Administration and EPA would be applicable.

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[1]The sum of the effective dose equivalent (for external exposure) and the committed effective dose equivalent (for internal exposure). TEDE is expressed in units of sievert (Sv) or rem.

[2]The common unit for the effective or "equivalent" dose of radiation received by a living organism, equal to the actual dose (in rads) multiplied by a factor representing the danger of the radiation. "rem" stands for "roentgen equivalent man," meaning that it measures the biological effects of ionizing radiation in humans. One rem is equal to 0.01 Sv.



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The final, or "recovery," phase occurs as part of a radiological incident site- or drinking-water-supply remediation effort. During this final phase, when site- or drinking-water-supply characterization and remediation cleanup effectiveness is determined, there is a potential for more extensive radiochemical analyses at the lowest radionuclide concentrations. Applicable drinking water regulations for radionuclides (40 CFR Parts 9, 141, 142) may be used during this phase.

During all phases of an incident response, radioanalytical resources are needed for identifying the radionuclide source terms, quantification of the radionuclides in a variety of media, and the gross radiation screening of samples for prioritization of sample processing or for information related to the general level of contamination. This guide has been developed to provide the Incident Commander (IC) and the laboratories selected to analyze samples during an incident with a logical processing scheme to prioritize sample processing in relation to the radionuclide derived water concentrations corresponding to established PAGs or Maximum Contaminant Levels (MCLs) under the Safe Drinking Water Act.

## A. Objectives

This document is intended to assist those analytical laboratories that will be called upon to provide rapid support to Agency personnel following a radiological or nuclear incident. Because EPA recognizes that in the immediate and intermediate period following such a release, there may not be sufficient time for the Incident Command Center (ICC) to coordinate and communicate complete data quality objectives, measurement quality objectives, and analytical priorities to the laboratory, this document will enable laboratories to proceed with a consistent approach to developing and reporting appropriate data suitable for the anticipated use.

The ultimate purpose of the screening process described in this guide is to ensure that public health is protected. The recommendations in this guide are based upon EPA's PAGs and applicable drinking water regulations for radionuclides (40 CFR Parts 9, 141, and 142, *National Primary Drinking Water Regulations; Radionuclides*; Final Rule. *Federal Register* 65:76707-76753, December 7, 2000).

This document presents a series of three analytical scenarios to aid laboratories in establishing priorities for analyzing samples received during the response to a radiological or nuclear incident. The following table summarizes the relevant responsibilities of the IC and the laboratory manager during such a response.

| Information Provided... | Sample Priority | Method Uncertainty | Miscellaneous MQOs | Reporting (Results and Anomalies) | Analyte Selection | Turnaround Time Compliance | Procedure Selection |
|---|---|---|---|---|---|---|---|
| By: | IC | IC | IC | Lab | IC | Lab | Lab |
| To: | Lab | Lab | Lab | IC | Lab | IC | IC |

One of the key objectives in this document is to explain the responsibilities indicated above in terms of analytical processes. While the IC should provide the necessary information (analytes, matrices, measurement quality objectives) that define the scope of the laboratory's processing requirements and results, the laboratory should ensure that the methods used have been validated and will meet the required measurement quality objectives (MQOs) and the required turnaround time. It is possible that immediately following such an event, especially when MQOs may not have been established or provided, laboratories may receive samples without complete documentation or direction. In such



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cases, laboratories may follow the procedures and examples in this document, and be confident that their results should provide reasonable and consistent results.

This document is not meant to replace any field monitoring decisions on sample prioritization. It is intended as a guide on how to establish priorities for samples received at the laboratory at different times throughout the response, and it should provide to the IC the basis for understanding the nature and limitations of the data received from the laboratories. Familiarity with Chapters 2 and 3 of MARLAP will be of significant benefit to the users of this guide.

## B. Scope and Radiological Scenarios

Radiological incidents can be subdivided into three phases: early (onset of the event to about Day 4), intermediate (about Day 4 to about Day 30), and recovery (beyond about Day 30). This guide concentrates on the time from the end of the early phase, through the intermediate phase and into the recovery phase. During the early phase, analytical priorities need to address the protection of the public and field personnel due to potentially high levels of radioactivity, and to provide for *qualitative* identification of radionuclides. During the intermediate phase, the radionuclides and matrices of concern are known *qualitatively*, and the *quantitative* levels suitable for making decisions based on analytical action levels need to be rapidly determined. The phase of an incident where this document will find its greatest utility is early in the intermediate phase through the end of the recovery phase. Laboratories performing analyses must focus on rapid turnaround of sample results and optimized sample analysis so that the initial qualitative aspects and concentrations related to the appropriate AALs can be determined quickly. During the recovery phase, the screening techniques used for samples will be of less significance because the radionuclides from the event are likely to have been characterized already. This is represented by the lower portions of the flow-charts, which address analyses of specific radionuclides. Potable water supplies will be evaluated against MCLs during this recovery phase.

Three distinct radioanalytical scenarios are presented for water potentially contaminated with radionuclides. The first two assume that the radionuclides are unknown.

- The first scenario is a water supply, surface, or groundwater source highly contaminated with an unknown quantity of yet unidentified radionuclides.

- The second scenario requires that the laboratory determine whether a water source from the affected areas and unknown source term is safe to drink.

- The third scenario, where the radionuclides have been identified, occurs later during the early or intermediate phases, and the laboratory need not waste analytical processing time trying to identify which radionuclides are present. The decision tree focuses on establishing the priority for processing samples based on the gross concentration screening values for the specific radionuclides.

In Radioanalytical Scenario 1, the identity of the radionuclides and potential concentrations are unknown. This is most likely to occur during the early phase of the event. The laboratory's priority is to identify all the radionuclides present and their concentrations in the water sources sampled.

The need to identify safe sources of drinking water (Radioanalytical Scenario 2) will occur later in



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the intermediate phase and into the recovery phase. Once all the radionuclides are identified, Radioanalytical Scenario 3 may be used for either scenario, depending upon the direction of the IC.

These scenarios may be applicable in different phases of the event, although as was previously indicated, Scenario 1 is usually the early phase and Scenario 2 is late-intermediate to recovery phase. Figure 1 depicts how these three radioanalytical scenarios relate to the response team's needs for sample prioritization.

In the third scenario, the radionuclides have been identified. This situation can arise during any of the phases, so while Figure 1 depicts Scenario 3 occurring during the later intermediate phase, Scenario 3 could occur earlier. The laboratory can save time by analyzing samples for its specific radionuclides, after it has had a gross screen to determine sample-processing priority based on its gross concentrations. Formal evaluation of other naturally occurring radionuclides may be necessary when assessing the water as a potential drinking water source.

As introduced earlier, PAGs establish radiation dose limits applicable to different phases of an incident response. The drinking water PAG (expressed as a numerical dose level) indicates a level of exposure at which protective action should be taken to prevent, reduce, or limit a person's radiation dose during a radiological incident. The derived water concentration (DWC) is the *concentration* of a radionuclide in water corresponding to the PAG dose and is used to facilitate the application of PAGs in the radioanalytical laboratory. For example, the concentration of $^{137}$Cs in drinking water corresponding to the 500-mrem PAG is $5.8\times10^4$ pCi/L.

Similarly, radionuclide DWCs corresponding to other specific dose or risk value may be calculated and applied as required. The term "analytical action level" (AAL) will be used as a general term denoting the radionuclide concentration at which action must be taken by incident responders.

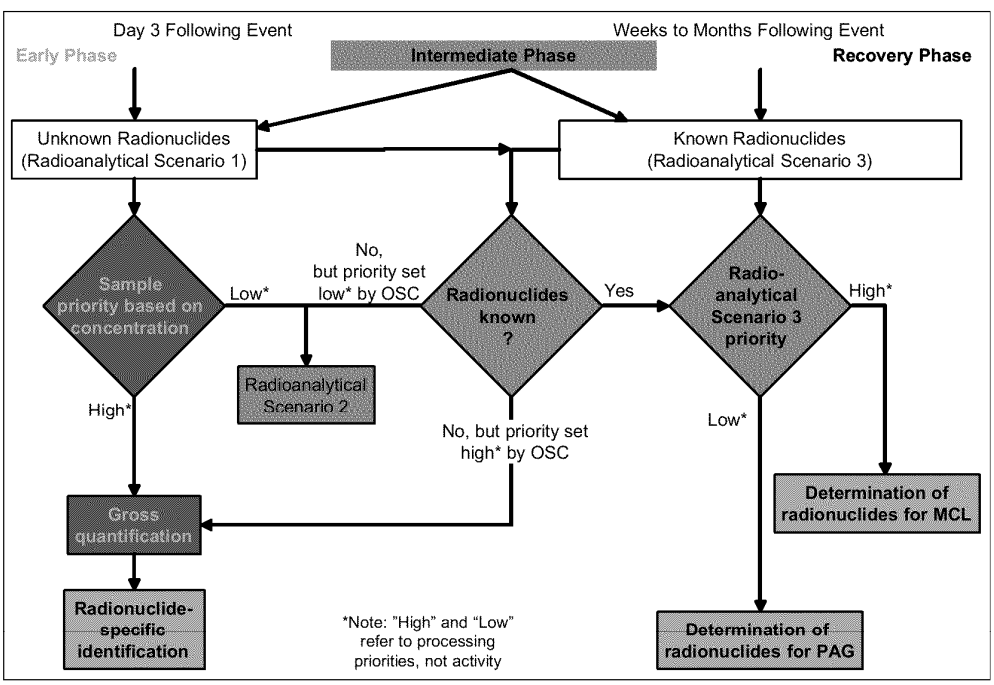


**Figure 1 – Water Sample Scenarios and Response Phases**

Decisions related to the processing and prioritization of specific samples will be made by laboratory personnel at the laboratory by comparing the results of radioanalytical measurements to "analytical decision level" (ADL) concentrations. Whenever the measured analyte concentration equals or exceeds the applicable ADL concentration, it will be concluded that the AAL (PAG or risk factor) has been exceeded.

When applied to prioritizing samples for processing, the ADL concentrations are always less than the corresponding AAL values by an interval calculated to provide statistical confidence when deciding whether the corresponding AAL has or has not been exceeded. The magnitude of this interval corresponds to the maximum uncertainty that would be consistent with acceptable decision error rates established during the data quality objectives (DQO)/MQO process.[1] In this process, the MQO of greatest significance is the required method uncertainty, $u_{MR}$. An example of a dose and its corresponding AAL, ADL, and $u_{MR}$ is shown here for $^{226}$Ra (based on tolerable Type I and Type II error rates; see details in Appendix VI):

| Measurement Type | Dose (mrem) | AAL[2] (pCi/L) | ADL (pCi/L) | $u_{MR}$ (pCi/L) |
|---|---|---|---|---|
| Screening[3] | 100 | 180 | 90 | 54 |
| Radionuclide-specific[4] | 100 | 180 | 130 | 22 |

Laboratories will perform both gross activity measurements and radionuclide-specific measurements during an incident. Because different DQOs and MQOs are applicable to different types of measurements, different $u_{MR}$ and corresponding ADL values are provided for screening and radionuclide-specific analyses. The default values for $u_{MR}$ and corresponding ADL for screening and radionuclide-specific determinations presented in Tables 5A, 5B, 6A, and 6B provide laboratories with a starting point for developing protocols and systems for incident response activities. It is anticipated that in the case of an incident, specific DQOs and MQOs may be developed by Agency personnel to reflect the specific nature and concerns of the incident and provided to the laboratory.

Decisions related to water quality suitable for drinking are based on specific regulatory values based on the Safe Drinking Water Act (SDWA). In this case, specific values for the Maximum Contaminant Level (MCL) and the Required Detection Level (RDL) are applicable for each radionuclide, as well as gross " and $ (see Tables 7A and 7B). If more than one beta- or gamma-emitting radionuclide is present, the "sum of fractions" rule applies. This is best illustrated in the example found in Appendix II, Scenario 1, Step 15. The "sum of fractions" rule does not apply to alpha-emitting radionuclides.

The flow diagrams and corresponding numbered notes and data tables depict the analytical processing suggested for rapid response and consistency. In keeping with concepts of the *Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP) Manual*, this guide does not specify analytical methods. A performance-based approach for the selection of appropriate analytical methods by the laboratory will be used to achieve MQOs specified by this document and the IC.

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[1]Appendix VI provides the derivation and detailed discussion of MQOs, required method uncertainties, and ADLs.

[2]See Appendix VI, Table 10A.

[3]Tables 5A and 5B in Appendix I summarize default ADLs and $u_{MR}$ for screening measurements.

[4]Tables 6A and 6B in Appendix I summarize default ADLs and $u_{MR}$ for radionuclide-specific measurements.



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Radiochemical methods to support response and recovery actions following a radiological or nuclear INS can be found in *Standardized Analytical Methods for Environmental Restoration following Homeland Security Events, Revision 3* (EPA 600-R-07-015).

MQOs are statements of performance objectives or requirements for selected method performance characteristics. Method performance characteristics include the method uncertainty, the method's detection capability, the method's quantification capability, the method's range, the method's specificity, and the method's ruggedness. An example MQO for the method uncertainty at a specified concentration, such as the AAL, could be:

> "A method uncertainty of 50 pCi/L or less is required for $^{241}$Am analysis at the 100-mrem AAL of 400 pCi/L."

The MQOs and any other analytical requirements serve as the basis for the laboratory's selection of a method under a performance-based approach. The laboratory should have performance data to demonstrate the method's ability to achieve the project-specific MQOs. Method validation and continued acceptable method performance assessments are essential to the performance-based approach to method selection.

This document presents a default set of MQOs. Actual MQOs, however, always will depend upon events and may need to be modified by the IC to better address a particular event. However, in order to have an analytical approach in place to address a variety of incident scenarios, the identified decision points in the accompanying flow diagrams refer to the default MQOs—primarily in the form of required method uncertainties—for analyzing the radionuclides of concern. For example, at most decision points in the diagrams where a quantitative value is given, a $u_{MR}$ at that AAL is identified in the notes and the tables. The $u_{MR}$ values are identified in Tables 5A, 5B, 6A, and 6B of Appendix I. Appendix VI describes the methodology used to establish the required method uncertainties identified in these tables. It is important to note that the ADL values specified in Appendix I are less than the PAGs or AALs stated in Appendix VI, Tables 10A and 10B, by the statistical factors identified in Appendix VI. In a few cases, an MQO in the form of a Required Detection Limit is used. These decision points have action limits (MCLs and RDLs) that are specified by regulation (i.e., the Safe Drinking Water Act). These are specifically identified in Tables 7A and 7B in Appendix I. In these instances, the measured value need only be less than the MCL to be within the limits of the regulation, and the sample-specific detection limit need only be less than or equal to the RDL.

Once the appropriate method has been selected, then based on the required method uncertainty or required detection limit, the laboratory can select the proper aliquant size, counting time and other parameters to meet the MQOs in the most efficient manner.

## C. Analytical Response Time

Decisions regarding the extent of contamination in surface and groundwater supplies will need to be made in a timely manner. Approximate times required for laboratory processing of these samples and finalizing the sample results are shown in Appendix V. This identifies the workflow for making qualitative and quantitative measurements of high-activity contaminated water samples (Radioanalytical Scenario 1). In addition, results of the sample radioanalytical measurements needs to be communicated promptly by the laboratory to the IC so that decisions regarding movement of



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population, sheltering, and additional sampling can be made.

## D. Implementation

It may be necessary for laboratories to incorporate key aspects of this document into their standard operating procedures. For example, the gross screening process will require specific standards and response factors for each of the instruments used by the laboratory. This could be a departure from the laboratory's current screening practice because the activity levels, sample geometries, and matrices may be significantly different from what the laboratory normally experiences.

Laboratories should become proficient with these procedures because they could be asked to respond to analytical requests in hours rather than weeks. Thus, laboratory personnel should become familiar with the recommendations and procedures, and laboratories should consider both training and actual "drills" or exercises where analytical scenarios and samples are tested during a controlled scenario. The frequency and depth of these exercises will be at the discretion of the laboratory management.

Laboratory personnel also should be cross-trained in different areas of the incident response functions. This will help to ensure sample analysis continuity throughout the length of the incident response.

Certain values are identified in the tables in this document for presumptive AALs, which may be relied upon in the absence of explicit action levels received from the Incident Command Center, so that the laboratory may begin to process samples promptly. However, these values may change based on the needs of the particular event. MQOs will be stipulated by the IC and should be communicated to the laboratory as early as possible so that analysis can meet project objectives.

## E. References

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF). 2005. *Standard Methods for the Examination of Water and Wastewater*, 21st Edition. Available for purchase from www.standardmethods.org/. (See note following this list for additional information on approved standard methods.)

U.S. Environmental Protection Agency (EPA). 1992. *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents*. Washington, DC. EPA 400-R-92-001, May. Available at: www.epa.gov/rpdweb00/rert/pags.html.

U.S. Environmental Protection Agency (EPA). 1999. *Cancer Risk Coefficients for Environmental Exposure to Radionuclides*. Federal Guidance Report No. 13. EPA 402-R-99-001, September. Available at: www.epa.gov/radiation/assessment/pubs.html.

U.S. Environmental Protection Agency (EPA). 2000. "Radionuclides Notice of Data Availability Technical Support Document." Available at: www.epa.gov/safewater/radionuclides/pdfs/regulation_radionuclides_rulemaking_techsupportdoc.pdf.

U.S. Environmental Protection Agency (EPA). 2000. 40 CFR Parts 9, 141, and 142, *National Primary Drinking Water Regulations; Radionuclides*; Final Rule. *Federal Register* 65:76707-



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76753, December 7. Available at: www.epa.gov/safewater/radionuclides/regulation.html.

U.S. Environmental Protection Agency (EPA). 2001. OSWER Directive 9283.1-14, Appendix B: "Use of Uranium Drinking Water Standards under 40 CFR 141 and 40 CFR 192 as Remediation Goals for Groundwater at CERCLA sites." November 6. Available at: www.epa.gov/superfund/health/contaminants/radiation/pdfs/9283_1_14.pdf.

U.S. Environmental Protection Agency (EPA). 2002. "Final Implementation Guidance for Radionuclides," EPA 816-F-00-002. 40 CFR 141.26(a)(2)(iii). Available at: www.epa.gov/safewater/radionuclides/compliancehelp.html.

U.S. Environmental Protection Agency (EPA). 2003. *Response Protocol Toolbox: Planning for and Responding to Drinking Water Contamination Threats and Incidents*. Interim Final – December. Office of Water. EPA817-D-03-001 through EPA-817-D-03-007. Available at: http://cfpub.epa.gov/safewater/watersecurity/home.cfm?program_id=8#response_toolbox.

U.S. Environmental Protection Agency (EPA). 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA QA/G-4). EPA/240/B-06/001. Office of Environmental Information, Washington, DC. Available at: www.epa.gov/quality/qs-docs/g4-final.pdf.

U.S. Environmental Protection Agency (EPA). 2007a. *Standardized Analytical Methods for Environmental Restoration following Homeland Security Events.* Revision 3. EPA 600-R-07-015. National Homeland Security Research Center, Office of Research and Development. Available at: www.epa.gov/nhsrc/pubs/reportSAM030107.pdf.

U.S. Environmental Protection Agency (EPA). 2007b. *Method Validation Requirements for Qualifying Methods Used by Radioanalytical Laboratories Participating in Incident Response Activities.* Revision 0. Office of Radiation and Indoor Air. Unpublished; undergoing final review.

U.S. Food and Drug Administration (FDA). 1998. "Accidental Radioactive Contamination of Human Food and Animal Feeds: Recommendations for State and Local Agencies." 13 August. Available at: www.fda.gov/cdrh/dmqrp/84.html.

U.S. Department of Health, Education and Welfare (HEW). 1970. *Radiological Health Handbook*, p.123.

U.S. Department of Homeland Security (DHS). 2004. *Nuclear/Radiological Incident Annex to the National Response Plan*. NUC-1. Available at: hps.org/documents/NRPNuclearAnnex.pdf.

*Multi-Agency Radiological Laboratory Analytical Protocols Manual (MARLAP)*. 2004. EPA 402-B-04-001A, July. Volume I, Chapters 3, 6, Volume II. Available at: www.epa.gov/radiation/marlap.

*Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), Revision 1*. 2000. NUREG-1575 Rev 1, EPA 402-R-97-016 Rev1, DOE/EH-0624 Rev1. August. Available at: www.epa.gov/radiation/marssim/.



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Approved *Standard Methods for the Examination of Water and Wastewater*, required for analyses under Radioanalytical Scenario 2, include the following. Analysis of the radionuclides discussed in the following section with procedures from other standard organizations may be acceptable (see 40 CFR 141.25 for alternative methods).

- 7110 Gross Alpha and Gross Beta Radioactivity (Total, Suspended, and Dissolved) (*3 methods*)
- 7120 Gamma-Emitting Radionuclides (*2 methods*)
- 7500-3H Tritium (*2 methods*)
- 7500-Cs Radioactive Cesium (*2 methods*)
- 7500-I Radioactive Iodine (*2 methods*)
- 7500-Ra Radium (*5 methods*)
- 7500-Sr Total Radioactive Strontium and Strontium-90 (*2 methods*)
- 7500-U Uranium (*3 methods*)

## II. RADIONUCLIDES

Table 1 lists some of the radionuclides that are believed to be accessible and possibly could be used in a radiological dispersion device (RDD)—or "dirty bomb"—or used to contaminate a drinking water supply, and which are addressed in this report.

This list is specifically for a RDD event and the major (noninclusive) dose-related radionuclides that might be formed from the detonation of an improvised nuclear device (IND). In the case of a IND, numerous short- and long-lived fission product radionuclides will be present, requiring proper identification and quantification. Several of the radionuclides on the list have progeny that will coexist with the parents. Thus, if $^{228}$Th is found, $^{224}$Ra also would be present (although it is not listed). Several different radionuclides may be present even if only one RDD is used.

**TABLE 1 – Radionuclides of Concern**

| Radionuclides Alpha Emitters | | Radionuclides Beta/Gamma Emitters | |
|---|---|---|---|
| Am-241 | Ra-226 | Ac-227† | Mo-99† |
| Cm-242 | Th-228 | Ce-141* | P-32* |
| Cm-243 | Th-230 | Ce-144‡ | Pd-103* |
| Cm-244 | Th-232 | Co-57* | Pu-241 |
| Np-237 | U-234 | Co-60* | Ra-228 |
| Po-210* | U-235 | Cs-134* | Ru-103† |
| Pu-238 | U-238 | Cs-137§ | Ru-106† |
| Pu-239 | U-Nat | H-3* | Se-75* |
| Pu-240 | | I-125* | Sr-89* |
| | | I-129† | Sr-90† |
| | | I-131* | Tc-99* |
| | | Ir-192* | |

* No radioactive progeny or progeny not analytically useful.
† Radioactive progeny with short half-lives, and the progeny may be used as part of the detection method for the parent.
‡ Radioactive progeny not used for quantification, only screening.
§ Radioactive progeny used for quantification only, not screening.



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## III. DISCUSSION

In order to illustrate the typical decisions and actions to be taken by a laboratory for each scenario, examples of the three scenarios using theoretical samples and measurement results are provided in Appendices II, III, and IV. These examples represent only three of many different possible permutations, however, and should not be construed as limiting. Each example is keyed back to the steps in its respective diagram and notes.

These scenarios assume that the time period from taking the sample to the actual beginning of the analysis by the laboratory will be short (under one day). Therefore, samples received by the laboratory will not be preserved, nor will they have been filtered. Sample filtration generally should not be performed until the extent of contamination and the radionuclide identity(ies) are known. The final decision on this must be communicated to the laboratory by the IC based on the project MQOs. Should it be necessary to delay analysis for any sample for more than two days, the sample should be preserved according to the analysis protocols to be determined.

For the three scenarios discussed in this guide, it is assumed that field personnel have performed some type of radiation detection survey of the samples prior to sending them to the laboratory. If appropriate, field personnel may determine which samples are to be submitted first to the laboratory based on these survey results. The laboratory's surveys and analyses of the samples are not intended to confirm the field survey results.

Only qualified laboratories using validated radioanalytical methods (see EPA 2007b and MARLAP, Chapter 6) should be used in order to process samples in a timely and effective manner. These laboratories will have the necessary radioanalytical capability and sample-processing capacity to conduct the required gross screening and radionuclide-specific analyses defined for the radioanalytical scenarios. This guide recommends the following analytical process flow.

1. General screening based on total radiation emitted from the sample.
2. Screening based on type of radiation emitted (i.e., alpha, beta, or gamma).
3. Specific analytical techniques applied after screening indicates the most significant activities.

This sequence is used for screening in the diagrams for each radioanalytical scenario. Each decision point in the flow diagram relates to an AAL (based on a PAG DWC, regulation, or risk-based DWC) that is part of the overall analytical process. The flow diagrams for the three radioanalytical scenarios (Figures 2, 3, and 4) use simplified process-control shapes: diamonds represent decision choices, and rectangles are action or information steps. The numerical limits in the diamonds of the flow diagrams are ADLs. Many of the flow diagram shapes have numbers keyed to the notes immediately following the respective figures. Most shapes are color-coded to reflect the highest priority analytical flow path (red), intermediate (next important) flow path (green), or the lowest priority flow path (yellow) based on the time needed to return the required analytical results to the IC. The accompanying numbered notes are color-coded in the same fashion, as are the examples in Appendices II, III, and IV. Consequently, it is highly advisable to study the flow paths in color, as a black-and-white version may be confusing or ambiguous.

The screening techniques outlined in the first steps of the flowcharts assume that the laboratory maintains the necessary instrumentation and can perform the initial gross sample screening (at or immediately subsequent to sample receipt) functions identified below:



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- Micro-R meters for evaluating radiation exposures and doses on low-activity samples.
- Dose-rate meters capable of detecting gamma-beta exposures and doses.
- Hand-held gross alpha frisker for assessing the alpha count rate on sample contact.
- Survey meters with appropriate alpha, beta, and gamma detector probes can be used to determine whether samples exceed the maximum dose rate that can be handled or analyzed at the laboratory.

The instrument used for gross screening analysis (mostly for ( radiation) should be calibrated (pCi/net dose rate) with a $^{137}$Cs source of appropriate geometry.

The laboratory also should have the instrumentation to perform radionuclide-specific analyses (e.g., high-purity germanium [HPGe] detectors for gamma and ion implanted silicon detectors for alpha spectrometry). Some of the radionuclides listed in Table 1 on page 9 (e.g., $^{103}$Pd) can be detected only with a specific type of gamma-ray detector because of their low gamma-ray emission energy (60 keV is the usual lower energy for many HPGe calibrations).

Each numbered box has associated with it a note that provides additional detail for that particular part of the process. Clarification is also provided in these notes as to when parallel paths of analysis should be followed to help expedite the processing of samples.

Table 12 (Appendix VI) provides estimated counting times for LSC and GPC and the minimum detectable concentration (MDC) that can be achieved by screening a small sample aliquant for gross alpha and beta activity. The values are based on typical detector efficiency and background values for two methods, gas proportional and liquid scintillation counting. Laboratories should prepare their own MDC tables using their preferred detection method as part of their standard operating procedures (SOPs). Laboratories also should determine (in advance) whether their individual analytical protocols will need to be revised to accommodate this process.

The number of samples that will be analyzed, and their level of contamination, will be significantly higher than normal samples. Laboratories must also consider the following:

- Separate sets of procedures for sample handling and storage.
- Increasing the frequency of detector background analyses.
- Increasing the frequency of QC checks.
- Consider adjusting the QC check activity level to more closely align with the activity of the anticipated samples.
- Increasing the frequency of contamination assessments (i.e., smears/swipes) on working surfaces in the laboratory.
- Separate protocols for personnel protective equipment.
- Separate protocols for personnel and sample radiation monitoring.
- Separate storage location for high-activity samples or a large group of samples, which would increase laboratory background for detectors or personnel. This storage location may need additional shielding or be sited so as not to affect operations.

It should be noted that modern radioanalytical procedures in the United States address low ambient concentrations of environmental radionuclides normally encountered during the past 30 years. With the detonation of an RDD or IND involving radionuclides with radioactive progeny, it is possible that the radioactive equilibria involved with these progeny may have been established (depending



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on the time between creation of the radionuclide source to detonation or the time of detonation to sampling, or both). This means that not only will there be considerably higher concentration of the parent but of each of the progeny. Furthermore, if multiple radionuclides are involved, the cross-contamination factor during separations must be minimized, a phenomenon that current day analysts may not have previously experienced. A specific example of such a phenomenon would be the elimination of $^{140}$Ba during the $^{90}$Sr separation process. Many processing schemes in today's laboratories do not account for this step because many samples are collected over a period of weeks to months and provided to laboratories as composites. Routine turnaround time for $^{90}$Sr analysis is 30 days. Thus, even if the 12-day $^{140}$Ba radionuclide is present, it would have decayed significantly by the time the laboratory receives the sample for analysis.

## IV. CROSSWALK of Data Values

The values corresponding to different terms referred to in this document are located in the tables listed below:

**TABLE 2 – Crosswalk of PAG, SDWA Limits, AAL, ADL, and $u_{MR}$ Values**

| | SDWA Required Limits | AAL | ADL | $u_{MR}$ |
|---|---|---|---|---|
| 500 mrem/100 mrem (Screening) | Tables 10A and 10B (PAGs) | — | Tables 5A and 5B | Tables 5A and 5B |
| 100 mrem (Radionuclide Specific) | — | Tables 10A and 10B (PAGs) | Tables 6A and 6B | Tables 6A and 6B |
| SDWA MCL Values | Tables 7A and 7B | — | — | — |
| SDWA RDL Values | Tables 7A and 7B | — | — | — |
| DQO and MQO Derivations | — | — | Tables 9A, 9B, 11A, and 11B | Tables 9A, 9B, 11A and 11B |
| Estimated Counting time for MDC (based on screening analysis) | Table 12 | — | — | — |

EPA's Response Protocol Toolbox (EPA, 2003) provides additional recommendations concerning planning and threat management, site characterization and sampling, and sample analysis to assist utilities and state and local agencies. If laboratory protocols for normal or routine situations cannot ensure that the DQOs and MQOs are achievable with the laboratory's SOPs under emergency conditions, then a separate set of SOPs for emergency conditions will need to be developed.



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## V. RADIOANALYTICAL SCENARIO 1 (Identifying Samples with Highest Activities)

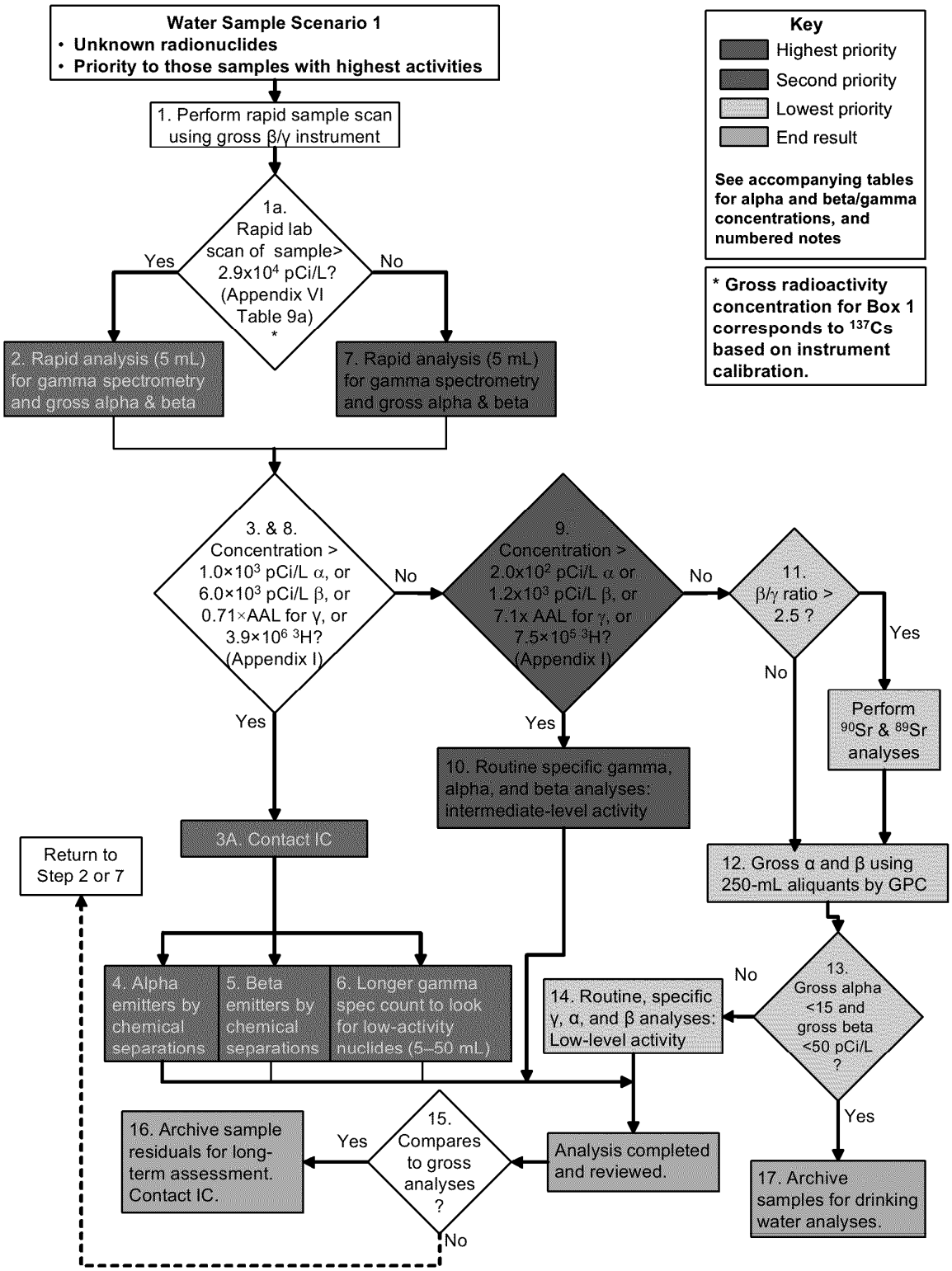


**Figure 2 – Water Scenario 1 Analytical Flow**

**Notes to Scenario 1: Contaminating Radionuclides Unknown**
**Purpose: Priority to Those Samples with Highest Activities**

Highest priority samples are all analyzed first. Only after an analytical step or procedure has been completed for the highest priority samples should lower priority samples be addressed. The samples may arrive over several days; those with the highest priority are always to be analyzed first. Lower priority samples (those following the green and yellow flow paths on this chart) may need to be stored for several days until the highest priority samples have been analyzed.

Many of the flow diagram shapes are color-coded to reflect the highest priority analytical flow path (red), intermediate (next important) flow path (green), or the lowest priority flow path (yellow) based on the time needed to return the required analytical results to the IC. The accompanying numbered notes are color-coded in the same fashion, as are the examples in Appendix II. It is highly advisable to study the flow paths in color, as a black-and-white printing may be confusing or ambiguous.

**1.** Analysis at this point is to assess if the 500-mrem AAL[1] values are exceeded by measurement of the sample's total gross radioactivity (concentration) with hand-held survey instruments. These might include a survey meter or Geiger-Muller (GM) counter with appropriately calibrated beta and gamma detector probes or a micro-roentgen meter (gamma only).[2] This step would most likely be performed with the sample container, unopened, leaving the determination of " ADLs to the next step. Unless the identification of the radionuclide contamination is known, the hand-held survey instrument should be calibrated using a $^{137}$Cs source that would replicate the sample container geometry. The subsequent measurement should be capable of identifying a concentration from zero to $5.8\times10^4$ pCi/L, which is the 500-mrem AAL for $^{137}$Cs. The ADL for this screening analysis is $2.9\times10^4$ pCi/L when applied to unknown radionuclides (see Appendix VI, Table 9A, on page 57). If the identification of the radionuclide(s) is known, the Analytical Detection Level (based on the AAL for the radionuclide listed for the 500-mrem value) is to be used (see Appendix I, Tables 5A and 5B). For survey instruments having an exposure rate readout, the instruments should be calibrated in terms of pCi/L per exposure unit readout for each container geometry expected and for the nuclide of interest, if known ($^{137}$Cs for unidentified nuclides).

Some laboratories may also use a calibrated NaI(Tl) detector to assess gross ( activity level (using an integrated spectrum technique) and relate this measurement to a gross or radionuclide-specific ( ADL.

Some gamma-emitting nuclides may not be detected at their ADLs if the sensitivity of the instrument used is inadequate. Tritium will not be detected, and beta-emitting radionuclides

[1] Depending on the time of the response, a 2-rem PAG may be applicable. If so, values for this may be obtained by scaling the PAGs and the ADLs by multiplying their corresponding 100-mrem values by 20. Thus the 2-rem PAG and ADL for $^{137}$Cs would be $2.4\times10^5$ and $1.2\times10^5$, respectively.

[2] Some manufacturers have developed kits that include the survey meter plus an alpha–beta–gamma pancake GM detector and a NaI gamma detector.



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that do not emit ( - or X-rays may not be detected depending on the window thickness of the detector.

The initial results of these measurements need to be checked against the information in the chain-of-custody form. Communication of preliminary findings to the IC may be very valuable in helping the IC determine the areas that may need additional samples. This feedback also will reinforce the priorities assigned to each sample and further enhance decision making.

**1a.** If the gross activity scan yields a value greater than $2.9\times10^4$ pCi/L, go to Step 2 (red path). Otherwise, go to Step 7 (green path).

> NOTE: The gross radioactivity measurements under Note 2 are evaluated against the ADLs listed in Table 5B for $^{241}$Am, $^{90}$Sr and $^{60}$Co, respectively, at the 500-mrem level. These are not the lowest ADL values for all radionuclides. Thus, no conclusions about the presence or absence of other radionuclides should be made at this point in the analytical process.

**2.** If the gross ", $, or ( activities of these samples indicate that an AAL may have been exceeded (i.e., the sample activity is greater than one of these ADL values: $1.0\times10^3$ alpha, or $6.0\times10^3$ $, or [0.71×AAL] for an individual ( pCi/L[1]), then these analyses have the highest priority. Rapid analytical techniques, using a 5-mL sample aliquant, for " and $ by either liquid scintillation counting (LSC)[2] or gas proportional counting (GPC) should be done to assess the individual levels of these components of the mixture. Additionally, a rapid gamma isotopic analysis needs to be performed using a HPGe detector. Note that, dependent upon the type of instrument used, the count time for some analyses may be shorter with LSC than with GPC. Screening for radionuclides such as $^{125/129/131}$I by GPC may need to be carefully performed to prevent loss of radionuclide analyte due to volatilization during sample evaporation.

Gamma isotopic analysis is performed with a high-purity germanium (HPGe) detector to identify the major ( emitters. Analysis should be made on the original sample container or on an aliquant as small as 20 mL in a standardized counting geometry. The ( isotopic analysis (original sample container or 20-mL aliquant) of Steps 2 and 7 using a HPGe detector and a counting time $10 minutes should be satisfactory for achieving the required method uncertainties for the (-emitting radionuclides in Table 5B (counting time will meet both the 500- and 100-mrem ADL values).

Tritium, a potential contaminant, will not be detected by either of the gross analysis scans unless LSC is used to determine gross beta. If GPC is used for gross beta analysis, a separate aliquant of the sample will need to be analyzed for tritium. Tritium analysis should be

[1]These values are based on the ADL values for $^{241}$Am and $^{90}$Sr, respectively. The assumption is that the detection device is calibrated with $^{137}$Cs and will yield the most representative gross activity measurement at this point in the screening process. The gamma ADL is 0.71×AAL value for any individual gamma ray emitter.

[2] LSC screening of samples typically is preferred over GPC because sample preparation of a 5-mL aliquant is much simpler, less time-consuming, and minimizes the risk of contamination. In addition, for the same counting time, LSC screening for this AAL has a better detection capability compared to GPC.



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performed during this stage of the analytical process. The ADL for tritium at this stage is $3.9\times10^6$ pCi/L.

**3.** Once the rapid analyses have been performed, the data should be reviewed to verify that the screening ADL concentrations have or have not been exceeded:

- $1.0\times10^3$ " pCi/L corresponding to $^{241}$Am
- $6.0\times10^3$ $ pCi/L corresponding to $^{90}$Sr
- the ( -specific concentrations listed
- $3.9\times10^6$ for $^3$H

(See the pCi/L values for other individual "- and $-emitting radionuclides listed in Tables 5A and 5B).

This is particularly important for " emitters, because the previous step was the first measurement of alpha radioactivity. Note that if exceeding the ADLs is not confirmed by at least one of the three analyses, the sample analysis reverts to the second priority analysis path.

Sample analysis prioritization will be based upon which ADL is exceeded. The ( analysis may help to assess which of the specific radionuclide analyses needs to be pursued with the highest priority. For example, if gross " activity exceeds the ADL and the ( radionuclides identified account for the observed gross $ activity, for which no individual $- or ( -emitting radionuclide ADL has been exceeded, priority would then shift to specific " emitters. Note in Table 5B that $^{57}$Co, $^{75}$Se,$^{103}$Pd, and $^{125}$I are ( -emitting nuclides only (these radionuclides decay via electron capture) and have no contribution to the results of a gross $ analysis.

In a different example, the gross $ indicates an ADL has been exceeded, but the gross " ADL was not exceeded. In this case, the $ emitter analyses would take priority along with gamma spectrometry analysis. These together would identify the specific $ components of the sample. The " analysis could be relegated to a lower priority flow path.

Some additional information may be obtained from the ( -ray analysis of those radionuclides that are principally " or $ emitters and have very low abundance ( rays. These types of radionuclides may be qualitatively identified in a short count (see Table 3, page 20). Qualitative identification of ( rays from those types of radionuclides may aid the laboratory in sample analysis prioritization.

High levels of $ activity with no significant specific ( component may warrant an additional GPC screening technique by using mass absorbers[1] to assess the $-particle energy. A sample volume greater than 5 mL may be required to effectively assess the range of the particles by

[1]A technique that has been used successfully to determine the energy of beta-only emitters is to measure the range of the beta particles in a pure material ("Feather analysis"). The ranges of beta particles in several pure materials (such as aluminum) have already been established. The units of thickness are expressed as areal density, or mg/cm$^2$. A set of aluminum absorbers of varying thickness is used, and the activity versus the absorber thickness is plotted on a semi-log scale. The linear portion of this curve is then extrapolated to find the "zero" activity thickness. This is then related to the $E_{\$max}$ of the beta particle, which will be characteristic for a particular radionuclide. A discussion of this technique can be found in *Principles of Radioisotope Methodology*, 3rd Edition, G.D. Chase and J.L. Rabinowitz, Burgess (Minneapolis) 1967.



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this method. This could minimize time spent on searching for the radionuclide (see Table 4, page 21).

Following Step 3, the highest activity samples that exceed the $1.0\times10^3$ or $6.0\times10^3$ pCi/L ADL screening levels (gross " or $), $^3$H, or specific ADL ( -emitting radionuclide concentrations, respectively, should be analyzed through Steps 4, 5, and 6 as quickly as possible. This will enable the laboratory to recalibrate its gross screening methods for those radionuclides actually found in the sample, which in turn will improve the accuracy of the gross screening techniques in assessing whether ADLs have been exceeded for subsequent samples. This also means that subsequent samples from the same location may be able to follow Radioanalytical Scenario 3 (page 28).

**3a.** The existence of samples exceeding the 500-mrem ADLs should be communicated to the IC as soon as possible.

> NOTE: Steps 4, 5, and 6 may be done concurrently based on the gross analysis results.

**4.** Chemical separation for specific " radionuclides commences if the gross " concentration exceeds the ADL (see Table 5A, page 32). Certain " emitters also emit ( rays or have ( -emitting decay products that may be identified in Step 3. The ( results can be used to determine which " emitter analyses need not be performed immediately. For example, lack of a significant 59 keV peak in the ( spectrum would indicate that an analysis for $^{241}$Am does not have to be performed. If the project manager does not specify the sequence of analyses, laboratory personnel should use their best professional judgment, based on the characteristics of the samples, to determine the order of processing the samples so that the results are obtained in the most efficient manner.

**5.** Chemical separations to be performed for specific $ radionuclides, not identifiable via gamma spectrometry, include $^3$H, $^{32}$P, $^{241}$Pu, $^{90}$Sr, and $^{89}$Sr. If the project manager does not specify the sequence of analyses, laboratory personnel should use their best professional judgment, based on the characteristics of the samples, to determine the order of processing the samples so that the results are obtained in the most efficient manner.

**6.** The initial gamma spectrometry results will have identified high activity samples that may provide insight as to which "- or $-only emitters are present. This longer count (compared to Step 7) and optional larger sample size should focus on lower-intensity ( -ray lines from additional radionuclides. When counting is completed, the analyst should ensure that newly identified ( -rays are from different radionuclides and not just low intensity lines from the predominant ( emitters.

> NOTE: Once radionuclides have been identified, gross screening methods should be recalibrated to the radionuclides of interest, and the laboratory may follow the flowchart for Radioanalytical Scenario 3.

**7.** If the initial gross screening method (Step 1) does not indicate a radioactivity greater than the ADLs, gross " and $ analyses using a 5-mL sample and a counting time of about 30 minutes should be performed to verify that these ADLs have not been exceeded. The (



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isotopic analysis (original sample container or 5-mL aliquant) of Steps 2 and 7 using a HPGe detector and a counting time less than 60 minutes may have a detection limit needed to quantify radionuclides at concentrations corresponding to the 500- or 100-mrem ADLs. If not, the sample should be counted longer.

Tritium is a potential contaminant that will not be detected by either of the gross analysis screens unless LSC is used to determine gross beta. If GPC is used for gross beta analysis, a separate aliquant of the sample will need to be analyzed for tritium by LSC. Tritium analysis should be performed during this stage of the analytical process. The ADL for tritium at this stage in the analytical process is $7.5\times10^5$ pCi/L.

**8.** Here the results from screening analyses performed in Step 7 are compared to the 500-mrem ADLs from Tables 5A and 5B (" $1.0\times10^3$ or $ $6.0\times10^3$), or specific (-emitting radionuclide ADL concentrations, respectively. If the screening concentrations are greater than these ADLs, a high priority would be established to analyze the samples for specific radionuclides in Steps 4, 5, or 6. If the screening results of Step 7 do not exceed the ADLs, then the question in Step 9 is evaluated.

**9.** Does the gross or specific radionuclide concentration exceed the corresponding (" 200 or $ $1.2\times10^3$)* or specific (-emitting ($3.3\times10^3$ for $^{60}$Co) radionuclide 100-mrem ADL concentrations, respectively? If "yes," proceed immediately with subsequent analyses. The status of samples exceeding the 100-mrem ADLs should be communicated to the IC. If "no," go to Step 11.

> NOTE: "*" gross concentrations noted above correspond to the 100-mrem ADL values for $^{241}$Am and $^{90}$Sr, respectively, listed in Tables 5A and 5B. These are not the lowest concentrations for all radionuclides, and decisions about the presence of other radionuclides should not be made until radionuclide-specific analyses have been performed.

**10.** Use a routine method that can provide analytical results within about one day. Sample size and counting time will need to be increased to verify screening levels and to quantify those radionuclides whose individual concentrations are below their corresponding 100-mrem ADL values listed in Tables 5A and 5B on pages 32 and 33 (see notes for Steps 4, 5, and 6 for other information on specific radionuclide analyses).

Calculate the sum of the ratios (individual nuclide concentration/100-mrem AAL are in Tables 10A and 10B, page 59) of all radionuclide concentrations above their respective RDL values (Tables 7A and 7B, page 36). If the summed value exceeds unity, then the 100-mrem AAL has been exceeded even though an individual value does not exceed the ADL (see example calculation in footnote 2 on page 41).

If the IC does not specify the sequence of analyses, laboratory personnel should use their best professional judgment, based on the radiological characteristics of the samples and in order of highest to lowest concentration, to determine the order to process the samples to produce expeditious results.

**11.** A $/( ratio >2.5 (i.e., ratio of gross $ to gross () indicates that $^{90}$Sr or $^{89}$Sr may be a signifi-



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cant contaminant. Although this decision falls into the low-priority path, this analysis should be done first for the low-priority samples because of the dose significance of $^{90}$Sr and the time required to do this analysis. Note that for the higher priority flow path, determination of strontium would be done in parallel with other analyses, so the urgency of its analysis does not need to be emphasized. Sufficient activity of the sample is necessary to have a statistically significant $/( ratio. The summed individual ( activities obtained from the HPGe detector from the printout would need to be applied for this calculation.

**12.** A GPC gross " and $ analysis of a larger sample (250 mL) and a longer counting time is warranted. These analyses will determine if either of the MCL values for drinking water (15 " pCi/L or 50 $ pCi/L) has been exceeded. Range determination of $-particle energy (see footnote on page 16) may be very effective with this 250-mL sample residue. This would help to further refine which $-only emitter is present at the highest concentration and deserves the priority analysis.

**13.** Determine if any gross ", $, or ( sample concentration exceeds the concentration corresponding to the screening MCL. For alpha emitters, this is 15 pCi/L and for beta emitters, this is 50 pCi/L. The status of any samples exceeding Safe Drinking Water Act standards should be communicated to the field coordinator.

**14.** Routine low-level analyses including total radiostrontium should be performed if not already done. If total radiostrontium results are greater than the ADL, use classical techniques to identify activities of $^{89}$Sr and $^{90}$Sr separately. A longer count time ( isotopic analysis should be completed first. This will assist in the identification of " or $ emitters, which may have low abundance gamma rays. Additionally, if the ( emitters are parent isotopes for other radionuclides, this will direct the analyst on which other analyses should be performed first. Sample size, counting time, and turnaround times shall be adjusted based on the laboratory's SOPs for water-compliance monitoring (see notes for Steps 4, 5, and 6 for other information on specific radionuclide analyses).

If the gross " concentration is between 5 and 15 pCi/L, "-specific radionuclide analysis is required to identify the radionuclides, including $^{226}$Ra. If the gross " concentration is less than 5 pCi/L, the sample should be analyzed for $^{228}$Ra and $^{226}$Ra, and by gamma spectrometry to verify that there are no low-activity ( emitters present.

**15.** When the high and intermediate priority radionuclide-specific analyses are completed, verify that no major nuclide has been missed: the sum of the individual nuclide concentrations (excluding tritium if screening measurement was made by GPC) is approximately equivalent to the gross activity concentration (a rule of thumb is within a range of about half to twice the gross value). This check will ensure that the sum of the measurements compares reasonably to the total measured gross activity. Activity concentrations due to decay products should be included in the verification. If not yet verified, the sum of the ratios (individual $- and (-emitter radionuclide concentration/100-mrem AAL are in Table 10B) of all radionuclide concentrations above their corresponding RDL value (Table 7B) must be calculated. If the summed value exceeds unity, then the 500-mrem or 100-mrem AAL has been exceeded, even though an individual radionuclide activity value <u>does not</u> exceed the respective ADL (see example calculation in Appendix II, Scenario I, Step 15).



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**16.** All samples should be archived for long-term or follow-up analyses. Those samples having radionuclide concentrations exceeding concentrations for the 100-mrem ADLs should be checked for preservation and stored for potential future analysis.

The IC should be notified with specific results for samples and radionuclide concentrations.

**17.** Archive samples for drinking water analyses. See Tables 7A and 7B for drinking water MCLs and their required detection limits (RDLs).

**Additional Points:**

Analysts should recognize that when performing gross " or gross $ analysis by evaporation of a sample, a significant loss of volatile radionuclides (such as tritium and iodine) will occur. Following this initial screening technique, the absence of any volatile radionuclides may need to be verified, depending upon the nature of the event.

Certain "- and $-emitting radionuclides have ( rays that are not used normally for analysis of those radionuclides, and may not necessarily be identified in gamma spectrometry software. The combination of gamma-ray abundance and half-life makes the gamma ray of little utility unless there is a significant mass of the material or the sample is counted for a long time. It is recommended that a separate library for incident response samples be created that has these ( rays. Table 3 provides some examples.

**TABLE 3 – Radionuclides with Low-Abundance Gamma Rays Not Usually Used For Their Analysis**

| **Radionuclide** | **$^{89}$Sr** | **$^{90}$Y** | **$^{129}$I** | **$^{210}$Po** | **$^{226}$Ra** | | **$^{228}$Th** |
|---|---|---|---|---|---|---|---|
| Principal Decay | $$^- | $$^- | $$^- | " | " | | " |
| Gamma, keV | 909 | 1761 | 40 (32 X-ray)* | 80.3 | 186 (262)* | | 84 |
| Abundance, % | $9.5\times10^{-4}$ | $1.1\times10^{-2}$ | 7.5 (92.5)* | $1.1\times10^{-3}$ | 3.3 ($5\times10^{-3}$)* | | 1.21 |
| **Radionuclide** | **$^{232}$Th** | **$^{235}$U** | **$^{237}$Np** | **$^{238}$Pu** | **$^{239}$Pu** | **$^{240}$Pu** | **$^{241}$Am** |
| Principal Decay | " | " | " | " | " | " | " |
| Gamma, keV | 911 (from $^{228}$Ac) | 185.7 | 86.5 | 55.3 | 112.9 | 54.3 | 59.5 |
| Abundance, % | 27.2 | 54 | 12.6 | $4.7\times10^{-2}$ | $4.8\times10^{-2}$ | $5.2\times10^{-2}$ | 35.7 |
| **Radionuclide** | **$^{241}$Pu** | **$^{242}$Pu** | **$^{243}$Cm** | | | | |
| Principal Decay | $$^- | " | " | | | | |
| Gamma, KeV | 149 | 44.9 | 278 | | | | |
| Abundance, % | $1.9\times10^{-4}$ | $4.2\times10^{-2}$ | 14 | | | | |

* Values in parentheses represent the next most abundant gamma ray.

These gamma rays can be used for qualitative identification of these radionuclides. Their presence in the gamma-ray spectrum should direct the analyst to perform chemical separations followed by alpha- or beta-specific detection.

Aluminum absorbers can be used to qualitatively identify the presence of radionuclides based on penetrating ability. Thus, if an aluminum absorber of 6.5 mg/cm$^2$ is used, and the measured activity is reduced to background, one could qualitatively state that the beta particle energy of the radionuclide is < 0.067 MeV. Conversely, if the absorber has little effect on the count rate, it can



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be stated that the beta particle energy is >0.067 MeV. Table 4 identifies some beta-only emitters with their energies and range in aluminum absorbers.

**TABLE 4 – Beta "Only" Emitters**

| Radionuclide | $^{241}$Pu | $^{63}$Ni | $^{129}$I | $^{35}$S | $^{99}$Tc | $^{32}$P | $^{90}$Sr/$^{90}$Y |
|---|---|---|---|---|---|---|---|
| Maximum Beta Energy, MeV | 0.021 | 0.067 | 0.150 | 0.167 | 0.294 | 1.711 | (0.546)/2.28 [1] |
| Range [2] in Aluminum, mg/cm$^2$ for $E_{\$max}$ | 0.8 | 6.5 | 27 | 32 | 75 | 800 | 1,100 |

Notes:

[1] It may be assumed that $^{90}$Sr/$^{90}$Y will be in secular equilibrium by the time any analysis is started. Thus, the 2.28 MeV beta particle of $^{90}$Y will be present.

[2] U.S. Department of Health, Education and Welfare (HEW). 1970. *Radiological Health Handbook*, p.123.



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## VI.RADIOANALYTICAL SCENARIO 2 (Identifying Uncontaminated Drinking Water)

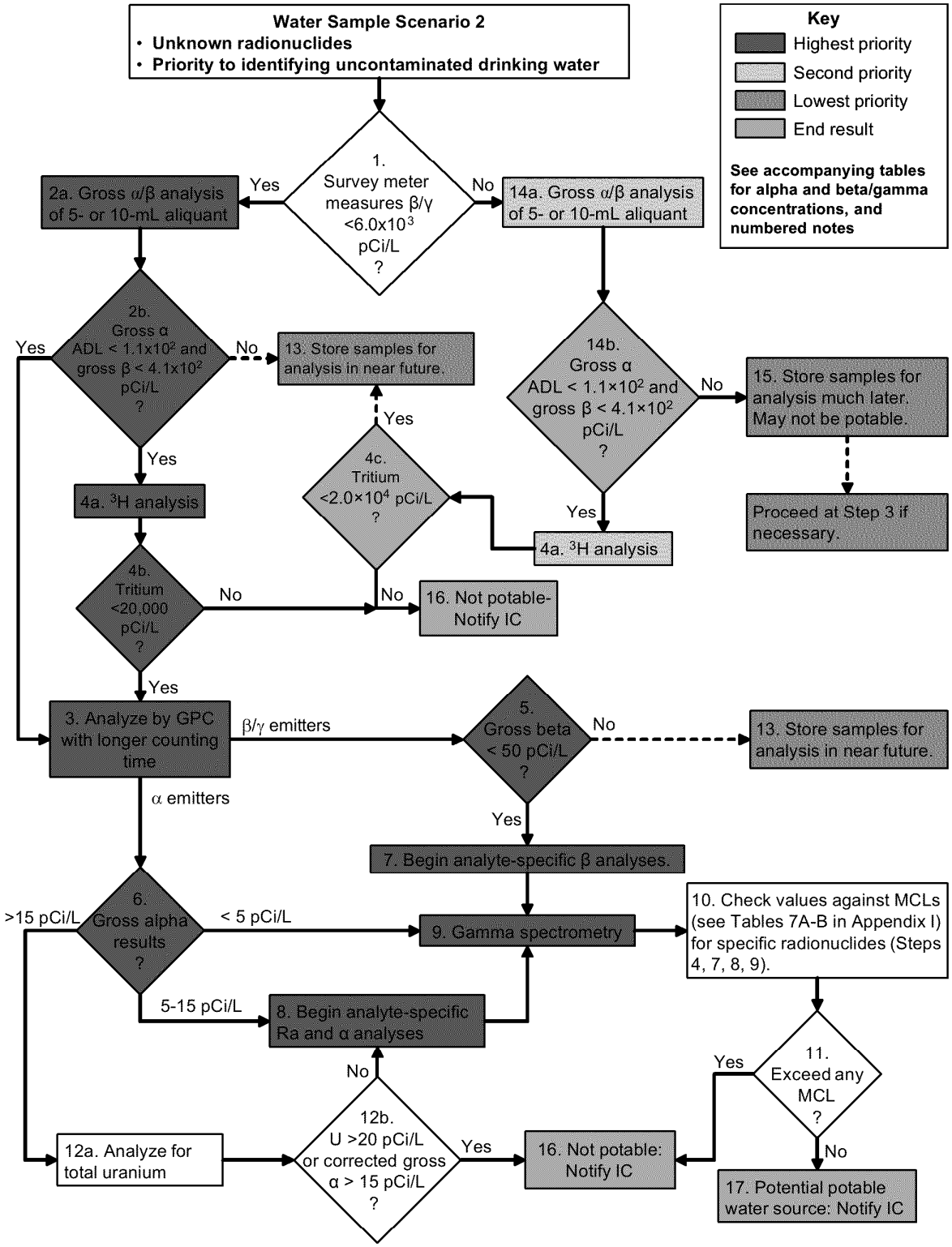


**Figure 3 – Water Scenario 2 Analytical Flow**

**Notes for Scenario 2: Contaminating Radionuclides Unknown**
**Purpose: Rapid Identification of a Potable Water Source**

Highest priority samples are all analyzed first. Only after an analytical step or procedure has been completed for the highest priority samples should lower priority samples be addressed. he samples may arrive over several days; analysis for those with the highest priority are always started first. Lower priority samples (those following the green and yellow flow paths on this chart) may need to be stored for several days until the highest priority samples have been analyzed. The samples with the highest priority in this instance will be the ones with the lowest activity. Gross " and $, and all analyses done to assess MCL values, must use standard methods approved for drinking water (page 9). This scenario assumes that the sources being analyzed have already been used as potable water sources.

Many of the flow diagram shapes are color-coded to reflect the highest priority analytical flow path (green), intermediate (next important) flow path (yellow), or the lowest priority flow path (olive brown) based on the time needed to return the required analytical results to the IC. The accompanying numbered notes are color-coded in the same fashion, as are the examples in Appendix III. It is highly advisable to study the flow paths in color, as a black-and-white printing may be confusing or ambiguous.

**1.** Screening with a hand-held survey instrument is to be performed as a contact reading on the outside of the sample container. The purpose of this screen is to eliminate quickly those samples that are obviously contaminated and thus may not be used as a drinking water source. Appropriate instruments might include a survey meter or Geiger-Muller counter with calibrated beta and gamma detector probes or a micro-roentgen meter (gamma only),[1] using a $^{137}$Cs source geometry that would replicate the sample container geometry. The calibration measurement should be capable of identifying a concentration down to $6.0\times10^3$ pCi/L, which is half of the 100-mrem AAL for $^{137}$Cs. Laboratories will need to develop instrument-specific calibration SOPs, which include the use of a mock sample container with a radionuclide source.

NOTE: The next steps use screening techniques. The MDCs are used as AALs. These values are based on those routinely achievable using the count times and volumes noted in Table 12 of Appendix VI.

**2a.** Gross alpha and gross beta screening measurements may be performed using a liquid scintillation counter (LSC)[2] or a gas proportional counter (GPC). For LSC, a 5- to 10-mL sample is mixed with a liquid scintillation cocktail in a LSC vial and counted for approximately 10 minutes. For GPC, a 5- to 10-mL sample is deposited on a planchet,

[1] Some manufacturers have developed kits that include the survey meter plus an alpha–beta–gamma pancake GM detector and a NaI gamma detector.

[2] LSC screening of samples typically is preferred over GPC because sample preparation of a 5-mL aliquant is much simpler, less time-consuming, and avoids possible contamination.



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evaporated, and then counted for approximately 30 minutes. Note that, dependent upon the type of instrument used, the count time for some analyses may be shorter with LSC than with GPC. The total mass of evaporated residue for GPC analysis may prevent processing a full 500 mL aliquant. In these cases, a smaller volume and longer count time will be required.

The ADLs for this part of the analysis are based on the AAL being considered MDC values. The ADL values are 110 pCi/L gross " and 410 pCi/L gross $ concentration (see Table 11A in Appendix VI). Table 12 in Appendix VI shows that the MDC values (210 pCi/L and 820 pCi/L) can be achieved with a 10-minute count of a 5-mL sample. Volumes and count times may be adjusted based on laboratory-specific instrumentation.

Screening for radionuclides such as $^{125/129/131}$I will not be able to be performed by GPC unless the samples are carefully prepared to prevent loss of radioiodines due to volatilization. Furthermore, radionuclides that decay by electron capture (such as $^{57}$Co, $^{75}$Se, $^{103}$Pd) may not be able to be screened using GPC. If any of these electron-capture radionuclides are present, analysis using a low-energy photon detector (LEPD) or a specific separation scheme for each will be required.

Tritium cannot be screened using GPC techniques, because it will most likely be present as a tritiated water molecule. LSC should be used routinely for tritium analysis because of tritium's very low electron energy and its likely presence as part of a water molecule. For these reasons, tritium has a special status. If GPC analysis, and both alpha and beta analyses are less than the ADLs, Steps 4a and 4b must be performed. If LSC analysis is used and both alpha and beta analyses are less than the ADLs, proceed directly with Step 3.

**2b.** A concentration less than the ADL for this part of the analysis—110 pCi/L gross " and 410 pCi/L gross $—will identify the samples most likely to have radionuclide concentrations that are below the Maximum Contaminant Levels (MCLs) for natural radionuclides, as well as anthropogenic radionuclides.

In subsequent steps, it will be necessary to show that gross " < 15 pCi/L and gross $ < 50 pCi/L (40 CFR Parts 9, 141, and 142, *National Primary Drinking Water Regulations; Radionuclides*; Final Rule. *Federal Register* 65:76707-76753, December 7, 2000).

If the results of either the gross alpha or beta analysis are greater than the ADLs for this step (which are based on the MDCs in Table 12), the sample should be checked for preservation and stored for analysis at a later time, to assess the presence of other radionuclides.

**3.** The gross alpha and beta results should be compared to specific limits from the Safe Drinking Water Act (Steps 5 and 6). The analyses for gross alpha and beta at these levels will require a larger sample volume and longer counting times. Gross " and $ analysis by GPC is a requirement of the SDWA.

> NOTE: Steps 3 and 4a (4a only required when GPC analysis is done) should be done in parallel to expedite the decision for further analyses.



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**4a.** Samples for tritium analysis may need to be either distilled or passed through an ion exchange resin if the gross beta results indicate significant counts above background (this could be due to naturally occurring radionuclides and still be less than MCLs). If tritium is present above the MCL of 20,000 pCi/L, the water source is not suitable for long-term use as drinking water.

**4b.** If the high priority sample tritium result is <20,000 pCi/L, a fresh sample aliquant (~ 4 L, portions of which will be used for separate analyses) should be analyzed for gamma, beta, and alpha emitting radionuclides (Steps 7, 8, and 9). If tritium concentration is > 20,000 pCi/L, the water is not a suitable drinking water source (Step 16).

**4c.** If tritium concentration of the low priority sample is >20,000 pCi/L, the water supply is not suitable as a drinking water source (Step 16). If tritium concentration is < 20,000 pCi/L, preserve the sample for future analyses (Step 13).

**5.** Analysis for specific beta emitters (Step 7) will be performed if the gross beta activity is less than 50 pCi/L. Methods used for specific beta emitters should be able to distinguish among the various isotopes of a specific element. Gross beta activity greater than 50 pCi/L means the source may not be suitable as a long-term drinking water supply. The sample should be checked for preservation and stored for analysis at a later date (Step 13).

**6.** Gross alpha analysis will need to distinguish among three different levels. Gross alpha activity between 15 and 35 pCi/L shall be analyzed for uranium contributions (Step 12). The uranium result is subtracted from the gross alpha result to determine gross alpha exclusive of uranium.

If gross alpha is between 5 and 15 pCi/L, alpha-specific radionuclide analysis is required to identify the radionuclides, with $^{228}$Ra and $^{226}$Ra taking priority. After or at the same time as these analyses, gamma spectrometry should be performed to assess presence of any gamma emitters.

Finally, if the gross alpha is less than 5 pCi/L, the sample should be analyzed for $^{228}$Ra and $^{226}$Ra, and by gamma spectrometry to verify that there are no low-activity gamma emitters present. The project manager may request additional radionuclide-specific analysis for man-made alpha emitters.

**7.** Chemical separation to be performed for pure $-emitting radionuclides not identifiable using gamma spectrometry include—but are not limited to— $^{3}$H (Step 4), $^{90}$Sr, $^{89}$Sr, $^{99}$Tc, $^{241}$Pu, and $^{32}$P. Sr-90 and $^{89}$Sr would have the highest priority if project management guidance is not provided. This step is done in parallel with Step 9.

**8.** Gross alpha activity between the detection limit and 15 pCi/L may indicate presence of anthropogenic alpha emitters or naturally occurring radium radionuclides. The exact nature of the activity should be verified, because these samples are the result of contamination. Samples should be analyzed for $^{228}$Ra and $^{226}$Ra.

**9.** Samples for gamma spectrometry analysis should be counted long enough to meet the $^{134}$Cs RDL of 10 pCi/L. The count time is dependent on the sample size, background, and detector



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efficiency (this will be a laboratory-specific counting time; 1-3 hours is an approximate value). The software library should include lines for the predominant gammas of all products in the U and Th natural decay series as well as any anthropogenic radionuclide with a half-life of greater than 1 day. The purpose of including these naturally occurring gamma-ray peaks in the library is to ensure complete identification of all gamma rays. Due to differential solubilities of the progeny of U, Th, and Ra, no assumptions or predictions can be made regarding the presence of the parents unless specific radiochemical separations are performed. Gamma analyses should be performed in parallel with the alpha- and beta-specific analyses. This step is done in parallel with Step 7.

**10.** Here the results from analyses performed in Steps 4a, 7, 8, and 9 are compared to their respective MCLs (Tables 7A and 7B, Appendix I).

**11.** If any radionuclide exceeds its MCL, the source should not be considered potable (Step 16). For beta emitters, the sum of the ratios (individual nuclide concentration/MCL value) of all concentrations greater than the RDL values must be calculated. If the sum of the fractions of all $ and ( -emitting radionuclides present exceeds 1.0, the water source is not potable.

**12a.** If gross alpha analysis in Step 6 is greater than 15 pCi/L, then perform analysis for total uranium (i.e, total uranium present on a mass basis).

**12b.** If the total uranium concentration is less than 20 pCi/L (30 : g/L or 30 ppb), and the corrected gross alpha activity (Gross alpha - total uranium) > 15 pCi/L, go to Step 8 and begin $^{226}$Ra and $^{228}$Ra analyses and any other alpha analyses requested by the IC. If the total uranium concentration is greater than 20 pCi/L, the water source cannot be used as a potable water supply (Step 16).

**13.** It is possible that the source may be acceptable for drinking water once radionuclide-specific analyses are performed. This path has a secondary priority. These samples should be checked to assess whether or not preservation, using acids or other appropriate chemical, has been performed. If not preserved, preservation appropriate to the analyte(s) should be made and the sample stored for potential analysis. Any decision to conduct further analyses or to dispose sample(s) should be made by the IC.

NOTE: The values in Step 14b correspond to the ADL values in Table 11A of Appendix VI.

**14a.** Samples that are greater than $6.0\times10^3$ pCi/L using the survey meter screening method may contain naturally occurring radionuclides but will not be potable. Analyze an aliquant of the sample by gross alpha and beta analysis.

**14b.** If the results of either the gross alpha or beta analysis[1] are greater than the ADLs, the sample should be preserved for analysis at a later time. It will not be acceptable as a drinking water source, but more detailed analysis may subsequently be required. If the gross alpha and gross beta analyses are both less than 110 pCi/L gross " and 410 pCi/L gross $, tritium analysis

[1] LSC screening of samples typically is preferred over GPC because sample preparation of a 5-mL aliquant is much simpler, less time-consuming, and avoids possible contamination.



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should be performed later (Step 4a of the yellow path).

**15.** Those samples that exceed the ADLs established for Steps 2a and 2b should be checked for preservation and stored until all other water sources have been analyzed and found acceptable or not acceptable. Specific radionuclide analyses may determine that the water source is acceptable.

**16.** The water supply is not suitable as a drinking water source. At least one analysis or the sum of the fractions of the beta emitters has exceeded the MCL for drinking water for that radionuclide.



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## VII. RADIOANALYTICAL SCENARIO 3 (Contaminating Radionuclides are Known)

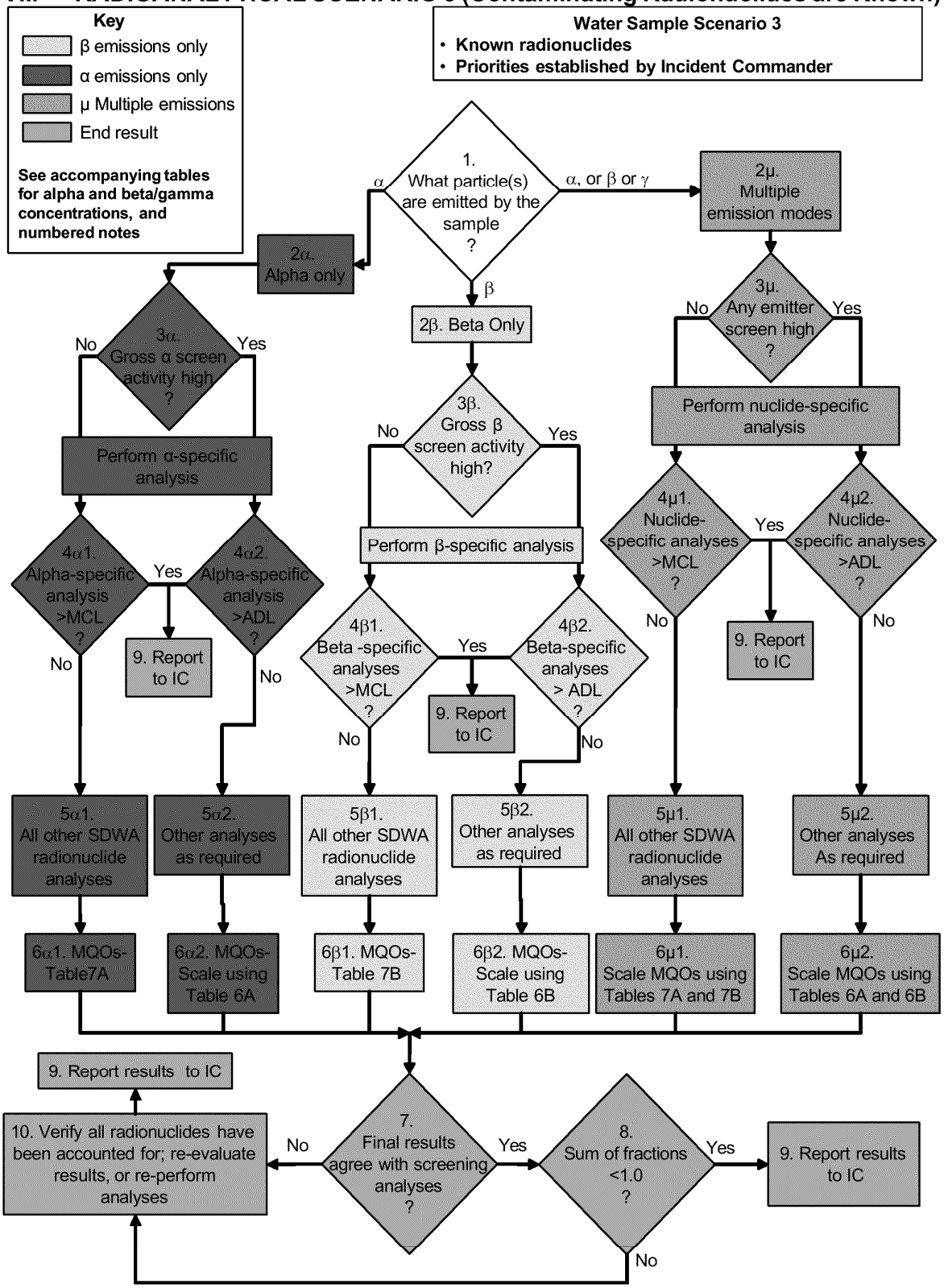


**Figure 4 – Water Scenario 3 Analytical Flow**

**Notes for Scenario 3: Contaminating Radionuclides Known**
**Purpose: Support the Specific Needs of the IC**

For this scenario, "\"" and "$" designate paths to be followed (and their associated notes) when samples received from the field contain radionuclides that emit only alpha or beta particles, respectively, and " : " (indicating a mixture of "-, $-, or (-emitting radionuclides) designates samples that contain either a gamma emitter or multiple emitters (alpha plus beta).

Scenario 3 takes place when the radioactive contaminants have been well characterized. Detailed analyses are required for the radionuclide(s) known to be in the samples, and at the direction of the IC. Thus, the radioanalytical process chart becomes much more streamlined, and sample priority is based upon what is needed by the Incident Commander at the time the samples are taken. Either high- or low-activity samples may take priority.

Because the radionuclides are known, the gross screening instruments should be calibrated for the radionuclides of interest. This allows rapid and more accurate assessment of the activity before the analytical separations are performed.

Many of the flow diagram shapes are color-coded to reflect the analytical flow path for various combinations of decay modes (green for alpha, gray for beta, or brown for any two emitters). The accompanying numbered notes are color-coded in the same fashion, as are the examples in Appendix IV. It is highly advisable to study the flow paths in color, as a black-and-white printing may be confusing or ambiguous.

**1.** The event that has taken place is now characterized, and the radionuclide(s) of concern have been identified. The flowchart is trimmed to deciding which of the three different radionuclide emissions are present. The emission mode generally determines the final radioanalytical method(s) that will be used to assess the concentration. Generally, $-only emitters will be analyzed by GPC or LSC, "-only emitters by either GPC or AS, and $- and (-emitters by gamma spectrometry. The choice is determined by what is known about the event. If more than one type of radionuclide emitter is present, the choice is to follow the (", or $, or () path.

**2".** This path is selected only if all the radionuclides from the event are " emitters. The samples still should be screened to distinguish high from low-activity samples. The instrument used to perform the screening analysis should be calibrated with the radionuclide of interest.

**2$.** This path is selected only if all the radionuclides from the event are $ emitters. The samples still should be screened to distinguish high from low-activity samples. The instrument used to perform the screening analysis should be calibrated with the radionuclide of interest. If more than one radionuclide is present, the screening instrument should be calibrated with the radionuclide that is expected to produce the lowest response. This will provide screening results that are a more conservative estimate of the activity present for that radionuclide.

**2 : .** This path is selected only if the radionuclides from the event emit a combination of ", or $, or ( emitters. The samples still should be screened to distinguish high from low-activity



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samples. The instrument used to perform the screening analysis should be calibrated with the radionuclide of interest.

**3".** **3$.** **3:.** The purpose of this step is to distinguish high-activity samples from low-activity samples and to rank the samples in order of their activity level. The subsequent flow paths would be selected based on the priority from the IC. Thus, it is important that this screening method is able to distinguish high-activity samples from low-activity samples in a reasonably short time. Using a 1-hour count time as the maximum and a 10-mL aliquant as the minimum, Table 12 in Appendix VI demonstrates the capability for MDC and critical-level values that can be achieved routinely using LSC or GPC analytical methods. Although these MDCs are not equivalent and do not relate to a specific DWC, they are low enough to be used for screening purposes. The samples should be numerically ranked based on their gross concentration and processed according to the priority specified by the IC.

> NOTE: The flow of priority splits here. Either of the paths for the suffixes 1 or 2 may get the priority. The difference is that suffix 1 is for SDWA requirements, and that suffix 2 flow path would be for IC-determined MQOs. Flow path 2 would be scaled to the appropriate ADL based on the 100-mrem values.

**4"$_1$** **4$$_1$** **4:$_1$** The first analytical priority when this path is chosen is for the known contaminant(s) from the event. This should use a radionuclide-specific method, and the RDL should be less than or equal to that shown in Table 7A or 7B. This path would be chosen if the intent was to look for potable water sources. If the event-specific contaminant is less than its respective MCL in Table 7A or 7B, then analysis for all other SDWA contaminants should proceed. If the event-specific contaminant concentration is greater than its respective MCL in Table 7A or 7B, notify the IC that this is not a potential potable water source.

**4"$_2$** **4$$_2$** **4:$_2$** The first analytical priority when this path is chosen is for the known contaminant from the event. This should use a radionuclide-specific method, and the ADL concentration plus corresponding $u_{MR}$ value should be a multiple of the value found in Table 6A or 6B (these tables are for the 100-mrem ADLs; the multiple would be based on the ratio of 100-mrem value to the maximum dose for the particular event). This path would be chosen if the direction were to identify water sources that may cause exposure in excess of the maximum dose allowed for the event. If the event-specific contaminant is less than its respective ADL (based on scaling of concentrations and in Tables 6A or 6B), then analysis for all other contaminants of concern should proceed. If the event-specific contaminant concentration is greater than its respective ADL for that event, notify the IC that this sample has exceeded the event-specific AAL.

**5"$_1$** **5$$_1$** **5:$_1$** Perform all other radionuclide SDWA required analyses.

**5"$_2$** **5$$_2$** **5:$_2$** Perform all other event related or requested radionuclide analyses.

**6"$_1$** **6$$_1$** **6:$_1$** Select the MCL values from Tables 7A or 7B to be compared with the final

analytical concentrations for the water sample.

6"$_2$ 6$$_2$ 6:$_2$ Select the ADL values from Tables 6A or 6B (scaled to the AAL for the event) to be compared with the final analytical concentrations for the water sample.

**7.** Compare the final results with the screening analysis and verify that no major nuclide has been missed: the sum of the individual nuclide concentrations (excluding tritium if the screening measurement was made by GPC) is approximately equivalent to the gross activity concentration (a rule of thumb is within a range of about half to twice the gross value). This check will ensure that the sum of the measurements compares reasonably to the total measured gross activity. Activity concentrations due to decay products should be included in the verification. If there is a discrepancy between the summed activity concentration of all statistically significant individual nuclide concentrations (i.e., sum all results detected at levels greater than the RDL or for drinking water), check for errors and resolve any discrepancies prior to proceeding.

**8.** If the sum of the fractions of all $- and (-emitting radionuclides present exceeds 1.0, verify analyses or calculations. The sample would have concentrations that exceed the 40 CFR limits. If the individual results and the sum of the fractions are less than their respective limits, report results to IC.

**9.** Several actions lead to this step:

- In steps 4"$_1$, 4$$_1$, and 4:$_1$, the result for the event-specific radionuclide exceeded the MCL for the radionuclide in potable water.
- From Step 8, all analyses indicated that the sample is within the limits of the MCLs from the SDWA.
- In steps 4"$_2$, 4$$_2$, and 4:$_2$, the event-specific radionuclide exceeded the ADL for the event.
- From Step 10 if the sum of fractions is greater than 1.0.
- From Step 10 if gross activity and sum of individual radionuclide activities in sample do not match within 0.5 to 2.0.

Notify the IC of the specific final results for all samples, with a description of any unresolvable discrepancies. All sample residuals or final counting forms should be archived until notification to dispose of them is received.

**10.** The results from the radionuclide-specific analysis and the gross measurement should match to within a factor of 0.5 to 2.0. If they do not, re-analysis may be required starting with the gross-activity measurement. It is possible that either a short-lived radionuclide activity has decayed away prior to having been analyzed, or a radionuclide analysis was missed. In either case, the discrepancy should be resolved, which may include specific correlations for the radionuclides from this event.

If this step is arrived at as a result of the sum of fractions being greater than 1.0, verify the data to ensure correctness and that the gross activity and sum of individual activities are within a factor of 0.5 to 2.0. When this review is completed, notify the IC of results per Step 9.



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## Appendix I. Tables of Radioanalytical Parameters for Radionuclides of Concern

**TABLE 5A – Analytical Decision Levels (ADL) and Required Method Uncertainty For Gross Alpha Screening Analysis**

| Radionuclide | Half-Life [1] | Additional Emissions | pCi/L | | | |
|---|---|---|---|---|---|---|
| | | | 500-mrem [2] | | 100 mrem [2] | |
| | | | ADL | Required Method Uncertainty [4, 5] ($u_{MR}$) | ADL | Required Method Uncertainty [4, 5] ($u_{MR}$) |
| Gross " Screen | — | | $1.0\times10^3$ | $6.1\times10^2$ | 200 | 120 |
| Am-241[3] | 432.2 y | ( | $1.0\times10^3$ | $6.1\times10^2$ | 200 | 120 |
| Cm-242 | 162.8 d | | $7.0\times10^3$ | $4.3\times10^3$ | $1.4\times10^3$ | $8.5\times10^2$ |
| Cm-243 | 29.1 y | ( | $1.3\times10^3$ | 760 | 250 | 150 |
| Cm-244 | 18.10 y | | $1.5\times10^3$ | $8.8\times10^2$ | 290 | $1.8\times10^2$ |
| Np-237 | $2.144\times10^6$ y | ( | $2.0\times10^3$ | $1.2\times10^3$ | 390 | $2.4\times10^2$ |
| Po-210 | 138.4 d | | 65 | 40 | 13 | 7.9 |
| Pu-238 | 87.7 y | | 900 | 550 | 180 | 110 |
| Pu-239 | $2.411\times10^4$ y | | 850 | 520 | 170 | 100 |
| Pu-240 | $6.564\times10^3$ y | | 850 | 520 | 170 | 100 |
| Ra-226 | $1.600\times10^3$ y | ( DP | 460 | 280 | 90 | 55 |
| Th-228 | 1.912 y | ( DP | $1.3\times10^3$ | 790 | 260 | 160 |
| Th-230 | $7.538\times10^4$ y | | 900 | 550 | 180 | 110 |
| Th-232 | $1.41\times10^{10}$ y | ( DP | 800 | 490 | 160 | 97 |
| U-234 | $2.455\times10^5$ y | ( DP | $3.2\times10^3$ | $1.9\times10^3$ | 650 | 400 |
| U-235 | $7.038\times10^8$ y | ( DP | $3.3\times10^3$ | $2.0\times10^3$ | 650 | 400 |
| U-238 | $4.468\times10^9$ y | ( DP | $3.5\times10^3$ | $2.1\times10^3$ | 700 | 430 |

Notes:

[1] The half-lives of the nuclides are given in years (y) or days (d). DP refers to "decay products." Radionuclide above the gray bar is default for calibrating screening instrumentation.

[2] The values in this table correspond to the numbered rectangles 2 and 7 in Radioanalytical Scenario 1.

[3] The $u_{MR}$ and ADL for $^{241}$Am are used for gross alpha screening.

[4] The relative required method uncertainty ($n_{MR}$) for values greater than the AALs in Table 10A of Appendix VI can be obtained by dividing the $u_{MR}$ value in this table by the corresponding AAL value in Table 10A.

[5] The individual required method uncertainty ($u_{MR}$)values in this table apply up to the corresponding values for AALs or 100-mrem values, respectively, identified in the tables in Appendix VI. Above the values noted in the Appendix VI tables, the relative required method uncertainty ($n_{MR}$)would apply.



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**TABLE 5B – Analytical Decision Levels (ADL) For Gross Beta or Gamma Screening Analysis**

| Radionuclide | Emission Type | Half-Life [1] | pCi/L | | | |
|---|---|---|---|---|---|---|
| | | | 500 mrem | | 100 mrem | |
| | | | ADL | Required Method Uncertainty [3, 6] ($u_{MR}$) | ADL | Required Method Uncertainty [3, 6] ($u_{MR}$) |
| Beta Gamma Screen[2] | $ ( | 30.07 y | $2.9\times10^4$ | $1.8\times10^4$ | $6.0\times10^3$ | $3.6\times10^3$ |
| Sr-90[2] | $ ($ DP) | 28.79 y | $6.0\times10^3$ | $3.6\times10^3$ | $1.2\times10^3$ | 730 |
| Co-60[2] | $ ( | 5.270 y | $1.7\times10^4$ | $1.0\times10^4$ | $3.3\times10^3$ | $2.0\times10^3$ |
| Ac-227+DP | $ (" DP) | 21.77 y | 550 | 330 | 110 | 67 |
| Ce-141 | $ ( | 32.51 d | $1.1\times10^5$ | $6.7\times10^4$ | $2.2\times10^4$ | $1.3\times10^4$ |
| Ce-144 | $ ( | 284.9 d | $1.5\times10^4$ | $8.8\times10^3$ | $2.9\times10^3$ | $1.8\times10^3$ |
| Co-57 | ( | 271.1 d | $3.2\times10^5$ | $1.9\times10^5$ | $6.5\times10^4$ | $4.0\times10^4$ |
| Cs-134 | $ ( | 2.065 y | $2.2\times10^4$ | $1.3\times10^4$ | $4.3\times10^3$ | $2.6\times10^3$ |
| Cs-137 | $ ( | 30.07 y | $2.9\times10^4$ | $1.8\times10^4$ | $6.0\times10^3$ | $3.6\times10^3$ |
| H-3 | weak $ | 12.32 y | $3.9\times10^6$ | $2.3\times10^6$ | $7.5\times10^5$ | $4.6\times10^5$ |
| I-125 | ( | 59.40 d | $6.5\times10^3$ | $4.0\times10^3$ | $1.3\times10^3$ | 790 |
| I-129 | $ ( | $1.57\times10^7$ y | $1.7\times10^3$ | $1.0\times10^3$ | 330 | 200 |
| I-131 | $ ( | 8.021 d | $2.7\times10^3$ | $1.6\times10^3$ | 550 | 330 |
| Ir-192 | $ ( | 73.83 d | $6.0\times10^4$ | $3.6\times10^4$ | $1.2\times10^4$ | $7.3\times10^3$ |
| Mo-99 | $ ( (( DP) | 65.94 h | $1.6\times10^5$ | $9.7\times10^4$ | $3.2\times10^4$ | $1.9\times10^4$ |
| P-32 | $ | 14.26 d | $3.0\times10^4$ | $1.8\times10^4$ | $6.0\times10^3$ | $3.6\times10^3$ |
| Pd-103 | ( | 16.99 d | $3.9\times10^5$ | $2.4\times10^5$ | $8.0\times10^4$ | $4.9\times10^4$ |
| Pu-241 | $ | 14.29 y | $5.0\times10^4$ | $3.0\times10^4$ | $1.0\times10^4$ | $6.1\times10^3$ |
| Ra-228 | $ (( DP) | 5.75 y | 80 | 49 | 16 | 9.7 |
| Ru-103 | $ ( | 39.26 d | $1.2\times10^5$ | $7.0\times10^4$ | $2.3\times10^4$ | $1.4\times10^4$ |
| Ru-106 | $ ( | 373.6 d | $1.1\times10^4$ | $6.7\times10^3$ | $2.2\times10^3$ | $1.3\times10^3$ |
| Se-75 | ( | 119.8 d | $3.4\times10^4$ | $2.0\times10^4$ | $6.5\times10^3$ | $4.0\times10^3$ |
| Sr-89 | $ | 50.53 d | $3.2\times10^4$ | $1.9\times10^4$ | $6.5\times10^3$ | $4.0\times10^3$ |
| Tc-99 | $ ( | $2.11\times10^5$ y | $1.2\times10^5$ | $7.3\times10^4$ | $2.4\times10^4$ | $1.5\times10^4$ |

Notes:

[1] The half-lives of the nuclides are given in years (y), days (d), or hours (h). DP refers to "decay products." Radionuclides above the gray bar are the default radionuclides for calibrating screening instrumentation.

[2] The AAL and associated $u_{MR}$ and ADL values for $^{137}$Cs are used for initial beta gamma screening analysis on sample bottle (Step 1 in Radioanalytical Scenarios 1 and 2). The AAL and associated $u_{MR}$ and ADL values for $^{60}$Co concentration are used for gross gamma measurements thereafter (see text). The AAL and associated $u_{MR}$ and ADL values for $^{90}$Sr are the defaults used gross beta screening.

[3] The relative required method uncertainty ($n_{MR}$) for values greater than the AAL values in Table 10B of Appendix VI can be obtained by dividing the $u_{MR}$ value in this table by the corresponding AAL value in Table 10B.

[4] Several nuclides in Table 5B decay by electron capture. These radionuclides cannot be detected using gross $ analysis. The electron-capture decay leads to characteristic X-rays of the progeny nuclide. The most effective way to detect the X-rays from these electron-capture-decay radionuclides is either with a low-energy photon detector (LEPD) or a reverse electrode germanium detector (N-type semiconductor detector). The lower energy range of these detectors is about 10 keV.

[5] If ( isotopic analysis versus gross ( analysis is used for rectangles 2 and 7 in Radioanalytical Scenario 1, comparisons should be made to the value specific for the radionuclide found in the ( analysis listed in this table.

[6] The individual required method uncertainty ($u_{MR}$) values in this table apply up to the corresponding values for AALs or 100-mrem AALs identified in the tables in Appendix VI. Above the values noted in the Appendix VI tables, the relative required method uncertainty ($n_{MR}$) applies.



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**TABLE 6A – Required Method Uncertainties for Alpha-Emitting Radionuclides at 100-mrem AAL When Using Radionuclide-Specific Methods**

| Radionuclide | pCi/L | |
|---|---|---|
| | 100-mrem ADL [1] | Required Method Uncertainty at or Below 100-mrem AAL [2, 3, 4] $u_{MR}$ |
| Am-241 | 280 | 50 |
| Cm-242 | $2.0\times10^3$ | 350 |
| Cm-243 | 350 | 63 |
| Cm-244 | 410 | 73 |
| Np-237 | 550 | 98 |
| Po-210 | 18 | 3.3 |
| Pu-238 | 250 | 45 |
| Pu-239 | 240 | 43 |
| Pu-240 | 240 | 43 |
| Ra-226 | 130 | 23 |
| Th-228 | 370 | 65 |
| Th-230 | 250 | 45 |
| Th-232 | 230 | 40 |
| U-234 | 920 | 160 |
| U-235 | 920 | 160 |
| U-238 | 990 | 180 |

Notes:

[1] Only the 100-mrem ADL and the associated required method uncertainty ($u_{MR}$) are shown.

[2] See Appendix VI for the rationale and methodology used in determining these values.

[3] These method uncertainties are applicable to each radionuclide when a radionuclide-specific method is used to determine the activity result .

[4] The values corresponding to an AAL of 100 mrem were chosen for these tables. These values can be used to conveniently scale to other project-specific AALs. For example, if a specific project had AALs at 20 mrem (one-fifth of 100 mrem), the table values can be scaled down simply by dividing the listed values by five. Thus, for an analytical action level of 20 mrem, the respective values for $^{210}$Po would be one fifth the values listed in Table 10A and this table:

$$\text{20-mrem AAL} = [\text{100-mrem AAL} / 5] = [26/5] \ . \ 5.2 \text{ pCi/L},$$

$$\text{20-mrem } u_{MR} = [\text{100-mrem } u_{MR} / 5] = [3.3/5] \ . \ 0.66 \text{ pCi/L}$$

and the corresponding 20-mrem ADL would be:

$$\text{20-mrem ADL} = [\text{100-mrem ADL}/5] = [18/5] = 3.6$$

See Appendix VI for details of these calculations.

**TABLE 6B – Required Method Uncertainties for Beta- or Gamma-Emitting Radionuclides at 100-mrem AAL When Using Radionuclide-Specific Methods**

| | pCi/L | |
|---|---|---|
| **Radionuclide** | **100-mrem ADL [1]** | **Required Method Uncertainty at or Below 100-mrem AAL [2, 3, 4]** $u_{MR}$ |
| Ac-227+DP | 160 | 28 |
| Ce-141 | $3.1\times10^4$ | $5.5\times10^3$ |
| Ce-144 | $4.1\times10^3$ | 730 |
| Co-57 | $9.2\times10^4$ | $1.6\times10^4$ |
| Co-60 | $4.7\times10^3$ | 830 |
| Cs-134 | $6.1\times10^3$ | $1.1\times10^3$ |
| Cs-137 | $8.5\times10^3$ | $1.5\times10^3$ |
| H-3 | $1.1\times10^6$ | $1.9\times10^5$ |
| I-125 | $1.8\times10^3$ | 330 |
| I-129 | 470 | 83 |
| I-131 | 780 | 140 |
| Ir-192 | $1.7\times10^4$ | $3.0\times10^3$ |
| Mo-99 | $4.5\times10^4$ | $8.1\times10^3$ |
| P-32 | $8.5\times10^3$ | $1.5\times10^3$ |
| Pd-103 | $1.1\times10^5$ | $2.0\times10^4$ |
| Pu-241 | $1.4\times10^4$ | $2.5\times10^3$ |
| Ra-228 | 23 | 4.0 |
| Ru-103 | $3.3\times10^4$ | $5.8\times10^3$ |
| Ru-106 | $3.1\times10^3$ | 550 |
| Se-75 | $9.2\times10^3$ | $1.6\times10^3$ |
| Sr-89 | $9.2\times10^3$ | $1.6\times10^3$ |
| Sr-90 | $1.7\times10^3$ | 300 |
| Tc-99 | $3.4\times10^4$ | $6.0\times10^3$ |

Notes:

[1] Only the ADL of 100 mrem and the associated required method uncertainty ($u_{MR}$) are shown.

[2] See Appendix VI for the rationale and methodology used in determining these values.

[3] These method uncertainties are applicable to each radionuclide when a radionuclide specific method is used to determine the activity result.

[4] The values corresponding to an AAL of 100 mrem were chosen for these tables and can be used to conveniently scale to other project-specific AALs. For example, if a specific project had AALs at 20 mrem (one-fifth of 100 mrem), the table values can be scaled down simply by dividing the listed values by five. Thus, for an AAL of 20 mrem, the value for $^{90}$Sr would be one-fifth the values listed in Table 10B and this table:

$$20 \text{ mrem AAL} = 100 \text{ mrem AAL} / 5 = [2400/5] = 480 \text{ pCi/L}$$

$$20 \text{ mrem } u_{MR} = 100 \text{ mrem } u_{MR} / 5 = [300/5] = 60 \text{ pCi/L}$$

and its corresponding ADL would be:

$$20 \text{ mrem ADL} = 100 \text{ mrem ADL} / 5 = [1700 / 5] = 340 \text{ pCi/L}$$

See Appendix VI for details of these calculations.



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**TABLE 7A – Maximum Contaminant Levels (MCL) and Required Detection Levels (RDL) for Alpha-Emitting Radionuclides in Water**

| Radionuclide | Drinking Water MCL [1] pCi/L (mg/L) [2] | Drinking Water RDL[5] pCi/L (mg/L) [2] |
|---|---|---|
| Gross " Screen | 15 | 3[4] |
| Am-241 | 15 ($4.4\times10^{-9}$) | 1.5 ($4.4\times10^{-10}$) |
| Cm-242 | 15 ($4.5\times10^{-12}$) | 1.5 ($4.5\times10^{-13}$) |
| Cm-243 | 15 ($3.0\times10^{-10}$) | 1.5 ($3.0\times10^{-11}$) |
| Cm-244 | 15 ($1.8\times10^{-10}$) | 1.5 ($1.8\times10^{-11}$) |
| Np-237 | 15 ($2.2\times10^{-5}$) | 1.5 ($2.2\times10^{-6}$) |
| Po-210 | 15 ($3.3\times10^{-12}$) | 1.5 ($3.3\times10^{-13}$) |
| Pu-238 | 15 ($8.9\times10^{-10}$) | 1.5 ($8.9\times10^{-11}$) |
| Pu-239 | 15 ($2.4\times10^{-7}$) | 1.5 ($2.4\times10^{-8}$) |
| Pu-240 | 15 ($6.6\times10^{-8}$) | 1.5 ($6.6\times10^{-9}$) |
| Ra-226 [3] | 5 ($5.1\times10^{-10}$) | 1.0 ($1.3\times10^{-10}$) |
| Th-228 [3] | 15 ($1.8\times10^{-11}$ | 1.5 ($1.8\times10^{-12}$) |
| Th-230 | 15 ($7.3\times10^{-7}$) | 1.5 ($7.3\times10^{-8}$) |
| Th-232 | 15 ($1.4\times10^{-1}$) | 1.5 ($1.4\times10^{-2}$) |
| U-234 | — | — |
| U-235 | — | — |
| U-238 | 20 ($3.0\times10^{-2}$ ) | 2.0 ($3.0\times10^{-3}$) |
| U-Nat | 20 (3.0×10–2 ) | 2.0 (3.0×10–3) |

Notes:
[1] Continuous intake.
[2] Value in parenthesis is mass concentration units, (ppm).
[3] Combined concentration of $^{228}$Ra and $^{226}$Ra not to exceed 5 pCi/L.
[4] Value for RDL taken from 40 CFR 141.26(a)(2)(iii). See "Final Implementation Guidance for Radionuclides," EPA 816-F-00-002, March 2002. Available at: www.epa.gov/safewater/radionuclides/compliancehelp.html.
[5] RDL value taken as 1/10 of the MCL value if not otherwise specified in the regulations.



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**TABLE 7B – Maximum Contaminant Levels (MCL) and Required Detection Levels (RDL) for Beta/Gamma-Ray Emitting Radionuclides in Drinking Water**

| Radionuclide | Drinking Water MCL [1] pCi/L (mg/L) [2] | Drinking Water RDL [6] pCi/L (mg/L) [2] |
|---|---|---|
| Gross $ Screen | 50 | 5.0 |
| Ac-227+DP [4] | 15 | 1.5 |
| Ce-141 | 300 ($1.1\times10^{-11}$) | 30 ($1.1\times10^{-12}$) |
| Ce-144 | 29, 30[4] ($9.4\times10^{-12}$) | 2.9, 3.0 ($9.4\times10^{-13}$) |
| Co-57 | 1,000 ($1.2\times10^{-10}$) | 100 ($1.2\times10^{-11}$) |
| Co-60 | 100 ($8.8\times10^{-11}$) | 10 ($8.8\times10^{-12}$) |
| Cs-134 | 80 ($6.2\times10^{-11}$) | 10 ($7.8\times10^{-12}$) |
| Cs-137 | 200 ($2.3\times10^{-9}$) | 20 ($2.3\times10^{-10}$) |
| H-3 | $2.0\times10^{4}$ (N/A) | 1,000 (N/A) [7] |
| I-125 | 30 ($1.7\times10^{-12}$) | 3.0 ($1.7\times10^{-13}$) |
| I-129 | 1 ($5.7\times10^{-6}$) | 0.1 ($5.7\times10^{-7}$) |
| I-131 | 3 ($2.4\times10^{-14}$) | 1.0 ($8.0\times10^{-15}$) [7] |
| Ir-192 | 100 ($1.1\times10^{-11}$) | 10 ($1.1\times10^{-12}$) |
| Mo-99 | 600 ($1.2\times10^{-12}$)[5] | 60 ($1.2\times10^{-13}$) |
| P-32 | 30 ($1.0\times10^{-13}$)[5] | 3.0 ($1.0\times10^{-14}$) |
| Pd-103 | 900 ($1.2\times10^{-11}$)[5] | 90 ($1.2\times10^{-12}$) |
| Pu-241 | 300 ($2.9\times10^{-9}$)[5] | 30 ($2.9\times10^{-10}$) |
| Ra-228 [3] | 5 ($1.8\times10^{-11}$) | 1.0 ($3.7\times10^{-12}$)[7] |
| Ru-103 | 200 ($6.2\times10^{-12}$) | 20 ($6.2\times10^{-13}$) |
| Ru-106 | 30 ($9.1\times10^{-12}$) | 3.0 ($9.1\times10^{-13}$) |
| Se-75 | 900 ($6.2\times10^{-11}$) | 90 ($6.2\times10^{-12}$) |
| Sr-89 | 20 ($6.9\times10^{-13}$) | 10 ($3.4\times10^{-13}$) [7] |
| Sr-90 | 8 ($5.8\times10^{-11}$) | 2.0 ($1.4\times10^{-11}$) [7] |
| Tc-99 | 900 ($5.3\times10^{-5}$) | 90 ($5.3\times10^{-6}$) |

Notes:

[1] Continuous intake.

[2] Value in parenthesis is mass concentration units (ppm).

[3] Combined concentration of $^{228}$Ra and $^{226}$Ra not to exceed 5 pCi/L.

[4] Includes decay products originating from the $^{227}$Ac in the body. Used only to calculate the concentration (pCi/L) or dose from $^{227}$Ac in the body. DP refers to "decay products."

[5] Value from OSWER Directive 9283.1-14, Appendix B: "Use of Uranium Drinking Water Standards under 40 CFR 141 and 40 CFR 192 as Remediation Goals for Groundwater at CERCLA sites." November 6, 2001. Available at: www.epa.gov/superfund/health/contaminants/radiation/pdfs/9283_1_14.pdf..

[6] RDL value taken as 1/10 of the MCL value if not otherwise specified in the regulations.

[7] RDL value taken from "Radionuclides Notice of Data Availability Technical Support Document,"(March 2000). Available at: www.epa.gov/safewater/rads/tsd.pdf. 40 CFR 141.26(a)(2)(iii). See "Final Implementation Guidance for Radionuclides," EPA 816-F-00-002, March 2002. Available at: www.epa.gov/safewater/radionuclides/compliancehelp.html.



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# APPENDIX II. Example of High Radionuclide Concentration in Water (Radioanalytical Scenario 1)

## Description

Surface water, storm water, drinking water, and estuaries have been impacted by an RDD. The specific radionuclides causing the radiological incident have not yet been determined, nor has their concentration in these samples. The event sequence in the laboratory assumes a single analyst following the analytical process chart, under conditions of single process stream. Analysis at this point is to assess if the 500-mrem AAL[1] values are exceeded by measurement of the sample's total gross radioactivity with hand-held survey instruments. These might include a survey meter or Geiger-Muller counter with appropriately calibrated beta and gamma detector probes or a micro-roentgen meter (gamma only).[2] This step would most likely be performed with the sample container, unopened, leaving the determination of " AAL values to the next step. Unless the identification of the radionuclide contamination is known, the hand-held survey instrument should be calibrated to respond to a gross screening $ and ( concentration of $5.8\times10^4$ pCi/L; a $^{137}$Cs calibration source should be used. If the identity of the radionuclide(s) is known, the ADL for the radionuclide listed for the 500-mrem value is to be used (see Table 5B, page 33). For survey instruments having an exposure rate readout, the instruments should be calibrated in terms of pCi/L per exposure unit readout for each container geometry expected and for the nuclide of interest ($^{137}$Cs for unidentified nuclides).

## Event Sequence

It is Day 1 of the event. The incident responders have established a field office for coordinating response efforts, including a laboratory project manager. At 1200 hours of Day 1, the incident-response team sends a laboratory three water samples taken from the affected area that they believed to be significantly above background radiation levels. The samples arrive at the laboratory at *Day 1, 1500 hours.*

## Analysis Path

Laboratory personnel perform an initial scan of the three 1-liter sample containers using a hand-held survey meter with appropriate detector probe obtaining the data in the table below. The average beta detection efficiency is 30%, and one may assume that the probe responds only to 10% of the decays from the sample bottle. Thus, the overall beta-detection efficiency for this scanning technique is 3 %. The overall gamma survey instrument response (a NaI(Tl) detector) conversion factor for this sample geometry (i.e., the one-liter sample bottle) is 53.6 pCi/( : R/h).

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[1] Depending on the time of the response, a 2-rem PAG may be applicable. If so, the radionuclide concentrations corresponding to the 2-rem PAG DWC can be calculated by taking the values for the 100-mrem column in the table and multiplying by 20.

[2] Some manufacturers have developed kits that include the survey meter plus an alpha–beta–gamma pancake GM detector and a NaI gamma detector.



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| Container ID | Gross Beta, cpm | Gross Gamma, : R/h |
|---|---|---|
| 1 | 5,100 | 1,175 |
| 2 | 470 | 57 |
| 3 | 300 | 35 |
| Background | 300 | 35 |

Alpha analysis has not yet been performed on these samples. The sample measurements from the above table are converted to units comparable to those in Table 6A for Container 1 having a 1-L volume as follows:

$$\text{Gross Beta Activity} = \frac{(5100\text{-}300)\ \text{cpm}}{(3.7 \times 10^{-2}\,\text{dps/ pCi}) \times 60\ \text{s/ min} \times 0.03} = 72{,}070\ \text{pCi / L}$$

and

$$\text{Gross Gamma Activity} = (1{,}175\text{-}35\ \text{: R/h}) \times (\ 53.6\ \text{pCi / : R/h}) = 61{,}104\ \text{pCi/L.}$$

The gross beta result exceeds the screening ADL of $2.9\times10^4$ pCi/L, and the gamma value exceeds the gross screening gamma ADL for $^{137}$Cs in Table 5B ($4.1\times10^4$ pCi/L), which take the sample priority to the **red** flow path for Container 1, Step 2, of Figure 2 (page 13).

A similar analysis for Container 2 yields 2,552 pCi/L beta and 1,179 pCi/L gamma. This takes us to the **green** flow path for Container 2 because it is less than the gross screening value of $2.9\times10^4$ pCi/L. Container 3 is measuring the equivalent of background dose rates, and at this point would be relegated to the **yellow** flow path. *The time is Day 1, 1600 hrs.*

**Step 2, Container 1.** A 5-mL aliquant of Container 1 is taken for gross alpha/beta analysis by liquid scintillation counting and gross gamma by Na(I)Tl. The net 15-min count rate for beta is $9.25\times10^2$ cpm (corrected for full open window efficiency of 0.60, yields $1.38\times10^5$ pCi/L), and for alpha is $1.14\times10^2$ cpm (corrected for full open window efficiency of 0.10, yields $1.02\times10^5$). The laboratory compares the pCi/L values with those in Tables 5A and 5B. The laboratory personnel will find that both alpha and beta values exceed the maximum ADL concentration listed ($^{241}$Am for alpha and $^{90}$Sr for beta).

The laboratory notes that the liquid scintillation gross beta counts far exceed the survey instrument gross beta counts. This indicates the presence of low energy beta emitters that would not be detected by a survey instrument.

The gross gamma count of $2.65\times10^2$ cpm (corrected for 85% efficiency to $2.8\times10^4$ pCi/L) is also greater than the ADL concentration in Table 5B ($1.6\times10^4$ for $^{60}$Co). The well NaI(Tl) detector display indicates the presence of several gamma ray peaks in the spectrum. The sample stays on the fast track **(red)** for analysis.

*The time is Day 1, 1700 hours.*

**Step 3, Container 1.** The laboratory compares the results of the Step 2 screening analyses with the 500-mrem ADL concentrations for screening in Tables 5A and 5B and determines that ADL concentrations have been exceeded for Container 1 for all three classes of analytes (", $, and ( ).



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The laboratory manager promptly notifies the IC that initial screening indicates that the 500-mrem AAL concentrations may have been exceeded for Container 1.

A sub-sample (aliquant) would be taken for each class of analysis (three total). While the digestions of the sub-samples for alpha (Step 4) and beta (Step 5) specific analyses are being performed, the third sample will be counted on an HPGe detector for about 1 hour (Step 6) for specific gamma ray identification.

The gamma spectrum will show net activity in several gamma peaks: 186, 295, 352, 609, 1,120, and 1,764 keV. These gamma peaks will be significantly above detector backgrounds for these energies, which correspond to $^{226}$Ra (and $^{214}$Pb/$^{214}$Bi progeny of $^{222}$Rn and $^{226}$Ra). This suggests to the analyst at least that $^{226}$Ra is present. Activity estimates for $^{226}$Ra can be made from the gamma-spectrometry data for the 186-keV peak. Due to the diffusion of $^{222}$Rn from water, it is expected that equilibrium between $^{226}$Ra and $^{222}$Rn (and decay progeny) in the water sample will not be attained. As such, the $^{226}$Ra activity estimates from the $^{226}$Ra/$^{222}$Rn progeny photopeaks 295, 352, 609, 1,120, and 1,764 keV will be biased low. However, it will show that the total beta activity does not come from only the contribution of the radium progeny. *The time is Day 1, 1830 hours.*

**NOTE**: No peak at 661 keV for $^{137}$Cs is found. The survey instruments used for screening analysis should be recalibrated with a gamma emitter that more closely matches the gamma energies of the $^{214}$Pb/Bi radionuclides.

It must be kept in mind that the gamma spectrum has eliminated the possibility of $^{131}$I and $^{137}$Cs, for this sample. However, tritium must be analyzed specifically, as its presence cannot be detected with the initial survey instruments and may be obscured during the gross liquid scintillation analysis due to the presence of the other beta emitters in high concentrations (see caution about beta mismatch in the preceding note about Step 2). Thus, an aliquant of the original sample or that used for the gamma spectrometry should be distilled, and the distillate analyzed for tritium. Sample analysis for tritium indicates 80,000 pCi/L tritium present at *Day 1, 1930 hours.*

When the alpha- and beta-specific analyses are completed, only $^{90}$Sr at 8,000 pCi/L, $^{226}$Ra at 28,000 pCi/L (and their respective progeny) and $^{3}$H at 80,000 pCi/L are found. It is important to note that the total gamma activity from $^{226}$Ra and its decay products is only about 80% of the total beta activity from these radionuclides. This is due to the low abundance of the gamma rays from this group of radionuclides.

**Step 15, Container 1.** These values are reviewed and are within about 25% of predicted from the gross analysis performed in Step 2. The value for $^{226}$Ra exceeds the 500-mrem ADL concentration of 460 pCi/L, $^{90}$Sr value exceeds the 500-mrem ADL concentration of $6.0\times10^{3}$, and $^{3}$H exceeds the 20,000 pCi/L MCL from the SDWA. These results are transmitted to the Incident Command Post. *The time is Day 1, 2030 hours.*

The remainder of the original sample is preserved, potentially for future analysis. The analysis of the container with the next highest priority based on dose would now proceed.

**Step 7, Container 2.** This container has initial measurements of 470 cpm beta and 57 ：R/h gamma



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corresponding to 2,552 pCi/L[1] gross beta and 1,179 pCi/L gross gamma. It will follow the green flow path from Step 1. The analysis of a 5-mL aliquant for a 15-minute gross alpha/beta count by liquid scintillation will proceed.

**Steps 8 and 9, Container 2.** Step 7 yields a gross alpha value of $2.8\times10^{11}$ cpm (corrected for full open window efficiency of 0.10, yields $2.52\times10^{2}$ pCi/L) and gross beta value of 17 cpm (corrected for full open window efficiency of 0.60 , yields $2.55\times10^{3}$ pCi/L). These, when compared to the values in Tables 5A and 5B, verify that the 500-mrem ADL concentrations have not been exceeded, but the 100-mrem ADL screening values of $2.0\times10^{2}$ pCi/L (based on $^{241}$Am) and $1.2\times10^{3}$ (based on $^{90}$Sr) have been exceeded. *The time is Day 1, 2100 hours.*

**Step 10, Container 2.** Analysis of alpha, beta, and gamma-specific radionuclides begins. Gamma spectrometry indicates no gamma rays are present except for those from $^{226}$Ra progeny. *The time is Day 1, 2230 hours.*

The aliquant from Container 2 is analyzed for tritium directly and found to contain 1800 pCi/L. *The time is Day 1, 2330 hours.*

First results from the alpha- and beta-specific analyses are completed. *The time is Day 2, 0300 hours.*

All alpha- and beta-specific analyses are completed. Supervisory review of results is completed, identifying the presence of $^{226}$Ra ($6.3\times10^{1}$ pCi/L) and $^{90}$Sr ($3.0\times10^{2}$ pCi/L). *The time is Day 2, 1300 hours.*

**Steps 15 and 16, Container 2.** Comparison of the gross alpha and gross beta to the sum of the alpha- and beta-emitting radionuclides matches to within 30%. None of the individual values of the identified radionuclides exceed their respective 100-mrem ADL concentration. Nor does the sum of the fractions of the $- and (-emitting radionuclides (0.126) exceed the aggregate AAL (1.0).[2] Thus neither exceeds the 100-mrem level. Results are reported to the Incident Commander. The remainder of the original sample is preserved for future analysis. The analysis of the container with the next highest priority (based on dose) would now proceed. *The time is Day 2, 1500 hrs.*

**Step 11, Container 3.** Initial micro-R or survey meter screening of this sample resulted in a dose rate equivalent to background, and the sample aliquants analyzed by LSC also were equivalent to

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[1](470-300)/[(0.03)(2.22) = 2,552 pCi/L beta, (57-35)[53.6 pCi/ ( : R/h)] = 1,179 pCi/L gamma

[2]The sum of the fractions is calculated as follows using the values from Tables 10A and 10B (Appendix VI) under the 100-mrem level (green) columns (Note that the contribution from " emitters is not included as part of the sum of fractions.):

| Radionuclide | Table 10A or 10B Value (pCi/L) | Sample Concentration From Radioanalytical Scenario (pCi/L) | Fraction |
|---|---|---|---|
| $^{3}$H | $1.5\times10^{6}$ | $1.8\times10^{3}$ | $1.2\times10^{-3}$ |
| $^{90}$Sr | $2.4\times10^{3}$ | $3.0\times10^{2}$ | $1.25\times10^{-1}$ |
| Sum | — | — | 0.126 |



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background in the short count. Following Step 9 on the decision tree, the gross beta-to-gamma ratio (Step 11) is calculated for a 10–15-mL aliquant of the sample (dried onto a planchet) and counted with a hand-held device. (It also would be possible to use the gross count data from the LSC and gamma spectrometry analyses to compute this value if more convenient for the analyst.) If the ratio is greater than 2.5, there is a strong possibility that $^{90}$Sr is present and that analysis should be immediately initiated. Due to the low activity in this sample, it is unlikely that it has been affected by the event, but it is prudent to determine whether if abnormal levels of $^{90}$Sr are present. Due to the low activity in this sample, it is unlikely that it has been affected by the event. It is preserved, and, if necessary, analysis may be resumed later at Step 12. *The time is Day 2, 1600 hours.*

**Steps 12 and 13, Container 3.** A 250-mL aliquant of the sample is counted by GPC to assess the gross alpha and beta values with respect to the maximum contaminant level (MCL). If gross alpha or gross beta is greater than 5 or 50 pCi/L, respectively, then the radionuclide-specific analyses should be performed if deemed necessary by the IC. If both are less than these values, the remainder of the original sample should be archived for analysis at a later time (Step 17). If this sample is less than both 5 and 50 pCi/L for alpha and beta, respectively, then it may be suitable as a drinking water source, and further analysis would be required. The actual gross alpha and beta results are 2 and 5 pCi/L, respectively. *The time is Day 2, 1800 hours.*

**Steps 14 and 15, Container 3.** The sample analyses have been completed for all alpha, beta and gamma emitters. Only traces of strontium above background (0.5 pCi/L) have been detected. The results are reviewed and transmitted to the IC. *The time is Day 2, 2100 hours.*

*Elapsed time from receipt of samples at laboratory: 30 hours.*



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# APPENDIX III. Example of Finding a Potable Water Source (Radioanalytical Scenario 2)

## Description[1]

During the intermediate phase following the detonation of an RDD, sources of potable water will need to be evaluated for radioactive contamination. For this scenario, the priority switches from the high priority for high-activity samples (clearly not potable) to high priority for low-activity samples. Thus, all water samples are screened for gross alpha and beta radioactivity based on the MCL screening levels, and those samples having gross radioactivity concentrations *below* the MCL have priority for specific contaminant analyses. The radionuclide contaminants that initiated the incident should have been completely characterized by now under "Radioanalytical Scenario 1," and their results would lead into the specific radioanalytical processes. However, it is possible that the water sources may have other radionuclide contaminants, either related to the initial incident or from naturally occurring sources, which also will need to be characterized. It is important to note that the priority flow path for this scenario is set up the *opposite* of Radioanalytical Scenario 1: the high priority flow path is for those samples that have very low activity. Additionally the flow diagrams are based on the concept of establishing the MDC as the AAL. Thus, the values for the ADLs are calculated using Tables 11A and 12 in Appendix VI.

## Event Sequence

It is Day 8 following an RDD event. The intermediate phase of the event is ongoing. The Incident Command Center has dispatched three samples to be assessed for their potential as drinking water sources for population areas where people will be returning to live.

The time frame for results is not as critical as in Radioanalytical Scenario 1, but prompt identification of drinking water sources is important in rebuilding public confidence in the cleanup effort. The only radionuclides that have been identified in any of the samples to date are $^{226}$Ra (and its progeny), $^{3}$H, and $^{90}$Sr. The beta survey meter has been calibrated with a $^{90}$Sr-specific source, and an overall efficiency for a 1 liter sample geometry is found to be 8%. The response of the micro-R meter to a radium source has been found to be 70 pCi/( : R/h).

*The three samples arrive at the laboratory at 0800 on Day 8.*

## Analysis Path

The three samples are screened upon arrival using a micro-R meter and a beta survey meter, yielding the following results based on the instrument specific calibrations:

| Sample Container | Container 5 | Gross pCi/L | Container 6 | Gross pCi/L | Container 7 | Gross pCi/L | Instrument Background |
|---|---|---|---|---|---|---|---|
| Gross Beta, cpm | 2,300 | 11,261 | 300 | 0 | 300 | 0 | 300 |
| : R/h | 38 | 210 | 36 | 70 | 35 | 0 | 35 |

[1]The events and radionuclides for Radioanalytical Scenario 2 are unrelated to Radioanalytical Scenario 1.



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Container 5 is greater than the 100-mrem ADL concentration for $^{90}Sr$ (see Table 6B) and is set aside for analysis at a later date. Containers 6 and 7 are less than any 100 mrem values except for $^{228}Ra$.

**Steps 2a and 2b, Containers 6 and 7.** The potential radionuclides are $^{226}Ra$, $^{3}H$, and $^{90}Sr$. An 8-mL aliquant of each sample is counted for 100 minutes on a gas proportional counter (GPC) with the following results. (See Appendix VI, Table 12, for approximate counting times. Laboratory personnel should use specific correction factors from their instruments to determine these times).

| Sample Container | Container 6 | Container 7 | Reagent Blank Background |
|---|---|---|---|
| GPC cpm, alpha | 0.04 | 0.02 | 0.02 |
| GPC cpm, beta | 145 | 12.3 | 4.5 |

Container 6 gross beta result is greater than 10,000 pCi/L, and the high GPC result compared to the beta screening result indicates a low energy beta emitter. Therefore, it is checked for preservation requirements and stored for analysis in the near future (next day or two), continuing at Step 13.

Container 7 has a gross beta concentration of 84 pCi/L. This is possibly a potable water source depending upon the specific radionuclides contained in the sample. An aliquant is removed for tritium analysis (Step 4a), and will also be assessed using Steps 3, 4b, and 6. *It is Day 9, 0900 hours.*

**Step 4b, Container 7.** This analysis from Step 4a should be started prior to taking any other steps. An assessment of whether or not the ADL for tritium has been exceeded can be determined using LSC in about 40 minutes. For this sample, the tritium concentration is determined to be 580 pCi/L (the ADL for the analysis was determined to be 410 pCi/L). This confirms that Steps 3, 5, and 6 should proceed. *It is Day 9, 1400 hours.*

**Steps 3, 5, and 6, Container 7.** Due to the low reading on the micro-R or survey meter in Step 1, a larger sample size was taken for the sample in Step 2b. In order to approximate the RDL values in the SDWA, the lab selects a sample size commensurate with its normal water quality programs. Looking ahead to Step 6, the sample follows the path "5–15 pCi/L" to the next step, "Begin radionuclide-specific alpha analysis" (Step 8). Also, Step 5 divides at the 50 pCi/L level, significantly above this sample, so the next step is "begin radionuclide-specific beta analyses" (Step 7). Beta-specific and gamma analyses should be performed in parallel.

The alpha- and beta-specific analyses are completed, yielding values for $^{226}Ra$ of 3.6 pCi/L and for $^{90}Sr$ of 1.2 pCi/L. *It is Day 10, 1200 hours.*

**Step 9, Container 7.** While beta- and alpha-specific analyses are being performed, gamma spectrometry also should be performed on this sample. Dependent on detector efficiency and sample size used, the count time will be between about 1 to 4 hours. No gamma-ray emitters are identified in this sample, except for $^{214}Pb/^{214}Bi$. Ra-228 analysis also is performed, and results are 1.1 pCi/L. *It is Day 8, 1800 hours.*

**Steps 10 and 11, Container 7.** The results from Steps 4b, 7, 8, and 9 are checked against the MCL and for Container 7. All are below the MCLs. The sum of the fractions of the MCLs for all beta-gamma radionuclides determined ($^{3}H$ and $^{90}Sr$) is 0.179. The value for $^{226}Ra + ^{228}Ra$ is 4.7 and is less than the MCL for drinking water. Because these values are less than their respective limits, the water



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may be acceptable as a potable water source. However, the laboratory should continue with all remaining samples because a single radiologically potable water supply may not be adequate. The analysis results are sent to the Incident Command Center. *It is Day 8, 2300 hours.*

**Step 13, Container 6.** Although this sample had a low overall micro-R or survey meter reading, it was preserved because of its statistically significant count rate above the reagent blank reading. The process, based on a time priority, would now pick up with this sample at Steps 4a and 4b.

**Step 4a, Container 6.** Tritium analysis is started on this sample while preparations are begun for specific alpha, beta, and gamma spectrometry analysis. Tritium in the sample is measured at 7,780 pCi/L. *The time is Day 8, 2400 hours*.

**Step 3, Container 6.** The gross beta value is ~20 pCi/L (Step 5, the majority of the original LSC response in Step 2 coming from tritium), and the gross alpha value is ~9 pCi/L (Step 8).

**Step 5, Container 6.** The gross beta concentration is less than 50 pCi/L, so beta-specific and gamma analyses should be performed (Steps 7 and 9). Gamma spectrometry indicates no other gamma emitters except for $^{214}$Pb/$^{214}$Bi. Beta analyses indicate the presence of $^{90}$Sr at 6.0 pCi/L. *The time is Day 9, 0400 hours.*

**Steps 6 and 12, Container 6.** The gross alpha indicates that it is not necessary to determine if uranium is present (Steps 12a and b). However, due to the nature of the event, uranium analysis by inductively coupled plasma-mass spectrometry is performed and subsequently shows that total uranium to be 2.7 pCi/L. The IC has requested that additional alpha specific analyses should be performed just to ensure that no other radionuclides are present (Step 8). *It is Day 9, 0200 hours.*

**Step 8, Container 6.** Alpha-specific analysis is performed for $^{226}$Ra and indicates <1.5 pCi/L.

**Steps 10 and 11, Container 6.** None of the MCLs for the identified radionuclides, or the gross alpha or beta MCLs, has been exceeded. However, the sum of fractions is 1.139 form tritium and strontium. Results reported to the Incident Command Center. *The time is Day 9, 1000 hours.*

**Steps 14a and b, Container 5.** A 10-mL aliquant is taken from Container 5 for gross alpha and beta analysis by GPC. After counting, the values are gross alpha 3.88 pCi/L and gross beta $4.6\times10^4$ pCi/L. The high LSC beta value compared to the screening analysis indicates a low energy beta emitter is present. *It is Day 9, 1800 hours.*

**Steps 4a and c, Container 5.** LSC is performed on the sample for tritium and found to contain 35,000 pCi/L. As this is above the MCL for tritium, this sample is not suitable for drinking water. The result is reported to the IC. Other radiochemical analyses would be performed as necessary based on the requests from the IC.

*The time is Day 9, 1900 hours.*

*Elapsed time from receipt of samples at laboratory: 35 hours.*



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## APPENDIX IV. Radionuclide Contaminants are Known (Radioanalytical Scenario 3)

### Description[1]

A public drinking water supply has been contaminated with a $^{90}$Sr source. Major portions of the supply system have been isolated to prevent the spread of contamination into these portions of the system. Unlike the two earlier scenarios, the radionuclide is known. For this reason, the screening methods can be used with greater precision. For this scenario, the IC has decided that the analytical priority becomes low-activity samples because of a short-term need for reliable potable water sources. Water samples are screened only for gross beta activity based on the MCL screening levels for $^{90}$Sr. The laboratory has adjusted calibration[2] of its screening survey equipment with $^{90}$Sr, making the gross measurements more accurate. The efficiency with the open-end counter for $^{90}$Sr is 18% for the sample geometry of a 1-L bottle. For this particular laboratory instrument, the $^{90}$Sr MCL of 8.0 pCi/L would yield a net ($^{90}$Sr plus $^{90}$Y) beta screen value of (3.2 ± 0.4) cpm. (The uncertainty is for illustrative purposes only.) Those samples having net beta activity *below* 3.2 cpm would be suspected of being below the MCL for $^{90}$Sr concentration. The liquid scintillation instrument used by this laboratory has an overall efficiency for $^{90}$Sr in aqueous samples of 86%, and a blank background of (2.40 ± 0.06) cpm.

The laboratory also has calibrated its gamma survey meter with a $^{137}$Cs source yielding 0.017 pCi/cpm for the 1-L bottle. The radionuclide contaminants that initiated the incident should have been completely characterized using the "Radioanalytical Scenario 1" process. The water supplies sampled are likely to have radionuclide concentrations over the entire range previously seen from this event. Although the primary focus is on potable water supplies, it is of secondary importance to know where the activity is distributed in the water system. Thus, lower-priority samples (i.e., high activity) will need to be reported to the IC early on and will need to be analyzed eventually.

### Event Sequence

It is *Day 3* following the dispersal of a large amount of $^{90}$Sr into a drinking water supply. The source of the water in the pipeline is from a reservoir that has been analyzed and found to be uncontaminated. The intermediate phase of the event is ongoing. The Incident Command Center has dispatched three samples from different segments of the water distribution system to determine if these segments have already been contaminated.

The timing for results is as critical as in Radioanalytical Scenario 1 because the public water supply has been shut down temporarily. Rebuilding public confidence in the cleanup effort will be enhanced tremendously if portions of the system can be released for use. *The three samples arrive at the laboratory at 0800 hours on Day 3.* It is assumed that $^{90}$Y is in full equilibrium with the $^{90}$Sr when the samples arrive at the laboratory.

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[1]Radionuclide Scenario 3 is unrelated to either Scenarios 1 or 2.

[2]The instrumentation was calibrated previously with a $^{137}$Cs source. The new calibration is with a $^{90}$Sr source. Because $^{90}$Sr will be in equilibrium with its $^{90}$Y progeny, the instrument also will measure the $^{90}$Y. Any $^{90}$Sr dispersed into the water supply can be assumed to be in equilibrium with its progeny $^{90}$Y (72 hours has already passed since the onset of the event), so the direct beta measurement will be a good approximation of the $^{90}$Sr concentration.



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## Analysis Path

Step 1. The three samples are surveyed upon arrival using a survey meter that has a sliding metal window. The measurements for the three samples yield the following results for gross beta-gamma:

| Sample Number | L271 | L375 | L446 | Background |
|---|---|---|---|---|
| Instrument reading $ + (, cpm | 26 ± 3 | 35 ± 3 | 85 ± 4 | 28 ± 3 |
| Instrument reading ( only, cpm | 26 ± 2 | 26 ± 2 | 29 ± 3 | 25 ± 2 |

(Associated uncertainties are 1 sigma.)

The direction from the IC is to assess samples for potential as a source for drinking water. Since the event-specific radionuclide is known ($^{90}$Sr, Step 2$), the laboratory personnel use flowchart for Scenario 3 to get directly to Step 3$. *It is Day 3, 0830 hours.*

**Step 3$1.** Sample L271 indicates that it is close to background and apparently has no significant beta emitters based on the gross screen. A 10-mL aliquot is counted for 60 minutes using the LSC yielding a value of 100 pCi/L. Using Table 12 in Appendix VI, an MDC for a 10-mL sample and 60 minute count time is 210 pCi/L (this would be adjusted by the laboratory to its specific counting systems). The ADL for this measurement is 110 pCi/L.[1] Because this result is less than the ADL, its value is less than the MDC. Proceed to Step 4$1. *It is Day 3, 1000 hours.*

Both L375 and L446 yield significant beta and gamma count rates, and after Step 4 should be considered for other analyses if directed by the IC (Step 4$2).

**Step 4$1.** $^{90}$Sr analysis is performed according to Standard Methods Procedure 7500-Sr (see reference on page 9). The final analytical value determined for $^{90}$Sr is (1.95 ± 0.38) pCi/L, with an MDC of 0.84 pCi/L. Because this is less than the MCL, proceed to Step 5$1.[2] *It is Day 4, 1400 hours.*

**Step 5$1.** All other SDWA analyses are performed. The only other radionuclide identified is $^{226}$Ra at a concentration of (2.6 ± 0.56) pCi/L, with an MDC of 0.90 pCi/L. *It is Day 4, 2300 hours.*

**Step 6$1.** The RDL value is 2.0 pCi/L for $^{90}$Sr and 1.0 pCi/L for $^{226}$Ra. Because $^{90}$Sr has an MDC of 0.84 pCi/L, and $^{226}$Ra has an MDC of 0.90 pCi/L, MQO requirements for both radionuclides have been met, and the data are deemed validated.

**Step 7.** The screening results were basically background. The low concentrations of the two radionuclides found are consistent with the background reading on the gross scan, and on the gross LSC analysis (the sum of the $^{90}$Sr and $^{226}$Ra would yield less than the gross counts background of 28 cpm for the survey meter, and the sum of the $^{90}$Sr and $^{226}$Ra progeny would yield less than the 100 pCi/L measured with the LSC gross screen).

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[1]UBGR – LBGR = 210 – 0. $u_{MR}$ = 210/3.29 = 64. ADL = MDC – 1.645 × 64 = 105 cpm.

[2]However, additional analyses will need to be done to ensure that MCLs for all radionuclides are met before the water supply is approved for consumption.



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**Step 8.** The sum of the fractions does not need calculation unless tritium or other $ and ( emitters are found in the sample. Ra-228 analysis will need to be done also to ensure compliance with the SDWA. [If previous results from this water source are available, this step may be omitted.]

**Step 9.** The IC is notified that water sample L271 has met the radionuclide requirements of the SDWA. Gross screening of samples L375 and L446 indicated that they contained high levels of radionuclides. Request direction as to whether or not detailed analyses on these sources should be performed.

*The time is Day 5, 2400 hours.*

*Elapsed time from receipt of samples at laboratory: 40 hours.*



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## APPENDIX V. Representative Analytical Processing Times

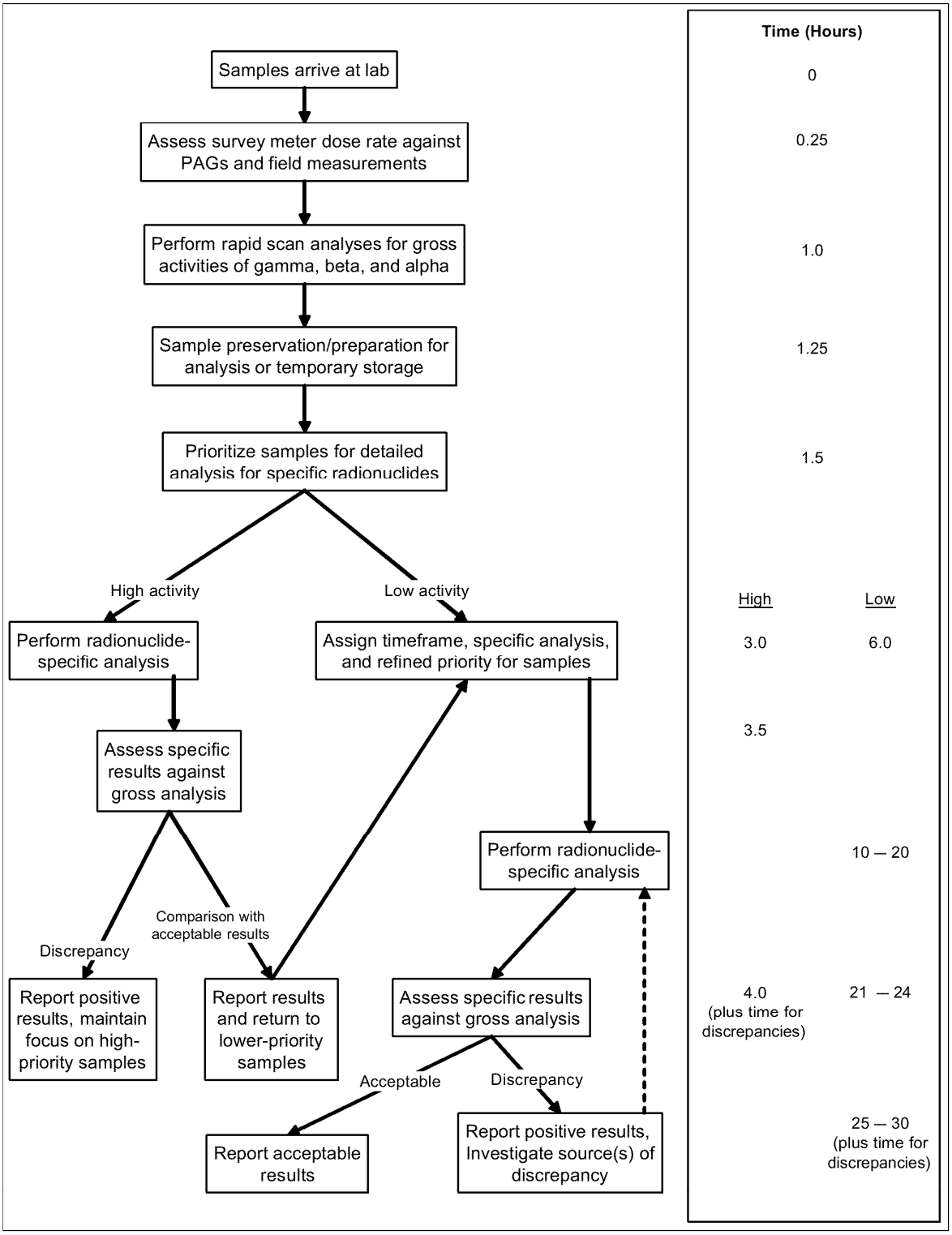


**Figure 5 – Approximate Timeframe for Radiochemical Analyses (Radioanalytical Scenario 1)**

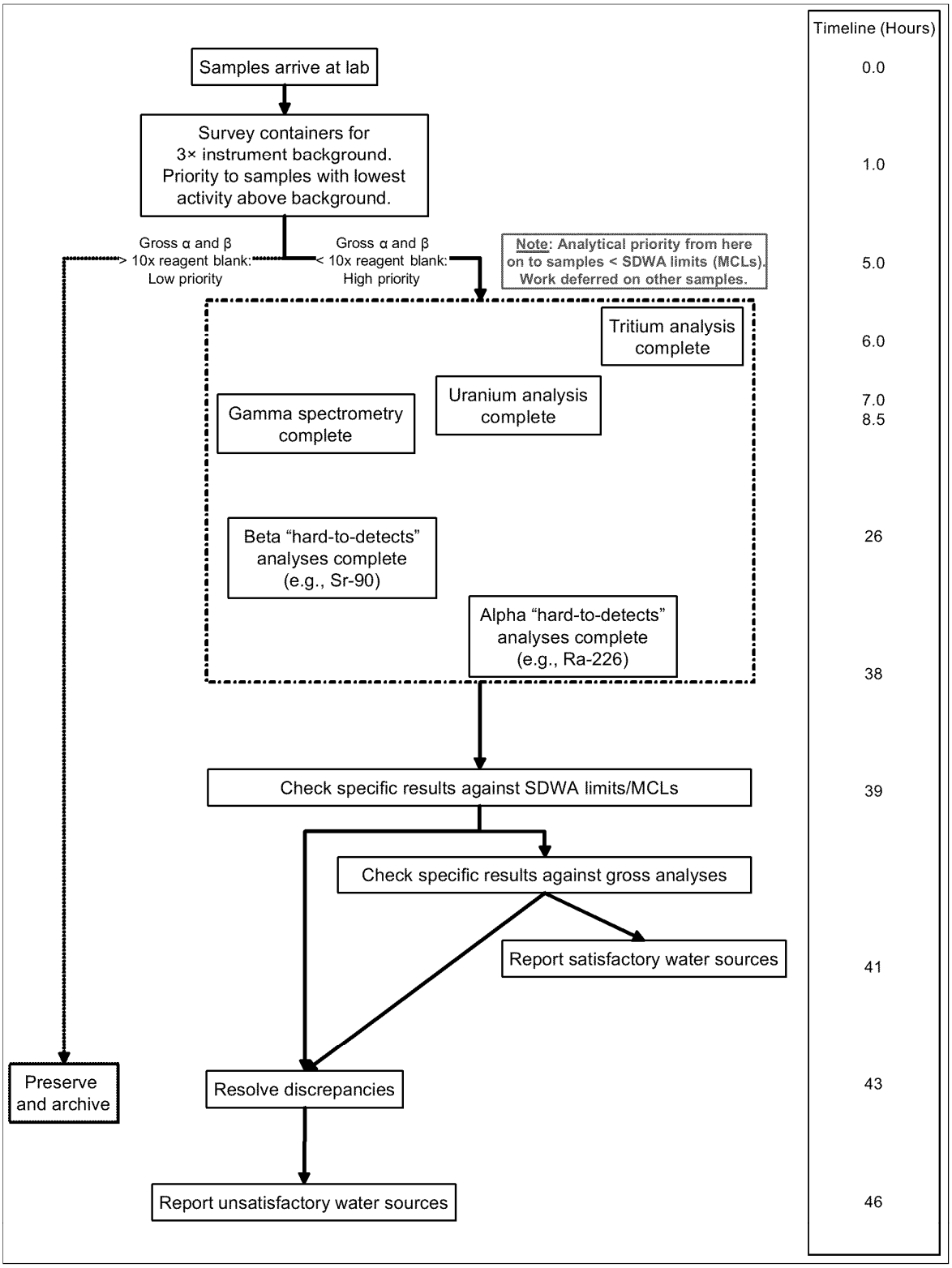


**Figure 6 – Approximate Timeframe for Radiochemical Analyses (Radioanalytical Scenario 2)**

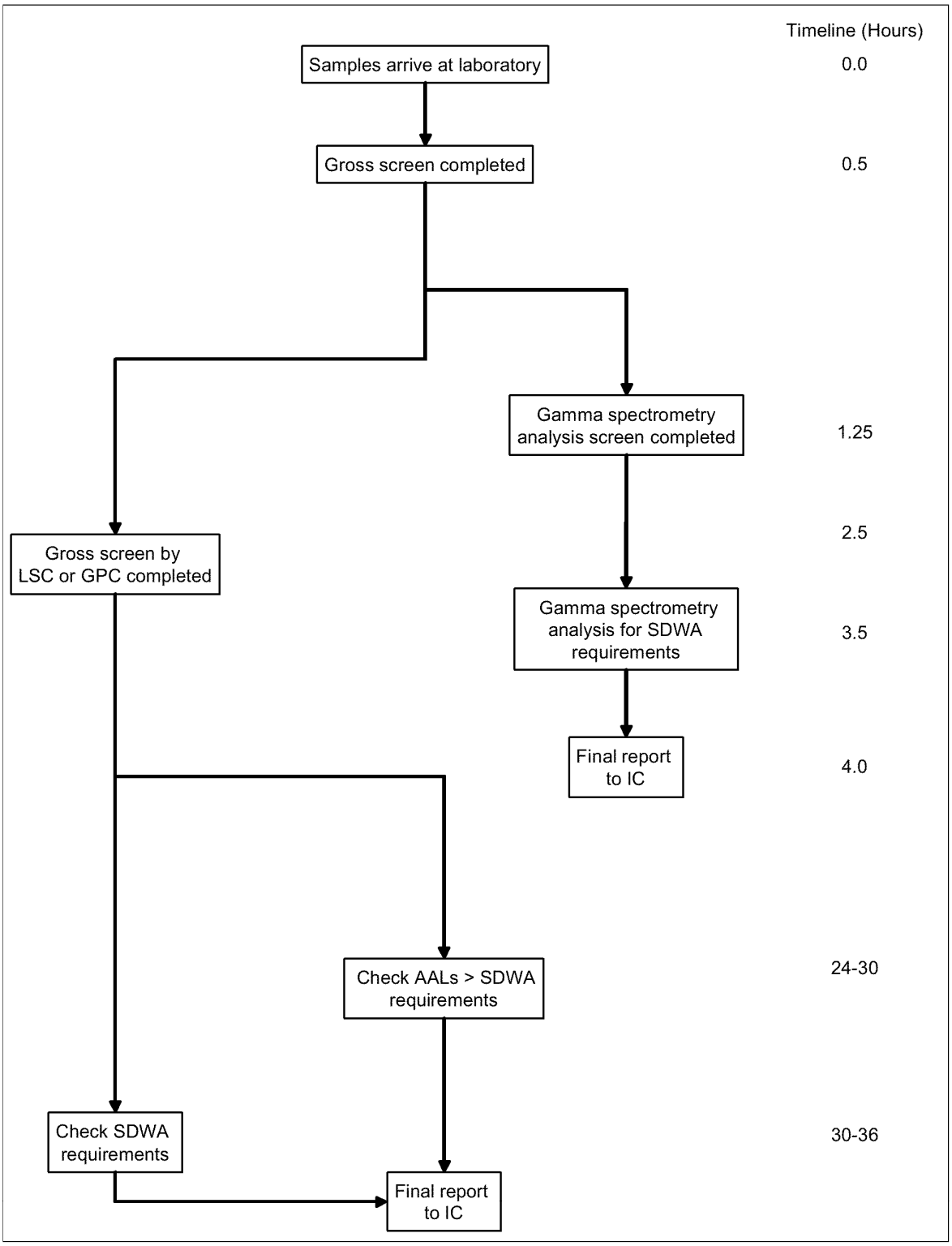


**Figure 7 – Approximate Timeframe for Radiochemical Analyses (Radioanalytical Scenario 3)**

## APPENDIX VI. Establishing DQOs and MQOs for Incident Response Analysis

Three distinct radioanalytical scenarios are presented for water potentially contaminated with radionuclides. The first two assume that the mixture of radionuclides in the sample is unknown. In each scenario there is special emphasis on the implementation of the decision trees presented within that scenario for prioritizing sample processing by the laboratory. This is to support timely decision-making by the IC regarding actions to protect human health for the first two cases, and in the third case to expedite analysis so that suitable drinking water may be used. Specific MQOs are not given for the third radioanalytical scenario because the analytical action levels (AALs) and decision levels (DLs) default to the SDWA requirements (see Tables 7A and 7B). The screening analyses in this scenario are simply used for internal laboratory prioritization.

This appendix covers single-sample screening measurement decisions by the laboratory. The IC may need to make decisions based on the final radionuclide-specific concentrations based on the mean of the set of samples taken from an area. Measurement quality objectives (MQOs) would need to be developed separately for this case. The required method uncertainty ($u_{MR}$) should be smaller in this case compared to the laboratory's screening decisions, perhaps by a factor of three (See MARLAP Appendix C).

The flowcharts depicted in this document contain decision points. There are three basic symbols on these flowcharts: Squares, which represent activities or tasks; diamonds, which represent decision points; and arrows, which represent flow of control. In these flow diagrams, there are many diamond-shaped decision points. Most often they are of the form shown in Figure 8. This is the general form of a theoretical decision rule as discussed in Step 5 of the data quality objectives (DQO) process. The parameter of interest usually is the "measurand" of the radiochemical analysis being performed (e.g., concentration of a radionuclide, total activity, etc.). The AALs will have been set according to criteria involving the appropriate PAGs or MCLs. The arrows specify the alternative actions to be taken.

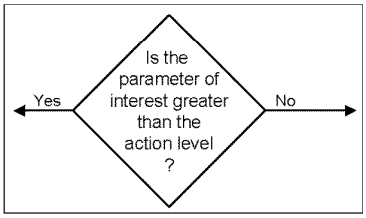

**Figure 8 – A Decision Point in a Flowchart**

The DQO process[1] may be applied to all programs involving the collection of environmental data with objectives that cover decisionmaking activities. When the goal of the study is to support decisionmaking, the DQO process applies systematic planning and statistical hypothesis testing methodology to decide between alternatives. Data quality objectives can be developed using the Guidance in EPA (2006) *Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4)*. The DQO process is summarized in Figure 9.

Table 8 summarizes the DQO process. From these, MQOs can be established using the guidance in MARLAP. The information in this table should be sufficient to enable the decisionmaker and laboratory to determine the appropriate MQOs. The output should include an AAL, discrimination limit, gray region, null hypothesis, analytical decision level (referred to in MARLAP as "critical

[1] For appropriate samples, AALs and required detection limits are established in Safe Drinking Water Act regulations (see box 13 in Scenario 1 and boxes 4c, 5, 6, 11, and 12b in Scenario 2).



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level"), and required method uncertainty at the AAL. A table summarizing DQO process for each decision point diamond can be prepared in advance and summarized as shown in Table 9.

Note that the existence of a decision point diamond implies that Steps 1-4 already have been determined.

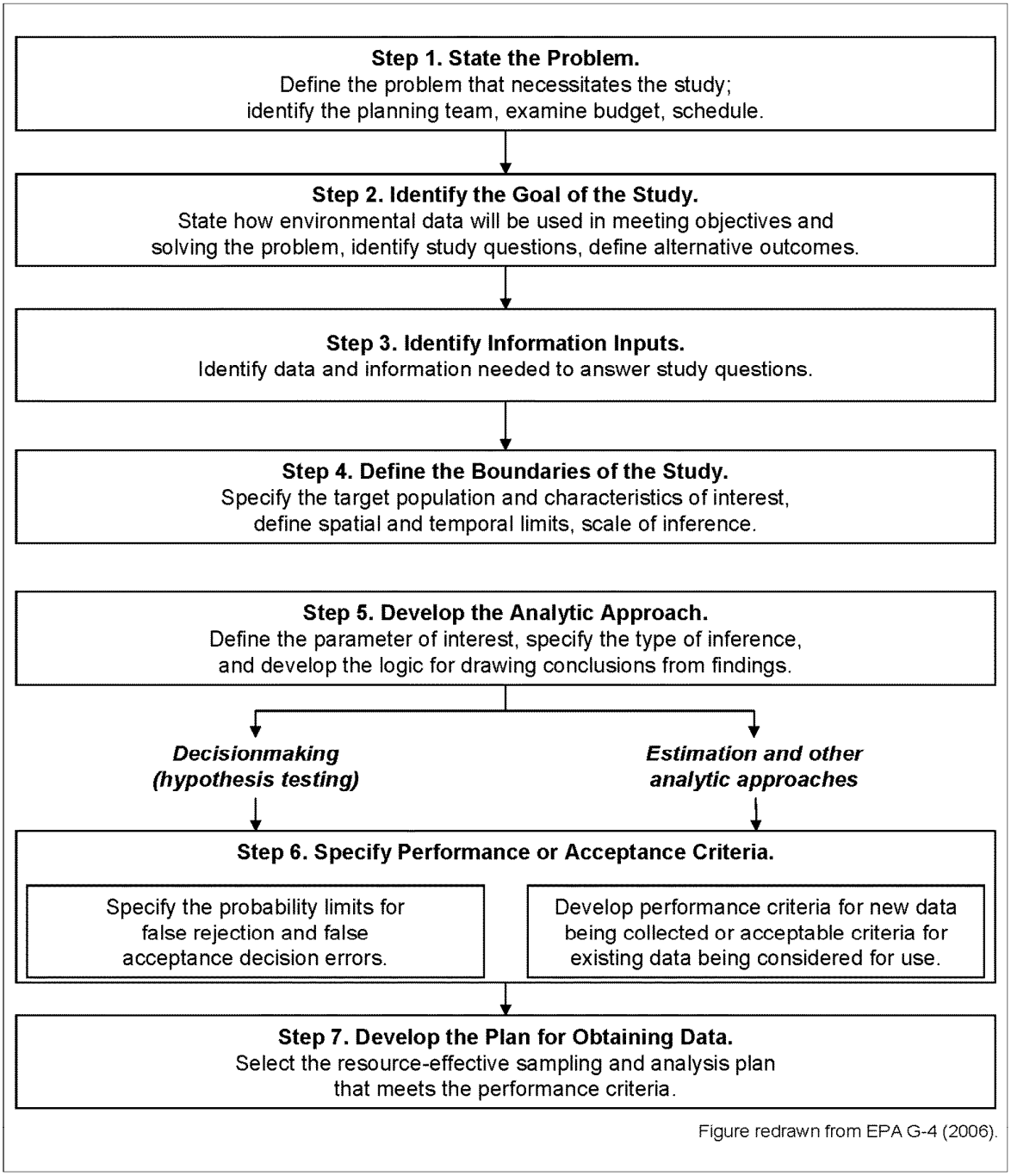


**Figure 9 – The Data Quality Objectives Process**

**TABLE 8A – The DQO Process Applied to a Decision Point**

| STEP | OUTPUT |
|---|---|
| Step 1. Define the problem | … with a preliminary determination of the type of data needed and how it will be used; identify decisionmaker. |
| Step 2. Identify the decision | …among alternative outcomes or actions, and a list of decision statements that address the problem. |
| Step 3. Identify information needed for the decision | Analytical action levels that will resolve the decision and potential sources for these; information on the number of variables that will need to be collected; the type of information needed to meet performance or acceptance criteria; information on the performance of appropriate sampling and analysis methods. |
| Step 4. Define the boundaries of the study | Definition of the target population with detailed descriptions of geographic limits (spatial boundaries); detailed descriptions of what constitutes a sampling unit timeframe appropriate for collecting data and making the decision or estimate, together with any practical constraints that may interfere with data collection; and the appropriate scale for decisionmaking or estimation. |
| Step 5. Develop a decision rule ***This defines the decision point diamond.*** | Identification of the population parameters most relevant for making inferences and conclusions on the target population; for decision problems, the "if..., then...else..." theoretical decision rule based upon a chosen AAL. |

The theoretical decision rule specified in Step 5 can be transformed into statistical hypothesis tests that are applied to the data. Due to the inherent uncertainty with measurement data, there is some likelihood that the outcome of statistical hypothesis tests will lead to an erroneous conclusion, i.e., a decision error. This is illustrated in Table 8B.

**TABLE 8B – Possible Decision Errors**

| Decision Made | True Value of the parameter of interest | |
|---|---|---|
| | Greater than the AAL | Less than the AAL |
| Decide that the parameter of interest is greater than the analytical action level | Correct decision | *Decision Error* |
| Decide that the parameter of interest is less than the analytical action level | *Decision Error* | Correct decision |

In order to choose an appropriate null hypothesis (or baseline condition), consider which decision error should be more protected against. Choose the null hypothesis which if falsely rejected would cause the greatest harm. Then the data will need to be convincingly inconsistent with the null hypothesis before it will be rejected, and the probability of this happening (a Type I error) is more easily controlled during the statistical design. Using values from Table 8D, Figures 10 and 11 illustrate these concepts for case (a) and case (b) respectively.

Failing to detect a sample that exceeds the AAL could have consequences to public health. But screening additional samples will slow the overall process and therefore also may impact the public health. The probability that such decision errors occur are defined as the parameters " and $ in steps 6.1 and 6.2 in Table 8C. Values of alpha and beta should be set based on the consequences of making an incorrect decision. How these are balanced will depend on the AAL, sample loads, and other factors as specified by the IC.



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The most commonly used values of alpha and beta are 5%, although this is by tradition and has no sound technical basis. These values may be used as a default, but should be optimized in Step 7 of the DQO process according to the actual risk of the decision error being considered.

**TABLE 8C – The DQO Process Applied to a Decision Point**

| STEP | OUTPUT |
|---|---|
| Step 6. Specify limits on decision errors | |
| Step 6.1 Determine analytical action level (AAL) on the gray region boundary and set baseline condition (null hypothesis, $H_0$) | Which is considered the worse: decision error (a) deciding that the parameter of interest is less than the AAL when it actually is greater, or (b) deciding that the parameter of interest is greater than the AAL when it actually is less? Case (a) is usually considered to be a conservative choice by regulatory authorities, but this may not be appropriate in every case.<br><br>If (a), the AAL defines the upper boundary of the gray region. The null hypothesis is that the sample concentration is above the AAL. (All samples will be assumed to be above the AAL unless the data are convincingly lower.) A desired limit will be set on the probability (") of incorrectly deciding the sample is below the AAL when the sample concentration is actually equal to the AAL.<br><br>If (b), the AAL defines the lower boundary of the gray region. The null hypothesis is that the sample concentration is below the AAL. (All samples will be assumed to be below the AAL unless the data are convincingly higher.) A desired limit will be set on the probability (") of incorrectly deciding the sample is above the AAL when the sample concentration is actually equal to the AAL. |
| 6.2 Define the discrimination limit (DL) | If (a), the discrimination limit defines the lower boundary of the gray region.[1] It will be a concentration below the AAL where the desired limit will be set on the probability ($) of incorrectly deciding the sample is above the AAL.<br><br>If (b), the discrimination limit defines the upper boundary of the gray region.[2] It will be a concentration above the AAL where the desired limit will be set on the probability ($) of incorrectly deciding the sample is below the AAL. |
| 6.3 Define the required method uncertainty at the AAL | According to MARLAP Appendix C, under either case (a) or case (b) above, the recommended required method uncertainty is:<br>$$u_{MR} \leq \frac{UBGR - LBGR}{z_{1-\alpha} + z_{1-\beta}} = \frac{\Delta}{z_{1-\alpha} + z_{1-\beta}}$$<br>where $z_{1-"}$ and $z_{1-\$}$ are the 1–" and 1–$ quantiles of the standard normal distribution function. |
| Step 7. Optimize the design for obtaining data | Iterate steps 1–6 to define optimal values for each of the parameters and the measurement method required. |

NOTES:

[1] The DL is the point where it is important to be able to distinguish expected signal from the AAL. When one expects background activity, then it might be zero. If one expects activity near the AAL, however, it might be at 90% of the AAL.

[2] The DL is the point where it is important to be able to distinguish expected signal from the AAL. If the AAL is near zero, the DL would define a concentration deemed to be too high to be undetected. Thus, the DL may be set equal to the MDC. If one expects activity near the AAL, however, it might be at 110% of the AAL.



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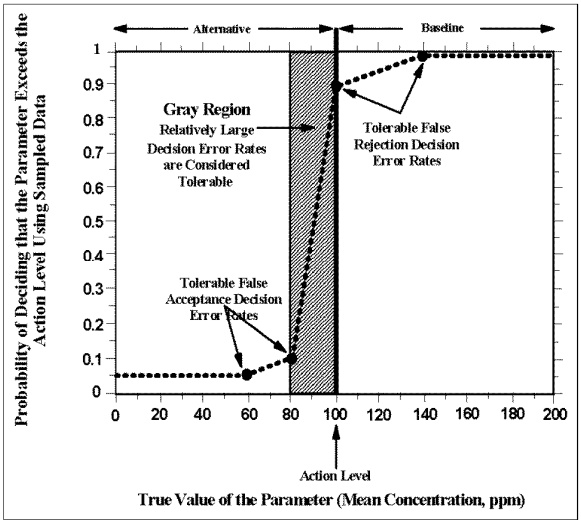


**Figure 10 * Example Illustrating Case (a). Baseline Condition (null hypothesis): Parameter Exceeds the AAL**

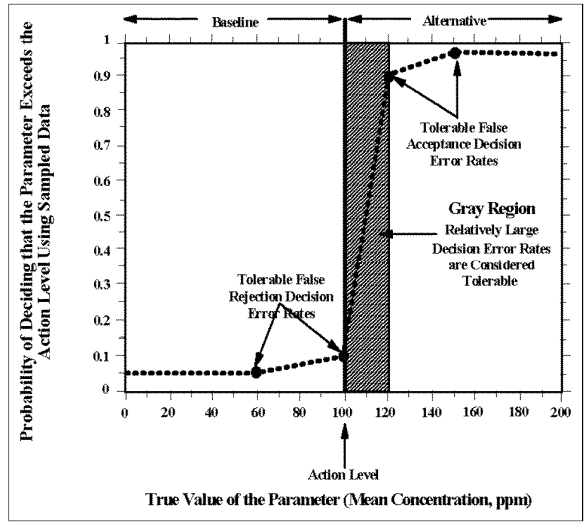


**Figure 11 * Example Illustrating Case (b). Baseline Condition (null hypothesis): Parameter Does Not Exceed the AAL**

Figures taken from EPA G-4 (2006)

In Figure 10, the AAL = 100, the DL = 80, ) = 100 – 80 = 20 " = $ = 0.1 and

$$u_{MR} \le \frac{\Delta}{z_{1-\alpha} + z_{1-\beta}} = \frac{20}{1.282 + 1.282} = 7.8.$$

In Figure 11, the AAL = 100, the DL = 120, ) = 120-100 = 20 " = $ = 0.1 and

$$u_{MR} \le \frac{\Delta}{z_{1-\alpha} + z_{1-\beta}} = \frac{20}{1.282 + 1.282} = 7.8.$$

**Table 8D – Values of $z_{1-"}$ (or $z_{1-\$}$) for Some Commonly Used Values of " (or $)**

| " or $ | $z_{1-"}$ (or $z_{1-\$}$) |
|---|---|
| 0.001 | 3.090 |
| 0.01 | 2.326 |
| 0.025 | 1.960 |
| 0.05 | 1.645 |
| 0.10 | 1.282 |
| 0.20 | 0.842 |
| 0.30 | 0.524 |
| 0.50 | 0.000 |

The concentration that indicates the division between values leading to rejecting the null hypothesis and those that do not is termed the "critical level." Possible values of the concentration can be divided into two regions, the acceptance region and the rejection region. If the value of the concentration comes out to be in the acceptance region, the null hypothesis being tested is not rejected. If the concentration falls in the rejection region, the null hypothesis is rejected. The set of values of a statistic that will lead to the rejection of the null hypothesis tested is called the critical region. Critical region is a synonym for rejection region.

In the context of analyte detection, the *critical value* (see MARLAP Attachment 3B.2) is the minimum measured value (e.g., of the instrument signal or the *analyte* concentration) required to give confidence that a positive (nonzero) amount of *analyte* is present in the material analyzed. The critical value is sometimes called the *critical level*.

In case (a), the critical value will be UBGR $- z_{1-\alpha}\, u_M$, where $u_M$ is its combined standard uncertainty of the measurement result, $x$. Only measurement results less than the critical value will result in rejecting the null hypothesis that the true concentration is greater than the AAL.

In case (b), the critical value will be LBGR $+ z_{1-\alpha}\, u_M$, where $u_M$ is its combined standard uncertainty of the measurement result, $x$. Only measurement results greater than the critical value will result in rejecting the null hypothesis that the true concentration is less than the AAL. This process can be completed for each diamond in each flowchart to fill in Table 12. In these tables, all values have been rounded to 2 significant figures.

In the following tables, MQOs were determined for screening using a discrimination level of zero and Type I and Type II error rates of alpha = beta = 0.05. These are the MQOs usually associated with developing MDCs and result in a relative method uncertainty of 30% at the AAL, and an ADL value of 0.5 times the AAL.

For radionuclide specific measurements, the requirements are more stringent, using a discrimination level of one-half the AAL and Type I and Type II error rates of alpha = 0.01 with beta = 0.05. This results in a relative method uncertainty of 13% at the AAL and an ADL value of 0.71 times the AAL. Note that gamma spectrometric measurements using an HPGe are always radionuclide specific, and therefore, have the more stringent MQOs.

**TABLE 9A – DQOs and MQOs for Radioanalytical Scenario 1. Prioritization Decisions Based on Screening[7] (Gross ", $, or ( Measurements)**

| Measurement Rectangle | Decision Point Diamond | Type of Analysis, " , $, or ( | Analytical AL (pCi/L) | Null Hypothesis $H_0$ Choose > AAL or < AAL i.e., case (a) or case (b) | DL DL < AAL in case (a) and DL > AAL in case (b) | ) = UBGR-LBGR | Type I error rate " | Type II error rate $ | $u_{MR}$ | $n_{MR}$ [6] | RDL or MDC | Analytical Decision Level (Critical Level) (pCi/L) | Source of AAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1a | ([1] | 58,000 | a | 0 | 58,000 | 0.05 | 0.05 | 18,000 | 0.30 | 58,000 | 29,000 | 500 mrem $^{137}$Cs |
| 2,7 | 3,8 | " | 2,000 | a | 0 | 2,000 | 0.05 | 0.05 | 610[2, 3] | 0.30 | | 1,000 | 500 mrem $^{241}$Am |
| 2,7 | 9 | " | 400 | a | 0 | 400 | 0.05 | 0.05 | 120[3] | 0.30 | | 200 | 100 mrem $^{241}$Am |
| 2,7 | 3,8 | $ | 12,000 | a | 0 | 12,000 | 0.05 | 0.05 | 3,600[3] | 0.30 | | 6,000 | 500 mrem $^{90}$Sr |
| 2,7 | 9 | $ | 2,400 | a | 0 | 2,400 | 0.05 | 0.05 | 720[3] | 0.30 | | 1200 | 100 mrem $^{90}$Sr |
| 2,7 | 3,8 | ( | 33,000 | a | 16,500 | 16,500 | 0.01 | 0.05 | 4,100[3] | 0.13 | | 23,000 | 500 mrem $^{60}$Co |
| 2,7 | 9 | ( | 6,600 | a | 3,300 | 3,300 | 0.01 | 0.05 | 830[3] | 0.13 | | 4,600 | 100 mrem $^{60}$Co |
| | 11[4] | | | a | | | | | | | | | |
| 12 | 13 | " | 15 | a | | | | | | | 3 | 15 | SDWA |
| 12 | 13 | $ | 50 | a | | | | | | | 5 | 50 | SDWA |
| | 15[5] | | | | | | | | | | | | |

Notes:

[1] Using survey instrument calibrated to $^{137}$Cs on contact in the recommended geometry.

[2] $u_{MR} < \frac{\Delta}{z_{1-\alpha} + z_{1-\beta}} = \frac{2000}{1.645 + 1.645} = \frac{2000}{3.29} \approx 610$

[3] Diamond 9 is the limiting decision criterion.

[4] Mathematically computed from data obtained earlier.

[5] Based on professional judgment from data obtained earlier. The comparison made is based on the MQOs established for the screening analyses and the individual radionuclide analyses. The acceptability of this measurement will vary widely based on the actual radionuclides in the sample and the radionuclides used to calibrate the screening instruments. Thus it will be incumbent on the laboratory staff to assess the agreement of these numbers. Guidance given in the document is a ratio range of *approximately* 0.5 to 2.0.

[6] The value for $\eta_{MR}$ (relative required method uncertainty) is determined by dividing the value of $u_{MR}$ by the AAL (fourth column in this table).

[7] Values for gamma analysis assume radionuclide-specific analyses using an HPGe. If a gamma detector of lower resolution is used, the screening error rates for gamma analysis should be changed to that of the alpha and beta analysis.

**TABLE 9B – DQOs and MQOs for Scenario 1. Values Reported Externally Based on Radionuclide-Specific Measurements**

| Measurement Rectangle | Decision Point Diamond | Type of Analysis, " , $, or ( | Analytical AL (pCi/L) | Null Hypothesis $H_0$ Choose > AAL or < AAL i.e., case (a) or case (b) | DL DL < AAL in case (a) and DL > AAL in case (b) | ) = UBGR-LBGR | Type I error rate " | Type II error rate $ | $u_{MR}$ | $\eta_{MR}$ [2] | RDL or MDC | Analytical Decision Level (Critical Level) (pCi/L) | Source of AAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | | " | See Tables 10A and 10B | a | 0.5 AAL | 0.5 AAL | 0.01 | 0.05 | AL/8 | 0.13 | | 0.71×AAL[1] | 100 mrem AAL |
| 5 | | $ | | a | 0.5 AAL | 0.5 AAL | 0.01 | 0.05 | AL/8 | 0.13 | | 0.71×AAL | 100 mrem AAL |
| 6 | | ( | | a | 0.5 AAL | 0.5 AAL | 0.01 | 0.05 | AL/8 | 0.13 | | 0.71×AAL | 100 mrem AAL |
| 10 | | " | | a | 0.5 AAL | 0.5 AAL | 0.01 | 0.05 | AL/8 | 0.13 | | 0.71×AAL | 100 mrem AAL |
| 10 | | $ ( | | a | 0.5 AAL | 0.5 AAL | 0.01 | 0.05 | AL/8 | 0.13 | | 0.71×AAL | 100 mrem AAL |
| 14 | | " | | a | 0.5 AAL | 0.5 AAL | 0.01 | 0.05 | AL/8 | 0.13 | | 0.71×AAL | 100 mrem AAL |
| 14 | | $ ( | | a | 0.5 AAL | 0.5 AAL | 0.01 | 0.05 | AL/8 | 0.13 | | 0.71×AAL | 100 mrem AAL |

Note:

[1] In case (a), the critical value is UBGR – $z_{1--"}$ $u_M$ = AAL – $z_{1-0.01}$ [ )/($z_{1-0.01}$ + $z_{1-0.05}$) ] = AAL – 2.326[ (AAL–0.5 AAL)/(2.326 + 1.645) ]
= AAL – 2.326(AAL / 8) . 0.71 AAL. Specific values for the ADL are listed in Tables 6A or 6B.

[2] The value for $\eta_{MR}$ (relative required method uncertainty) is determined by dividing the value of $u_{MR}$ by the AAL (fourth column in this table).

**TABLE 10A – Derived Water Concentrations (DWC) Corresponding to "-Emitting Radionuclide Analytical Action Levels**

| Radionuclide | Half-Life | Additional Emissions | pCi/L | |
|---|---|---|---|---|
| | | | 500-mrem AAL [1] [2] | 100-mrem AAL [1] [2] [3] |
| Gross " Screen [5] | – | – | $2.0\times10^{3}$ | 400 |
| Am-241 | 432.2 y | ( | $2.0\times10^{3}$ | 400 |
| Cm-242 | 162.8 d | | $1.4\times10^{4}$ | $2.8\times10^{3}$ |
| Cm-243 | 29.1 y | ( | $2.5\times10^{3}$ | 500 |
| Cm-244 | 18.10 y | | $2.9\times10^{3}$ | 580 |
| Np-237 [4] | $2.144\times10^{6}$ y | ( | $3.9\times10^{3}$ | 780 |
| Po-210 | 138.4 d | | 130 | 26 |
| Pu-238 | 87.7 y | | $1.8\times10^{3}$ | 360 |
| Pu-239 | $2.411\times10^{4}$ y | | $1.7\times10^{3}$ | 340 |
| Pu-240 | $6.564\times10^{3}$ y | | $1.7\times10^{3}$ | 340 |
| Ra-226 [4] | $1.600\times10^{3}$ y | ( DP | 910 | 180 |
| Th-228 [4] | 1.912 y | ( DP | $2.6\times10^{3}$ | 520 |
| Th-230 | $7.538\times10^{4}$ y | | $1.8\times10^{3}$ | 360 |
| Th-232 | $1.405\times10^{10}$ y | ( DP | $1.6\times10^{3}$ | 320 |
| U-234 | $2.455\times10^{5}$ y | ( DP | $6.3\times10^{3}$ | 1300 |
| U-235 | $7.038\times10^{8}$ y | ( DP | $6.6\times10^{3}$ | 1300 |
| U-238 | $4.468\times10^{9}$ y | ( DP | $7.0\times10^{3}$ | $1.4\times10^{3}$ |

Notes:

The half-lives of the nuclides are given in years (y) or days (d). DP refers to "decay products."

[1] Values are based on the dose conversion factors in Federal Guidance Report No.13, CD Supplement, 5-year-old child and the 50th percentile of water consumption.

[2] 365-day intake.

[3] The-100 mrem AAL values were obtained by dividing 500-mrem PAG DWC values by 5. AALs have been rounded to 2 significant figures.

[4] Includes decay products originating from the $^{226}$Ra or $^{228}$Th in the body. Used only to calculate the concentration (pCi/L) or dose from $^{226}$Ra or $^{228}$Th in the body.

[5] The AAL and associated $u_{MR}$ and ADL values for $^{241}$Am are used as the default for gross alpha screening analysis.

**TABLE 10B – Derived Water Concentrations (DWC) Corresponding to $-Emitting Radionuclide AALs**

| Radionuclide | Emission Type | Half-Life | pCi/L | |
|---|---|---|---|---|
| | | | 500-mrem AAL [1] [2] | 100-mrem AAL [1] [2] [3] |
| Beta Gamma Screen [4] | $ | – | $5.8\times10^{4}$ | $1.2\times10^{4}$ |
| Ac-227DP | $ (" DP) | 21.77 y | $1.1\times10^{3}$ | 220 |
| Ce-141 | $( | 32.51 d | $2.2\times10^{5}$ | $4.4\times10^{4}$ |
| Ce-144 | $( | 284.9 d | $2.9\times10^{4}$ | $5.8\times10^{3}$ |
| Co-57 | ( | 271.1 d | $6.3\times10^{5}$ | $1.3\times10^{5}$ |
| Co-60 | $( | 5.270 y | $3.3\times10^{4}$ | $6.6\times10^{3}$ |
| Cs-134 | $( | 2.065 y | $4.3\times10^{4}$ | $8.6\times10^{3}$ |
| Cs-137 | $( | 30.07 y | $5.8\times10^{4}$ | $1.2\times10^{4}$ |
| H-3 | weak $ | 12.32 y | $7.7\times10^{6}$ | $1.5\times10^{6}$ |
| I-125 | ( | 59.40 d | $1.3\times10^{4}$ | $2.6\times10^{3}$ |
| I-129 | $( | $1.57\times10^{7}$ y | $3.3\times10^{3}$ | 660 |
| I-131 | $( | 8.021 d | $5.4\times10^{3}$ | $1.1\times10^{3}$ |
| Ir-192 | $( | 73.83 d | $1.2\times10^{5}$ | $2.4\times10^{4}$ |
| Mo-99 | $ ( (( DP) | 65.94 h | $3.2\times10^{5}$ | $6.4\times10^{4}$ |
| P-32 | $ | 14.26 d | $5.9\times10^{4}$ | $1.2\times10^{4}$ |
| Pd-103 | ( | 16.99 d | $7.8\times10^{5}$ | $1.6\times10^{5}$ |
| Pu-241 | $ | 14.29 y | $1.0\times10^{5}$ | $2.0\times10^{4}$ |
| Ra-228 | $ (( DP) | 5.75 y | 160 | 32 |
| Ru-103 | $( | 39.26 d | $2.3\times10^{5}$ | $4.6\times10^{4}$ |
| Ru-106 | $( | 373.6 d | $2.2\times10^{4}$ | $4.4\times10^{3}$ |
| Se-75 | ( | 119.8 d | $6.7\times10^{4}$ | $1.3\times10^{4}$ |
| Sr-89 | $ | 50.53 d | $6.3\times10^{4}$ | $1.3\times10^{4}$ |
| Sr-90 | $ | 28.79 y | $1.2\times10^{4}$ | $2.4\times10^{3}$ |
| Tc-99 | $( | $2.11\times10^{5}$ y | $2.4\times10^{5}$ | $4.8\times10^{4}$ |

Notes:

The half-lives of the nuclides are given in years (y), days (d), or hours (h). DP refers to "decay products."

[1] Values are based on the dose conversion factors in Federal Guidance Report No.13, CD Supplement, 5-year-old child and the 50th percentile of water consumption.

[2] 365-day intake.

[3] The 100-mrem AAL values were obtained by dividing 500-mrem PAG DWC values by 5. AALs have been rounded to 2 significant figures.

[4] The AAL and associated $u_{MR}$ and ADL values for $^{137}$Cs are used as the defaults for initial beta gamma screening analysis on sample bottle (Step 1 in Radioanalytical Scenarios 1 and 2). The AAL and associated $u_{MR}$ and ADL values for $^{60}$Co concentration are used as defaults for gross gamma measurements thereafter (see text). The AAL and associated $u_{MR}$ and ADL values for $^{90}$Sr are the defaults used for gross beta screening.

Several nuclides in Table 10B decay by electron capture. These radionuclides cannot be detected using gross $ analysis. The electron capture decay leads to characteristic X-rays of the progeny nuclide. The most effective way to detect the X-rays from these electron-capture-decay radionuclides is either with a low-energy photon detector (LEPD) or a reverse electrode germanium detector (N-type semiconductor detector). The lower range of energy with these detectors is about 10 keV.



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**TABLE 11A – DQOs and MQOs for Scenario 2.**
**Internal Lab Prioritization Decisions Based on Screening**
**(Gross ", $, or ( Measurements)**

| Measurement Rectangle | Decision Point Diamond | Type of Analysis, " , $, or ( | Analytical AL (pCi/L) | Null Hypothesis $H_0$ Choose > AAL or < AAL i.e. case (a) or case (b) | DL DL < AAL in case (a) and DL > AAL in case (b) | ) = UBGR-LBGR | Type I error rate " | Type II error rate $ | $u_{MR}$ | $n_{MR}$ [3] | RDL or MDC | Analytical Decision Level (Critical Level) (pCi/L) | Source of AAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | ([1] | 12,000 | a | 0 | 12,000 | 0.05 | 0.05 | 3,600 | 0.30 | 12,000 | 6,000 | 100 mrem $^{137}$Cs AAL |
| 2a | 2b | " | 210 | a | 0 | 210 | 0.05 | 0.05 | 64 | 0.30 | 210 | 110 | LSC MDC 5mL 10 min[2] |
| 2a | 2b | $ | 820 | a | 0 | 820 | 0.05 | 0.05 | 250 | 0.30 | 820 | 410 | LSC MDC 5mL 10 min[2] |
| 14a | 14b | " | 210 | a | 0 | 210 | 0.05 | 0.05 | 64 | 0.30 | 210 | 110 | LSC MDC 5mL 10 min[2] |
| 14a | 14b | $ | 820 | a | 0 | 820 | 0.05 | 0.05 | 250 | 0.30 | 820 | 410 | LSC MDC 5m: 10 min[2] |
| 3 | 5 | $ | 50 | | | | | | | | 5 | 50 | SDWA |
| 3 | 6 | " | 15 | | | | | | | | 3 | 15 | SDWA |

Notes:
[1] Using survey instrument calibrated to $^{137}$Cs on contact.
[2] See Table 12.
[3] The value for $n_{MR}$ is determined by dividing the value of $u_{MR}$ by the AAL (fourth column in this table).

**TABLE 11B – DQOs and MQOs for Scenario 2.**
**Values Reported Externally Based on Radionuclide-Specific Measurements**

| Measurement Rectangle | Decision Point Diamond | Type of Analysis, " , $, or ( | Analytical AL (pCi/L) | Null Hypothesis $H_0$ Choose > AAL or < AAL i.e. case (a) or case (b) | DL DL < AAL in case (a) and DL > AAL in case (b) | ) = UBGR-LBGR | Type I error rate " | Type II error rate $ | $u_{MR}$ | $n_{MR}$ | RDL | Analytical Decision Level (Critical Level) (pCi/L) | Source of AAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 11 | $ | See Tables 7A and 7B | | | | | | | | See Tables 7A and 7B | | SDWA |
| 8 | 11 | " | | | | | | | | | | | SDWA |
| 9 | 11 | ( | | | | | | | | | | | SDWA |
| 4a | 4b, 4c | $^{3}$H | 20,000 | | | | | | | | 1,000 | 20,000 | SDWA |
| 12a | 12b | U | 20[1] | | | | | | | | 0.3 | 20 | SDWA |

Note:
[1] 20 pCi/L = 30 ppb U. The measurement of uranium can be based on mass or activity using appropriate conversion factors.

Estimates of nominal *a priori* minimum detectable concentrations (MDC) for two commonly used gross alpha and beta screening methods, using liquid scintillation and gas proportional counting, have been summarized in Table 12. The table provides estimates of MDCs as a function of sample aliquant volume and sample

counting times. The MDCs were calculated using the working expressions provided by Currie[1], assuming paired observations having equal counting times for background and sample measurements and Type I and II error probabilities of 5%. The table notes provide the typical modern instrument detector efficiencies and background count rates used to calculate the MDC values. Critical levels ($L_C$) are one-half the MDCs.

**TABLE 12 – Minimum Detection Concentration Values for Various Counting Times and Sample Volumes**

## Liquid Scintillation Counting

| Emission Type | Alpha | Alpha | Alpha | Alpha | Alpha | Beta | Beta | Beta | Beta | Beta |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume (mL) | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Count Time (m) | 1 | 5 | 10 | 30 | 60 | 1 | 5 | 10 | 30 | 60 |
| MDC (pCi/L) | 590 | 210 | 140 | 77 | 53 | 1,720 | 730 | 510 | 290 | 210 |
| $L_C$ (pCi/L) | 295 | 105 | 120 | 38.5 | 26.5 | 860 | 365 | 255 | 145 | 105 |

| Emission Type | Alpha | Alpha | Alpha | Alpha | Alpha | Beta | Beta | Beta | Beta | Beta |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume (mL) | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Count Time (m) | 1 | 5 | 10 | 30 | 60 | 1 | 5 | 10 | 30 | 60 |
| MDC (pCi/L) | 880 | 320 | 210 | 110 | 79 | 2,760 | 1,170 | 820 | 470 | 330 |
| $L_C$ (pCi/L) | 440 | 160 | 105 | 55 | 39.5 | 1,380 | 585 | 410 | 235 | 115 |

Assumptions for 5-mL sample: alpha detector efficiency = 0.8; alpha background cpm = 1.2; beta detector efficiency = 1.0; beta background cpm = 36

## Gas Proportional Counting

| Emission Type | Alpha | Alpha | Alpha | Alpha | Alpha | Beta | Beta | Beta | Beta | Beta |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume (mL) | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Count Time (m) | 1 | 5 | 10 | 30 | 60 | 1 | 5 | 10 | 30 | 60 |
| MDC (pCi/L) | 1,880 | 540 | 330 | 160 | 110 | 1,230 | 450 | 300 | 160 | 110 |
| $L_C$ (pCi/L) | 940 | 270 | 165 | 80 | 55 | 615 | 225 | 150 | 80 | 105 |

| Emission Type | Alpha | Alpha | Alpha | Alpha | Alpha | Beta | Beta | Beta | Beta | Beta |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume (mL) | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Count Time (m) | 1 | 5 | 10 | 30 | 60 | 1 | 5 | 10 | 30 | 60 |
| MDC (pCi/L) | 3,770 | 1,080 | 660 | 320 | 210 | 2,470 | 900 | 600 | 330 | 230 |
| $L_C$ (pCi/L) | 1,885 | 540 | 330 | 160 | 105 | 1,235 | 450 | 300 | 165 | 115 |

Assumptions: alpha detector efficiency = 0.10; alpha background cpm = 0.10; beta detector efficiency = 0.30; beta background cpm = 1.4

[1] Currie, Lloyd. 1968. "Limits for Qualitative Detection and Quantitative Determination: Application to Radiochemistry." Analytical Chemistry 40(3): 586-593.



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## APPENDIX VII. Glossary

***accuracy*:** The closeness of a measured result to the true value of the quantity being measured. Various recognized authorities have given the word "accuracy" different technical definitions, expressed in terms of bias and imprecision. Following MARLAP, this document avoids all of these technical definitions and uses the term "accuracy" in its common, ordinary sense.

***aerosol***: A suspension of fine solid or liquid particles within a gaseous matrix (usually air).

***aliquant*:** A representative portion of a homogeneous *sample* removed for the purpose of analysis or other chemical treatment. The quantity removed is not an evenly divisible part of the whole sample. An aliquot, by contrast, is an evenly divisible part of the whole.

***analyte*:** See *target analyte.*

***analytical action level (AAL)***: The value of a quantity that will cause the decisionmaker to choose one of the alternative actions. The *analytical action level* may be a derived concentration level (such as the *derived water concentration* in this document), background level, release criteria, regulatory decision limit, etc. The AAL is often associated with the type of media, *target analyte*, and concentration limit. Some AALs, such as the release criteria for license termination, are expressed in terms of dose or risk. MARLAP uses the term "action level." See *total effective dose equivalent (TEDE).*

***analytical decision level (ADL)***: The minimum measured value for the radionuclide concentration in a sample that indicates the amount of radionuclide present is equal to or greater than the *analytical action level* at a specified *Type II error* rate (assumes that *method uncertainty* requirements have been met). Any measurement result equal to or greater than the applicable ADL is considered to have exceeded the corresponding *analytical action level*. MARLAP uses the term "*critical level.*"

***background (instrument)*:** Radiation detected by an instrument when no *source* is present. The background radiation that is detected may come from radionuclides in the materials of construction of the detector, its housing, its electronics, and the building, as well as the environment and natural radiation.

***background level*:** A term that usually refers to the presence of radioactivity or radiation in the environment. From an analytical perspective, the presence of background radioactivity in samples needs to be considered when clarifying the radioanalytical aspects of the decision or study question. Many radionuclides are present in measurable quantities in the environment.

***bias (of a measurement process)*:** A persistent deviation of the mean measured result from the true or accepted reference value of the quantity being measured, which does not vary if a measurement is repeated.

***blank (analytical or method)*:** A *sample* that is assumed to be essentially free of the *target analyte* (the "unknown"), which is carried through the radiochemical preparation, analysis, mounting, and measurement process in the same manner as a routine sample of a given matrix.



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***calibration*:** The set of operations that establishes, under specified conditions, the relationship between values indicated by a measuring instrument or measuring system, or values represented by a material measure, and the corresponding known value of a parameter of interest.

***calibration source*:** A prepared *source*, made from a *certified reference material*, that is used for calibrating instruments.

***certified reference material*:** A radioactive material, accompanied by an uncertainty at a stated level of confidence, with one or more values certified by a procedure that establishes its traceability to accepted standard values. A "standard reference material" is a certified reference material issued by the National Institute of Standards and Technology (NIST) in the United States. NIST certifies a standard reference material for specific chemical or physical properties and issues it with a certificate that reports the results of the characterization and indicates the intended use of the material.

***chain of custody*:** Procedures that provide the means to trace the possession and handling of a sample from collection to data reporting.

***check source*:** A material used to validate the operability of a radiation measurement device, sometimes used for instrument quality control. See *source, radioactive.*

***critical level***: Termed *analytical decision level* in this document in the context of evaluating sample results relative to an *analytical action level.* In the context of analyte detection, *critical level* means the minimum measured value (e.g., of the instrument signal or the radionuclide concentration) that indicates a positive (nonzero) amount of a radionuclide is present in the material within a specified probable error. The critical level is sometimes called the *critical value* or *decision level.*

***data quality objective (DQO)***: Qualitative and quantitative statements that clarify the study objectives, define the most appropriate type of data to collect, determine the most appropriate conditions from which to collect the data, and specify tolerable limits on decision error rates. Because DQOs will be used to establish the quality and quantity of data needed to support decisions, they should encompass the total *uncertainty* resulting from all data collection activities, including analytical and sampling activities.

***derived radionuclide concentration (DRC)***: General application term used in discussions involving both of the terms *derived air concentration* and *derived water concentration.*

***derived water concentration (DWC)***: The concentration of a radionuclide, in pCi/L, that would result in exposure to a specified dose level. Generally refers to a *protective action guide* or other specified dose- or risk-based factor related to an *analytical action level.* In this document, for example, the "500-mrem DWC for $^{239}$Pu" is the concentration of $^{239}$Pu, in pCi/L, that would result in an exposure of 500 mrem and would refer to the 500-mrem PAG. The DWC is radionuclide-specific.

***discrimination limit (DL)***: The DL is the point where it is important to be able to distinguish expected signal from the *analytical action level.* The boundaries of the *gray region.*



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***dose equivalent*:** Quantity that expresses all radiations on a common scale for calculating the effective absorbed dose. This quantity is the product of absorbed dose (*grays* (Gy) or rads) multiplied by a quality factor and any other modifying factors (MARSSIM, 2000). The quality factor adjusts the absorbed dose because not all types of ionizing radiation create the same effect on human tissue. For example, a dose equivalent of one *sievert* (Sv) requires 1 Gy of beta or gamma radiation, but only 0.05 Gy of alpha radiation or 0.1 Gy of neutron radiation. Because the sievert is a large unit, radiation doses often are expressed in millisieverts (mSv). See *total effective dose equivalent* and *roentgen.*

***gray (Gy)*:** The International System of Units (SI) unit for absorbed radiation dose. One gray is 1 joule of energy absorbed per kilogram of matter, equal to 100 *rad.* See *sievert.*

***gray region*:** The range of possible values in which the consequences of decision errors are relatively minor. Specifying a gray region is necessary because variability in the analyte in a population and imprecision in the measurement system combine to produce variability in the data such that the decision may be "too close to call" when the true value is very near the *analytical action level.* The *gray region* establishes the minimum distance from the *analytical action level* where it is most important to control *Type II decision errors.*

***incident of national significance (INS)*:** An actual or potential high-impact event that requires a coordinated and effective response by and appropriate combination of federal, state, local, tribal, nongovernmental, or private-sector entities in order to save lives and minimize damage, and provide the basis for long-term community recovery and mitigation activities.

***measurement quality objective* (*MQO*):** The analytical data requirements of the *data quality objectives*, which are project- or program-specific and can be quantitative or qualitative. These analytical data requirements serve as measurement performance criteria or objectives of the analytical process. MARLAP refers to these performance objectives as MQOs. Examples of quantitative MQOs include statements of required analyte detectability and the *uncertainty* of the analytical protocol at a specified radionuclide concentration, such as the *analytical action level.* Examples of qualitative MQOs include statements of the required specificity of the analytical protocol (e.g., the ability to analyze for the radionuclide of interest (or *target analyte*) given the presence of interferences).

***method uncertainty*:** The predicted *uncertainty* of the result that would be measured if the method were applied to a hypothetical laboratory *sample* with a specified analyte concentration. Although individual measurement uncertainties will vary from one measured result to another, the *required method uncertainty* is a target value for the individual measurement uncertainties and is an estimate of uncertainty before the sample is actually measured. See also *uncertainty*, *required method uncertainty*, and *relative required method uncertainty.*

***method validation*:** The demonstration that the method selected for the analysis of a particular analyte in a given matrix is capable of providing analytical results to meet the project's *measurement quality objectives* and any other requirements in the analytical protocol specifications.

***minimum detectable concentration (MDC)*:** An estimate of the smallest true value of the analyte concentration that gives a specified high probability of detection.



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***nuclide-specific analysis*:** Radiochemical analysis performed to isolate and measure a specific radionuclide.

***null hypothesis ($H_0$)*:** One of two mutually exclusive statements tested in a statistical *hypothesis test* (compare with alternative hypothesis). The null hypothesis is presumed to be true unless the test provides sufficient evidence to the contrary, in which case the *null hypothesis* is rejected and the alternative hypothesis ($H_1$) is accepted.

***performance evaluation (PE) program*:** A laboratory's participation in an internal or external program of analyzing proficiency-testing samples appropriate for the analytes and matrices under consideration (i.e., PE program traceable to a national standards body, such as NIST). Reference-material samples used to evaluate the performance of the laboratory are called performance-evaluation or proficiency-testing samples or materials. See *certified reference material.*

***precision*:** The closeness of agreement between independent test results obtained by applying the experimental procedure under stipulated conditions. Precision may be expressed as the standard deviation. Conversely, imprecision is the variation of the results in a set of replicate measurements.

***protective action guide (PAG)***: The radiation dose to individuals in the general population that warrants protective action following a radiological event. In this document, PAGs limit the projected radiation doses for different exposure periods: not to exceed 2-rem *total effective dose equivalent (TEDE)* during the first year, 500-mrem TEDE during the second year, or 5 rem over the next 50 years (including the first and second years of the incident). See *total derived water concentration* and *analytical action level.*

***quality assurance (QA)*:** An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected. Quality assurance includes *quality control.*

***quality control (QC)*:** The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the project; operational techniques and activities that are used to fulfill requirements for quality. This system of activities and checks is used to ensure that measurement systems are maintained within prescribed limits, providing protection against out-of-control conditions and ensuring that the results are of acceptable quality.

***reference material***: See *certified reference material.*

***rem*:** The common unit for the effective or equivalent dose of radiation received by a living organism, equal to the actual dose (in rads) multiplied by a factor representing the danger of the radiation. Rem is an abbreviation for "roentgen equivalent man," meaning that it measures the biological effects of ionizing radiation in humans. One rem is equal to 0.01 Sv. See *sievert* and *dose equivalent.*



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***relative required method uncertainty*** **($n_{MR}$):** The *required method uncertainty* divided by the *analytical action level.* The relative required method uncertainty is applied to radionuclide concentrations above the *analytical action level.* A key *measurement quality objective.*

***required method uncertainty*** **($u_{MR}$):** *Method uncertainty* at a specified concentration. A key *measurement quality objective.* See also *relative required method uncertainty.*

***roentgen (R)***: A unit of exposure to ionizing radiation. It is that amount of gamma rays or X-rays required to produce ions carrying one electrostatic unit of electrical charge in one cubic centimeter of dry air under standard conditions. The unit of exposure rate is roentgens per hour (R/h). For environmental exposures, the typical units are microroentgens per hour ( : R/h), or $10^{-6}$ R/h. In SI units, 1 R = $2.58\times10^{-4}$ C/kg (coulombs per kilogram).

***sample*****:** (1) A portion of material selected from a larger quantity of material. (2) A set of individual samples or measurements drawn from a population whose properties are studied to gain information about the entire population.

***screening method*****:** An economical gross measurement (alpha, beta, gamma) used in a tiered approach to method selection that can be applied to *analyte* concentrations below an *analyte* level in the *analytical protocol specifications* or below a fraction of the specified *action level.*

***sievert (Sv)*****:** The SI unit for the effective dose of radiation received by a living organism. It is the actual dose received (*grays* in SI or rads in traditional units) times a factor that is larger for more dangerous forms of radiation. One Sv is 100 *rem*. Radiation doses are often measured in mSv. An effective dose of 1 Sv requires 1 gray of beta or gamma radiation, but only 0.05 Gy of alpha radiation or 0.1 Gy of neutron radiation.

***source, radioactive*****:** A quantity of material configured for radiation measurement.

***source term radionuclide*****:** A radionuclide that is a significant contaminant in an environmental sample and results in dose contributions that will be important in decisionmaking.

***sum of fractions***: A calculated value to determine whether the summed contributions to dose by all radionuclides in a sample, divided by their respective dose limits, exceeds 1.0. For purposes of this calculation, the actual *analytical action level* (*derived water concentration* or *protective action guide*) is used rather than an *analytical decision level.*

***swipes*****:** A filter pad used to determine the level of general radioactive contamination when it is wiped over a specific area, about 100 $cm^2$ in area. Also called smears or wipes.

***target analyte*****:** A radionuclide on the list of radionuclides of interest or a radionuclide of concern for a project.

***total effective dose equivalent*****:** The sum of the effective dose equivalent (for external exposure) and the committed effective dose equivalent (for internal exposure), expressed in units of Sv or rem. See *dose equivalent.*



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***Type I decision error*:** In a hypothesis test, the error made by rejecting the null hypothesis when it is true. A Type I decision error is sometimes called a "false rejection" or a "false positive."

***Type II decision error*:** In a hypothesis test, the error made by failing to reject the null hypothesis when it is false. A Type II decision error is sometimes called a "false acceptance" or a "false negative."

***uncertainty*:** A parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand. See *method uncertainty.*



ED_001057C_T3_00173295

**Submit Time:** 5/29/2012 10:25:10
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** OW attending, preparing: Invitation: Follow Up on the Radiation Papers (May 30 01:00 PM EDT in 3412 ARN )

FYI, I talked to Lisa just now to confirm that tomorrow's meeting with Bob is about the PAG Manual and I gave her some more context about what's happening with it. She said she and Sam are meeting with Pam this afternoon to show her how comments were (and weren't in one case) incorporated regarding water, so they will meet our 4 pm deadline and attend tomorrow's meeting with Bob.

S.
----- Forwarded by Sara DeCair/DC/USEPA/US on 05/29/2012 10:23 AM -----

From: Lisa Christ/DC/USEPA/US
To: Sara DeCair/DC/USEPA/US@EPA
Date: 05/29/2012 10:07 AM
Subject: Fw: Invitation: Follow Up on the Radiation Papers (May 30 01:00 PM EDT in 3412 ARN )

---

Hi Sara,
Can you please confirm which draft radiation guidance will be discussed at tomorrow's meeting? We have recently reviewed/commented on:

- the International-US Compilation and Messaging Guidance
- the draft Protective Action Guides and Planning for Radiological Incidents and Federal Register Notice seeking public comment.

Thank you -
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Lisa M. Christ, Associate Chief
Targeting and Analysis Branch
Office of Ground Water and Drinking Water
USEPA
1200 Pennsylvania Ave NW
Washington, DC 20460-0001
phone: 202.564.8354
fax: 202.564-3760
Mail Code: 4607M

----- Forwarded by Lisa Christ/DC/USEPA/US on 05/29/2012 10:01 AM -----

From: Pamela Barr/DC/USEPA/US
To: Lisa Christ/DC/USEPA/US@EPA, Eric Burneson/DC/USEPA/US@EPA, Phil Oshida/DC/USEPA/US
Date: 05/24/2012 06:23 PM
Subject: Fw: Invitation: Follow Up on the Radiation Papers (May 30 01:00 PM EDT in 3412 ARN )

---

Do we know what these papers are? I may want one of you to go with me. Thanks

Pamela S. Barr
Acting Director
Office of Groundwater and Drinking Water
Room 2331A EPA East
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

U.S. Environmental Protection Agency
1200 Pennsylvania Ave.
Washington, DC 20460

phone: 564-3752 fax: 564-3758
barr.pamela@epa.gov
----- Forwarded by Pamela Barr/DC/USEPA/US on 05/24/2012 06:22 PM -----

## Invitation: Follow Up on the Radiation Papers

**Wed 05/30/2012** 1:00 PM - 1:45 PM

Chair: **Bob Perciasepe/DC/USEPA/US**

Sent By: **Teri Porterfield/DC/USEPA/US**

Location:

**Bob Perciasepe**

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Required:

Dana Tulis/DC/USEPA/US@EPA, Debbie Dietrich/DC/USEPA/US@EP

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@EPA, John Michaud/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEP

A/US@EPA, Larry Stanton/DC/USEPA/US@EPA, Lisa Feldt/DC/USEPA

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The purpose will be to discuss the draft radiation guidance du

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**Submit Time:** 10/16/2012 10:44:39
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Susan Stahle/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** Your favorite project -- correct citation?

Sue,

Not sure who this came from (OMB compiled), but could this be more correct than our previous 'legal paragraphs' in the PAG Manual?

The 1946 AEA was extensively modified by the 1954 AEA, to the extent that we now refer to the Act as the AEA of 1954. The 1954 AEA is also the Act referenced in the Reorg. Plan No. 3 of 1970.

Correct citation is: Section 274h. of the Atomic Energy Act of 1954, as amended (AEA), 42 USC 2021(h)

Thanks!!

S.

**Draft 2012 PAG Manual 7-23-2012.docx** Draft 2012 PAG Manual 7-23-2012.docx

**Submit Time:** 7/10/2012 15:50:05
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Glenna Shields/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** Document for IE design help

Glenna,

Can your group work with IE to get this document designed in a more attractive and readable format for publication on the web (as PDF, perhaps?) and easily printed by public reviewers who see the FR announcement of availability?

We don't have a solid timeframe but any idea on turnaround would be helpful, once they've had a chance to look it over. As you might guess, the content is locked down, to the word. Any grammar catches would be appreciated, but I probably have to okay each one!

Let me know how I can help, and thank you,

Sara

Draft 2012 PAG Manual 7-10-2012.docx Draft 2012 PAG Manual 7-10-2012.docx

**Submit Time:** 10/11/2012 13:23:11
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** bbhattacharya@endyna.com
**Cc:**
**Subject:** New spreadsheet for edits

Bani,

I did try to pull the water comments out to the other tab but promptly lost the ability to unsort the main tab. Here is the updated spreadsheet, unscathed, with today's responses in it. I will not do a new version electronically until I see your update, which I hope will be easy to generate. Please do email with any questions as I'll be offisite the rest of today through Monday afternoon. (Checking Blackberry, always.)

Thank you and good luck with this!!

Sara
cell 202-738-2871

**PAGS Comment Responses Oct 11 2012.xlsx** PAGS
Comment Responses Oct 11 2012.xlsx

Tyler and Smita,

Two sided and my fax didn't mix (a good thing, saving a tree) so here is my markup, attached. You'll see that I trail off a bit on some of my key sentences and I'll be looking back at old versions for some of the gems we liked before. (Might be good to do a webinar to talk through some of these, so I can page through my old versions and suggest lingo.)

Also, I changed my mind mid-edit about whether there should be 6 or 4 chapters. I think 4.... And I didn't indicate that I think we'll be cutting out Sections 3.5.1 through 3.5.10 based on recent discussions.

If all this can be shown in Track Changes, I can run it past people here and see what reviews will be needed. My meeting with top management is Wednesday.

Thanks so much, and let me know if you run into questions!

Sara

SCAN0001.pdf SCAN0001.pdf

"Smita Siddhanti" ---03/14/2012 04:17:27 PM---Sara, sure you can fax it to us at 703-848-9001. -Smita

From: "Smita Siddhanti" <siddhanti@endyna.com>
To: Sara DeCair/DC/USEPA/US@EPA
Cc: "'Tyler A. Willis'" <twillis@endyna.com>
Date: 03/14/2012 04:17 PM
Subject: RE: Hope to have a fax markup to you in the morning

---

Sara, sure you can fax it to us at 703-848-9001.
-Smita

---

**From:** Sara DeCair [mailto:DeCair.Sara@epamail.epa.gov]
**Sent:** Wednesday, March 14, 2012 4:14 PM
**To:** siddhanti@endyna.com
**Cc:** 'Tyler A. Willis'
**Subject:** Hope to have a fax markup to you in the morning

Smita and Tyler,

I've marked up most of Ch. 1 and will get to the FR Notice by tomorrow morning -- can I fax it over for you to have a quick look and then we can talk through actual edits? It will need to be in Track Changes, natch, so my bosses can see what we've changed. Many thanks!!

S.

"Smita Siddhanti" ---03/13/2012 05:17:05 PM---Hi Sara,

From: "Smita Siddhanti" <siddhanti@endyna.com>
To: Sara DeCair/DC/USEPA/US@EPA
Cc: "'Tyler A. Willis'" <twillis@endyna.com>

Date: 03/13/2012 05:17 PM
Subject: RE: Ready to work? Let me know if we can chat!

---

Hi Sara,

Good to hear from you. Yes, I am in the office tomorrow am – let us plan to talk at 9, if that works for you.
Tyler can join us too.
We will call you at the number you gave.

Best,
-Smita

Smita K. Siddhanti, Ph.D. | Program Manager
P: 703.848.8840 | F: 703.848.9001
Cell-703-217-4800

**EnDyna, Inc.**
7926 Jones Branch Drive.
Suite 620
McLean, VA 22102
www.endyna.com

---

**From:** Sara DeCair [mailto:DeCair.Sara@epamail.epa.gov]
**Sent:** Tuesday, March 13, 2012 5:08 PM
**To:** siddhanti@endyna.com
**Subject:** Ready to work? Let me know if we can chat!

Smita,

We have the green light to smash a few papers together with the PAGs and even have a mandated deadline of 60 days to publish! Any chance we can talk tomorrow? My desk is 202-343-9108 and I should be there about 8:30 am....

Luckily the writing is done, need to just do some smoothing and formatting!

S.

**Subject:** Copy of PAGs
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**Submit Time:** 6/27/2012 17:56:22
**To:** "Mike Boyd" <boyd.mike@epa.gov>

You can also see I have a darling contractor :)
---
Sent by EPA Wireless E-Mail Services

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**From:** Brielle Welzer [bwelzer@endyna.com]
**Sent:** 06/27/2012 07:52 PM GMT
**To:** Sara DeCair
**Subject:** RE: Beautify copy of PAGs? Say.... by Friday? :)

Hi Sara,

I've worked on the document -

Comment one - CHECK.

Comment two - CHECK.
- Inserted the rest of the paragraph - so it is now fully included (p.14)
- BUT - I have not addressed the "chronic" versus "stochastic" issue from Comment #2.

The EPA website (http://www.epa.gov/rpdweb00/understand/health_effects.html) seems to define stochastic as "chronic." So maybe this is acceptable - despite Comment #2's issue with this word choice.

Also -

the beautification process (The EnDyna Half-Day Salon):

- I updated the table of contents - 2.3.3 and 2.6.1 were missing.

- I changed some colors within text boxes and tables (text boxes on Pages 12 and 13)

- I added one space between tables and their titles.

- I deleted one blank page.

Are there any other formatting issues you wanted me to focus on?

Will we have to change the cover to July 2012?

Please feel free to call me or request a call - in case some of what I've done is unnecessary/unhelpful. I'm happy for any criticism or feedback.

Thanks so much,

- Brie

Draft 2012 PAG Manual 6-1-2012 v2 - bw.doc

**Submit Time:** 10/23/2012 17:39:39
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** Don't mess with this, it's perfect [in air quotes]

Soooo..... I replaced or edited the headers throughout the 11 sections since editing the first ones made a whole bunch of the headers go away. Heh! This would probably look cleaner for our conversations with managers and OMB if I just accept those changes since switching to October is merely true, not an edit.

I think I fixed the extra return above that Makeup/Function switch, and I think it looks clear enough in the redline. And I checked for comment consistency in that great new sentence about roles.

Tomorrow, I am sure to finish the spreadsheet (I have the responses but I also want it to sort the right way.... still working on that) and a one-pager is a piece of cake. I can have that ready any time.

Cheers!

S.

**PAG Manual with OMB and EPA cmts incorp 10-23-2012.docx** PAG Manual with OMB and EPA cmts incorp 10-23-2012.docx

**Submit Time:** 3/21/2012 16:38:34
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** twillis@endyna.com
**Cc:** siddhanti@endyna.com
**Subject:** New version, just a little formatting

Tyler,

I went through and hopefully mostly cleared up the questions you had (thank you for highlighting those items) and now I've moved the Re-entry matrix so I messed up the formatting for it to fit. I also may have screwed up the TOC but tried to fix it -- dangerous!

In the meantime I am getting an internal review done now, and will have a few more tweaks maybe on Friday. We hope to send it for an intra-office review on Monday. So let me know if you will not be able to get a better formatted version back to me by Monday morning? Many thanks,

Sara

**Draft PAGs Combined Document - 03-21-2012sdd.doc** Draft PAGs Combined Document - 03-21-2012sdd.doc**Draft PAGs FR Notice - 03-21-2012sdd.docm**

**2012sdd.docm** Draft PAGs FR Notice - 03-21-2012sdd.docm

**Subject:** PAG files
**To:** CN=Debbie Dietrich/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Mike Flynn/OU=DC/O=USEPA/C=US@EPA CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Alan Perrin/OU=DC/O=USEPA/C=US
**Submit Time:** 5/23/2012 14:01:16

Debbie,

Here are the files, the draft FR Notice and the draft PAGs Manual, ready to be distributed for review.

A suggested distribution list includes the addresses you used in your "heads-up" note along with the additional names mentioned earlier today:

Lisa Feldt, Larry Stanton, Dana Tulis, James Woolford, Barnes Johnson, Pamela Barr, Eric Berneson, David Travers, John Michaud, Susan Stahle, Mike Flynn, Jonathan Edwards

A note follows that you might use with the distribution (please feel free to modify). Let us know if there is anything else we can do. -Alan

---

Intra-agency colleagues and PAGs reviewers,

Since your last review of the PAG Manual and FR Notice in early April, an agreement was struck between Bob Perciasepe and Jane Lute of DHS to incorporate the 2008 RDD/IND Planning Guide into the PAG Manual, in effect, merging the Deputies' PLE Cleanup paper and the RDD/IND Late Phase guidance. Attached are draft versions of the slightly expanded combined Manual and the FR Notice for your review and concurrence.

Since the language in the PAGs and the Deputies' PLE papers has already been approved at a high level, very few changes have been made. Since the last review: most comments received were incorporated; some text was updated to provide bridging language between the Deputies' cleanup paper and the 2008 RDD/IND Late Phase guidance. It is good news that, with this merged document, users will end up with a single guidance for radiological incidents once the PAG Manual is finalized.

I apologize for the current review time frame! EPA is being asked to meet some very demanding external deadlines, unfortunately that means our internal deadlines must be equally demanding. **Please provide your office's consolidated concurrence/comments via email not later than 4:00 pm on Tuesday, May 29, to Alan Perrin with a cc to me**. We are meeting with the Deputy Administrator at 1 pm the following day (5/30) to discuss any remaining issues. Let me know if you have any concerns, and thank you for providing your input on such a short schedule.

Sincerely,

Debbie
{signature block}

Draft PAGs FR 5-22-2012.doc Draft PAGs FR 5-22-2012.docDraft 2012

PAG Manual 5-22-2012.doc Draft 2012 PAG Manual 5-22-2012.doc

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Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376

**Subject:** Merged guidance, please review
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Submit Time:** 5/16/2012 12:12:05

Here is my first draft. Should I ask Mike Boyd or Betsy or Dan or anyone else to review it now, too? I've also attached the RDD-IND guidance that I pulled from, and also put in comments about why I used what I did.

Happy reading!

S.

**RDD-IND doc parts to incorporate 5-15-2012.doc** **SOE Cleanup paper with RDD-IND Guidance incorporated 5-16-2012.docx**

**From:** "Tyler A. Willis" <twillis@endyna.com>
**To:** Sara DeCair/DC/USEPA/US@EPA
**Subject:** PAGs Docs
**Submit Time:** 3/20/2012 09:29:31

Sara,

Attached are the documents you sent us with the edits and a read through. Give me a call or send an email if you like.

Regards,

**Tyler A. Willis**

**Senior Environmental Consultant**
twillis@endyna.com

**EnDyna, Inc.**
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McLean, VA 22102
Tel: (703) 848-8842, ext. 124
Fax: (703) 848-9001
www.endyna.com

**Draft PAGs FR Notice - 03-20-12.doc** **Draft PAGs Combined Document - 03-20-12.doc**

**Subject:** Fw: Confirming: Wed., Nov. 14 at 2 pm on PAGs Manual
**To:** CN=Connie Gillam/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA
**From:** CN=Alan Perrin/OU=DC/O=USEPA/C=US
**Submit Time:** 11/9/2012 13:47:54

Connie,

The OMB contact below (Lisa Jones) will need clearance info for Mike Flynn, Debbie Dietrich, Sara and me for the 11/14 meeting. The form is attached, can you work with Debbie and Mike's office to ensure that the info is transmitted. [I think you have my and Sara's info, let us know if that is not the case.]

Thanks, Alan
~~~~~~~~~~~~~
Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376

----- Forwarded by Alan Perrin/DC/USEPA/US on 11/09/2012 01:38 PM -----

From: "Whiteman, Chad" Ex. 6 - Personal Privacy
To: Sara DeCair/DC/USEPA/US@EPA
Cc: Alan Perrin/DC/USEPA/US@EPA, Jonathan Edwards/DC/USEPA/US@EPA, "Schwab, Margo" Ex. 6 - Personal Privacy
Date: 11/09/2012 01:28 PM
Subject: RE: Confirming: Wed., Nov. 14 at 2 pm on PAGs Manual

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Sara,

We'll be meeting in Room 9104 of the New Executive Office Building (NEOB) for our 2pm meeting on Wednesday, November 14th. Please submit your security clearance information to Lisa Jones at Ex. 6 - Personal Privacy

Thanks,
Chad

**From:** DeCair.Sara@epamail.epa.gov [mailto:DeCair.Sara@epamail.epa.gov]
**Sent:** Tuesday, November 06, 2012 2:03 PM
**To:** Whiteman, Chad; Schwab, Margo
**Cc:** Perrin.Alan@epamail.epa.gov; Edwards.Jonathan@epamail.epa.gov
**Subject:** Confirming: Wed., Nov. 14 at 2 pm on PAGs Manual

Chad,

Glad that you and Alan were able to settle on Nov. 14th at 2 pm. Mike Flynn, Debbie Dietrich, Alan and I have it on our calendars. Once you have a room reserved, let me know the room number. And should I ask everyone to send you their full names, DOB, and SSN directly, or will you give me a form to collect the info on one sheet?

Thank so much,

Sara
~~~~~~~~~~~~~

202-343-9108

"Whiteman, Chad" ---11/02/2012 05:11:13 PM---On Wed (11/7), NSS has a meeting from 3:30-4:30 on their calendar and Margo has something at 5 that

From: "Whiteman, Chad" Ex. 6 - Personal Privacy
To: Sara DeCair/DC/USEPA/US@EPA
Date: 11/02/2012 05:11 PM
Subject: RE: After 4 on Wed?

---

On Wed (11/7), NSS has a meeting from 3:30-4:30 on their calendar and Margo has something at 5 that will require her to leave early that day. The following week, both Dom and Margo are out on Tuesday (11/13) for most of the day for a workshop that is offsite. I would recommend that we do it on Wed (11/14)...looks like 2 or 3pm would work best. Does that work on your end?

**From:** DeCair.Sara@epamail.epa.gov [mailto:DeCair.Sara@epamail.epa.gov]
**Sent:** Friday, November 02, 2012 5:04 PM
**To:** Whiteman, Chad
**Subject:** After 4 on Wed?

Chad,
Any chance we could look at times after 4 next Wednesday? Mike is hosting his annual Office-wide national meeting from 1 to 3 that day.
Thanks for checking,
Sara **Security Clearance Information - Nov 14 @ 2pm - NEOB 9104.xls** Security Clearance Information - Nov 14 @ 2pm - NEOB 9104.xls

**Submit Time:** 11/27/2012 15:15:03
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** Kit and Kaboodle....

.... as always, in case I'm flattened by a bus on the way home tonight :-D

S.

**PAGS Comment Responses Nov 20 2012.xlsx** PAGS Comment Responses Nov 20 2012.xlsx**Key issues follow up from OMB meeting 11-27-2012_v4.docx** Key issues follow up from OMB meeting 11-27-2012_v4.docx**PAG Manual redline no highlights 11-27-2012.docx** PAG Manual redline no highlights 11-27-2012.docx

**Subject:** FAQs may be ready for sub-PAGs Subcommittee review?
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=William Sacks/OU=DC/O=USEPA/C=US@EPA CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Submit Time:** 6/19/2012 11:30:16

Yep, no worries though. I think the next steps are a little bit interdependent, since the interagency staff I work with will care what we say, but the internal review steps should dictate how formally we have buy in on the content.

Maybe I can pose to Alan and Jon that we start a PAGs Subcommittee review (or a subset of that group) of this material, to make sure they don't worry about how it might impact the PAGs themselves.... Then it'd be great to learn what steps are after that review, for getting permission to post the FAQs on the web. Thank you!!

S.

-----William Sacks/DC/USEPA/US wrote: -----
To: Sara DeCair/DC/USEPA/US@EPA
From: William Sacks/DC/USEPA/US
Date: 06/19/2012 10:52AM
Subject: Re: Link to request Turbo FRMAC

Jess got back to me. She said that I need to figure out from you who else (maybe in the interagency) needs to review.

Any insight on this? It seems like you asked me to find out what the next step is and then I get an answer that the next step begins with you, so there could be some confusion as to what should actually happen next.

William D. Sacks
U.S. Environmental Protection Agency
Radiation Protection Division
202.343.9707

Sara DeCair---06/19/2012 08:47:35 AM---Cool -- thank you! So what's next? -----William Sacks/DC/USEPA/US wrote: ----- To: Sara DeCair/D

From: Sara DeCair/DC/USEPA/US
To: William Sacks/DC/USEPA/US@EPA
Date: 06/19/2012 08:47 AM
Subject: Re: Link to request Turbo FRMAC

---

Cool -- thank you! So what's next?

-----William Sacks/DC/USEPA/US wrote: -----
To: Sara DeCair/DC/USEPA/US@EPA
From: William Sacks/DC/USEPA/US
Date: 06/19/2012 08:36AM
Subject: Re: Link to request Turbo FRMAC

This version includes the link for Turbo FRMAC and some changes that Jess made to the '2 rem first year' question.

# Ex. 5 - Deliberative Process

*(See attached file: FAQs All November 2011 6_19_2012.docx)*

William D. Sacks
U.S. Environmental Protection Agency
Radiation Protection Division
202.343.9707

[attachment "FAQs All November 2011 6_19_2012.docx" removed by Sara DeCair/DC/USEPA/US]

**Submit Time:** 6/29/2012 17:22:02
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Mike Flynn/OU=DC/O=USEPA/C=US@EPA CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA
**Cc:** CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA CN=Jessica Wieder/OU=DC/O=USEPA/C=US@EPA CN=Raymond Lee/OU=DC/O=USEPA/C=US@EPA
**Subject:** PAG Manual and FR Notice

Mike, Jon, and Alan,

Here is the newly hyperlinked and cleaned up PAG Manual. We incorporated Gerry Epstein's deletion and one addition from Trish at NRC, it's an evacuation concept that we'd talked about adding back in our PAGs Subcommittee discussions a few years ago.

Draft 2012 PAG Manual 6-29-2012 v4.pdf Draft 2012 PAG Manual 6-29-2012 v4.pdfDraft 2012 PAG Manual 6-29-2012 v4.doc Draft 2012 PAG Manual 6-29-2012 v4.doc

The draft FR Notice is supposed to be double-spaced but this is the content that we've agreed to within the Agency.

Draft PAGs FR 6-28-2012.doc Draft PAGs FR 6-28-2012.doc

Let me know if there is anything I can do to move this along!

Sara

**Submit Time:** 5/18/2012 16:06:29
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** twillis@endyna.com
**Cc:** siddhanti@endyna.com CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA
**Subject:** Document to clean up by COB Monday

Tyler,

Thanks for your prompt (and positive) response! A couple needs for this updated version, which I had to slap together so we could do some reviews this weekend.

- Check for first use of acronyms being spelled out, then only shortened later in the doc.
- Ensure pagination and Table of Contents are correct
- Check the format of the footnote #30 that I probably messed up when I was pasting in the latest cleanup lingo?
- (New) section 4.1.6 now has a bunch of subsections, since it's dropped in from another document - suggestions on delineating those? A fourth numeric layer seems a little over the top for a numbering structure!
- Make sure any new acronyms or references are inserted into the Acronyms/Refs at the back.
- Section 4.2 was entirely replaced with new content so it needs to be numbered and made consistent with the rest of the formatting to the extent possible.
- Make bulleted lists consistent with rest of document (I definitely messed the new ones up).

I'm attaching the source documents for Cleanup and Waste, that were the big reason for this new version. Let me know if yo have any questions -- here is my cell number: 202-738-2871.

Thank you so much!

Sara

**Draft PAGs-Combined Document 5-18-2012.doc** Draft PAGs-Combined Document 5-18-2012.doc

**SOE Cleanup paper with RDD-IND Guidance incorporated 5-18-2012.docx** SOE Cleanup paper with RDD-IND Guidance incorporated 5-18-2012.docx**waste-disposal_combined April 5 2012.docx** waste-disposal_combined April 5 2012.docx

**Subject:** files
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**From:** CN=Alan Perrin/OU=DC/O=USEPA/C=US
**Submit Time:** 3/21/2012 15:35:51

PAGs_outline_3-21-12.docx PAGs_outline_3-21-12.docxPAG-PLE_bullets.docx PAG-PLE_bullets.docx

Thanks!
~~~~~~~~~~~~~
Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376
~~~~~~~~~~~~~

**Subject:** First Design of Format for DRAFT PAG Manual
**To:** CN=Sara DeCair/OU=DC/O=USEPA/C=US@EPA
**Cc:** Glenna Shields/DC/USEPA/US@EPA
**From:** CN=Tony Nesky/OU=DC/O=USEPA/C=US
**Submit Time:** 7/30/2012 16:43:16

Dear Sara:

Here's the first cut at a format for the draft PAG Manual to be published in the Federal Register. I'd like to make some changes, but why don't you look at it first, and we can get back to the contract for a *final* format for the *draft* document. (This sentence makes sense only in the context of this PAG Manual.)

Alan had wanted a neat, readable, but basic format for the version to appear in the FR. When we go for final publication, we can havea fancier format with columns, colors, etc.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

PAG_Ch2_v1.pdf PAG_Ch2_v1.pdf

**Submit Time:** 4/10/2012 08:59:18
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** twillis@endyna.com
**Cc:** siddhanti@endyna.com
**Subject:** Only one set of comments so far

Tyler,

These are super easy to incorporate (from Sue Stahle, I may have already forwarded them). In this version, I went through to respond and then found hardly anything needing a suggestion from me! I expect one or two more sets of comments by tomorrow. I will send them on quickly so we can get our new version for Thursday or Friday. Thanks!!

Sara

**Draft_PAGs-Combined-Doc_3-27-12_clean (sd04102012).docx** Draft_PAGs-Combined-Doc_3-27-12_clean (sd04102012).docx **Draft_PAGs-FR_3-27-12_clean (sd04102012).docx** Draft_PAGs-FR_3-27-12_clean (sd04102012).docx

Oh thank goodness! I am attaching what I've been given, so that each comment can be put into a spreadsheet like we've done before.

**2012 PAG Manual 7-20-2012_Redline Comments from 10_1_2012_with-line#s.docx**

**line#s.docx** 2012 PAG Manual 7-20-2012 Redline Comments from 10_1_2012_with-line#s.docx

**2012 PAG Manual 7-20-2012_Summary Comments 10_01_2012.docx**

**2012.docx** 2012 PAG Manual 7-20-2012 Summary Comments 10_01_ 2012.docx

Just an example for the spreadsheet here -- if there's a better way to organize, let's try it! And heck, we don't really know who the commenters are (OMB for all, I guess)....

**Master List Responses 3-9-2007.xls** Master List Responses 3-9-2007.xls

Many thanks! I am reachable via phone or email anytime for questions. Let's plan to chat briefly this afternoon or Friday to see how it's going.

S.

Smita Siddhanti ---10/03/2012 10:42:46 AM---Hi Sara, Sorry for not getting back earlier, I was out in meetings all day yesterday. Sure, I have

From: Smita Siddhanti <Siddhanti@endyna.com>
To: Sara DeCair/DC/USEPA/US@EPA
Date: 10/03/2012 10:42 AM
Subject: RE: Got time to help with PAGs?

---

Hi Sara,
Sorry for not getting back earlier, I was out in meetings all day yesterday. Sure, I have staff to help you with this. Do send me your comments and I will connect you with Bani or Jeff, who can help you now and in coming weeks.
I am available to talk any time after noon today.
Best,
-Smita

**From:** Sara DeCair <DeCair.Sara@epamail.epa.gov>
**Date:** October 2, 2012 12:00:30 PM EDT
**To:** <siddhanti@endyna.com>
**Subject: Got time to help with PAGs?**
Hi Smita!

We finally got something to work with from OMB -- do you have some staff time to put toward compiling comments in a spreadsheet like we've done before? I am, as usual, chewing on the policy implications and drafting responses....

Thanks for letting me know! I am on calls at 1 and 2 today, but otherwise can be reached at my

desk. Also, we are hoping to complete draft responses within two weeks, as you look at your staffing.

S.

desk 202-343-9108

Jess got back to me. She said that I need to figure out from you who else (maybe in the interagency) needs to review.

Any insight on this? It seems like you asked me to find out what the next step is and then I get an answer that the next step begins with you, so there could be some confusion as to what should actually happen next.

William D. Sacks
U.S. Environmental Protection Agency
Radiation Protection Division
202.343.9707

Sara DeCair---06/19/2012 08:47:35 AM---Cool -- thank you! So what's next? -----William Sacks/DC/USEPA/US wrote: ----- To: Sara DeCair/D

From: Sara DeCair/DC/USEPA/US
To: William Sacks/DC/USEPA/US@EPA
Date: 06/19/2012 08:47 AM
Subject: Re: Link to request Turbo FRMAC

---

Cool -- thank you! So what's next?

-----William Sacks/DC/USEPA/US wrote: -----
To: Sara DeCair/DC/USEPA/US@EPA
From: William Sacks/DC/USEPA/US
Date: 06/19/2012 08:36AM
Subject: Re: Link to request Turbo FRMAC

This version includes the link for Turbo FRMAC and some changes that Jess made to the '2 rem first year' question.

**Ex. 5 - Deliberative Process**

*(See attached file: FAQs All November 2011 6_19_2012.docx)*

William D. Sacks
U.S. Environmental Protection Agency
Radiation Protection Division
202.343.9707

[attachment "FAQs All November 2011 6_19_2012.docx" removed by Sara DeCair/DC/USEPA/US]

**Submit Time:** 5/22/2012 16:46:13
**From:** CN=Sara DeCair/OU=DC/O=USEPA/C=US
**To:** CN=Lee Veal/OU=DC/O=USEPA/C=US@EPA CN=Alan Perrin/OU=DC/O=USEPA/C=US@EPA CN=Jonathan Edwards/OU=DC/O=USEPA/C=US@EPA
**Cc:**
**Subject:** PAGs two-pager updated for Mike

I'll print the PAG Manual and a final version of this two-pager first thing in the morning. Do you think the "Issue:" line up top does the trick here? Thanks for suggestions!

S.

Process Path for PAGs 5-22-2012.docx Process Path for PAGs 5-22-2012.docx

**From:** "Milligan, Patricia" <Patricia.Milligan@nrc.gov>
**To:** Sara DeCair/DC/USEPA/US@EPA
**Submit Time:** 6/28/2012 12:05:59
**Subject:** additional thoughts for your consideration

I spoke with Steve about the child thyroid and FDA…. But his comments are worth considering..

**From:** LaVie, Steve
**Sent:** Wednesday, June 27, 2012 2:51 PM
**To:** Milligan, Patricia
**Cc:** Kahler, Robert
**Subject:** RE: - Final Protective Action Guidelin...

Trish

I went through the document—greater diligence on the early phase, less on the late phase. I do not believe that I identified any show stoppers, but there are some items for consideration.

**Ex. 5 - Deliberative Process**

# Ex. 5 - Deliberative Process

**From:** Bani Bhattacharya <bbhattacharya@endyna.com>
**To:** Sara DeCair/DC/USEPA/US@EPA
**Subject:** RE: PAGs comments spreadsheet 9Oct2012 EnDyna
**Submit Time:** 10/9/2012 13:57:39

Hi Sara,

This is the revised spreadsheet.

Regards,
Bani Bhattacharya

**EnDyna**, Inc.
**7926 Jones Branch Drive**
**Suite 620**
**McLean, VA 22102**
**Tel: 703 848 8842 Ext: 124**
**Fax: 703 848 9001**
**www.endyna.com**

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**From:** Sara DeCair [DeCair.Sara@epamail.epa.gov]
**Sent:** Tuesday, October 09, 2012 9:52 AM
**To:** Bani Bhattacharya
**Subject:** RE: PAGs comments spreadsheet EnDyna 8Oct2012

Thanks, Bani -- by noon or 12:30 pm would be ideal. I will need to print one copy to show my colleagues at a 1 pm meeting. Much appreciated!!

Bani Bhattacharya ---10/09/2012 09:35:51 AM---Hi Sara, I'll make the necessary changes and send it to you soon. By when do you want it?

From: Bani Bhattacharya <bbhattacharya@endyna.com>
To: Sara DeCair/DC/USEPA/US@EPA
Date: 10/09/2012 09:35 AM
Subject: RE: PAGs comments spreadsheet EnDyna 8Oct2012

---

Hi Sara,

I'll make the necessary changes and send it to you soon. By when do you want it?

Regards,
Bani Bhattacharya

EnDyna, Inc.
7926 Jones Branch Drive
Suite 620
McLean, VA 22102
Tel: 703 848 8842 Ext: 124
Fax: 703 848 9001
www.endyna.com

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**From:** Sara DeCair [DeCair.Sara@epamail.epa.gov]
**Sent:** Tuesday, October 09, 2012 8:34 AM
**To:** Bani Bhattacharya
**Subject:** Re: PAGs comments spreadsheet EnDyna 8Oct2012

Good morning Bani,

I am reviewing the spreadsheet and working on how best to attack these comments, and talking with people here about what's next. Meantime, here are a few things you could do to make it work for us the best:

- Indicate in the Reviewer column whether it's "OMB Summary" or "OMB markup." This is so we can distinguish from a few other sources of comments that I can see coming in.
- I think we don't need the ID column or the blank column up front.
- Can you make the Column titles always show as we scroll down or print on each page?
- Also make the file name (with date, always! good thing to do) show on the printout so we don't mix up versions.

Thank you so much, this is incredibly helpful!

Sara

Bani Bhattacharya ---10/08/2012 04:54:18 PM---Hi Sara, Attached is the spreadsheet for your kind perusal. I have marked things in red if the infor

From: Bani Bhattacharya <bbhattacharya@endyna.com>
To: Sara DeCair/DC/USEPA/US@EPA
Date: 10/08/2012 04:54 PM
Subject: PAGs comments spreadsheet EnDyna 8Oct2012

---

Hi Sara,

Attached is the spreadsheet for your kind perusal. I have marked things in red if the information was missing or needed some clarification. Also, I've placed most of the comments from the summary document into relevant sections within the spreadsheet. A few were generic or general comments pertaining to a chapter than a section within a chapter.

Regards,
Bani Bhattacharya

EnDyna, Inc.