

DEP-EPA-PWD Meeting

Iodine-131 in Philly DW Issue

David J. Allard, CHP

PaDEP Bureau of Radiation Protection

March 28, 2012



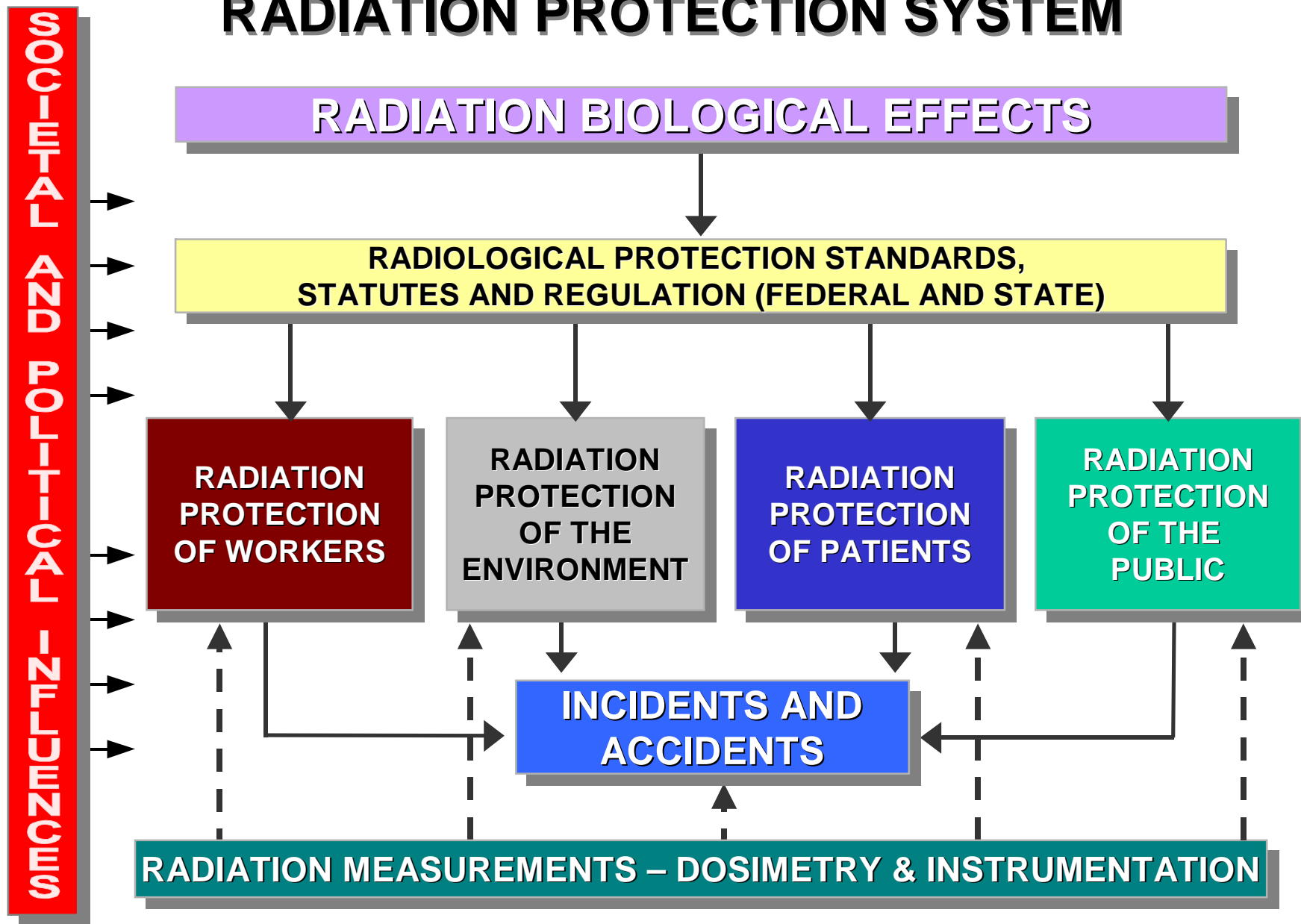
(Rev. 3/26/2012)

Objective of this Presentation

- Japan reactors / accidents response
- National Response Framework / Federal - States coordination
- PA Response and Report
- Iodine-131 DW issue / reg gaps
- Need for a national review
- Discussion



RADIATION PROTECTION SYSTEM



PA Nuclear Plant Sites

Limerick

Three Mile Island



Peach Bottom

ISFSI >



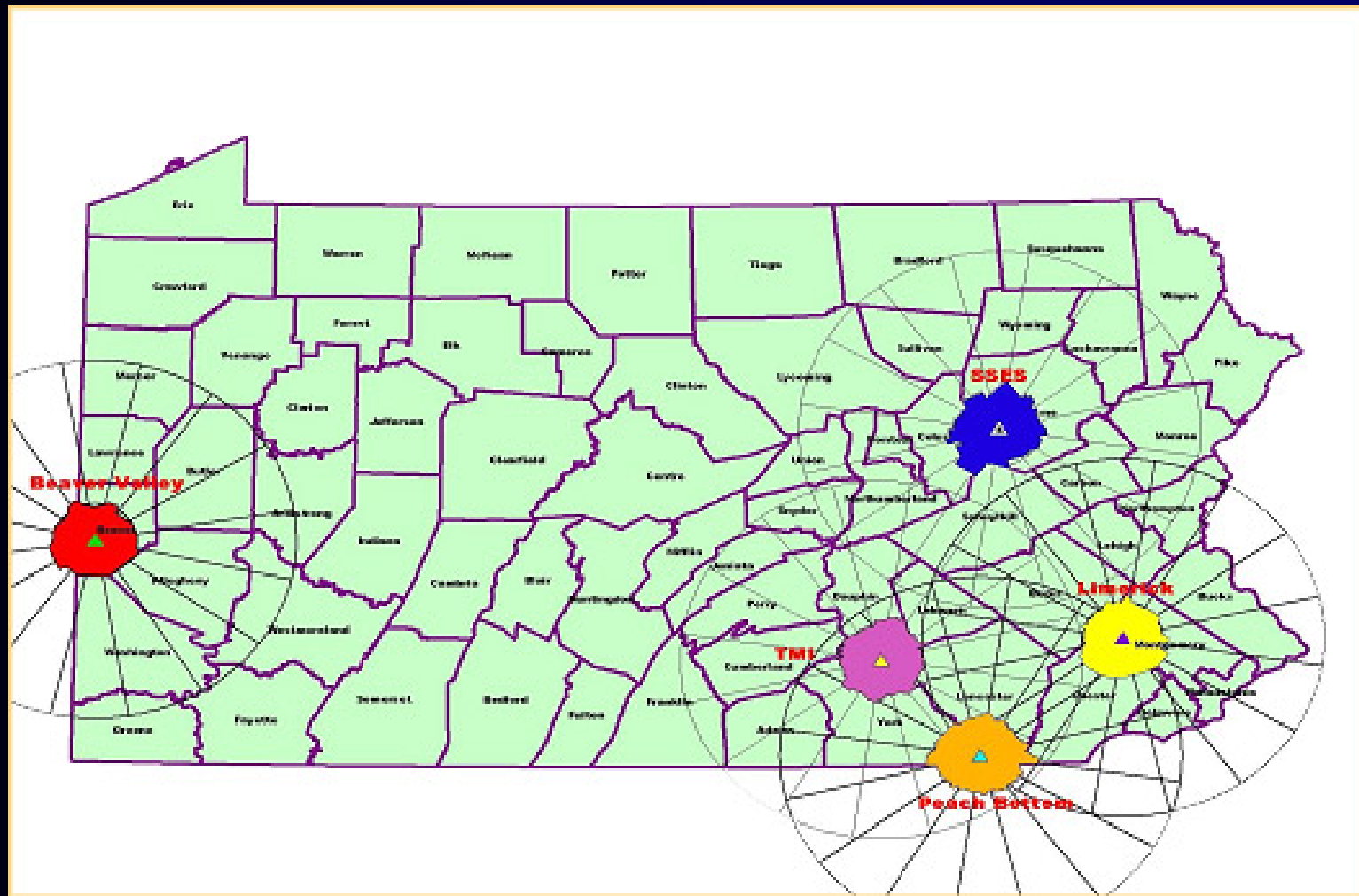
Beaver Valley

Susquehanna



Nuclear Power Plant EPZs

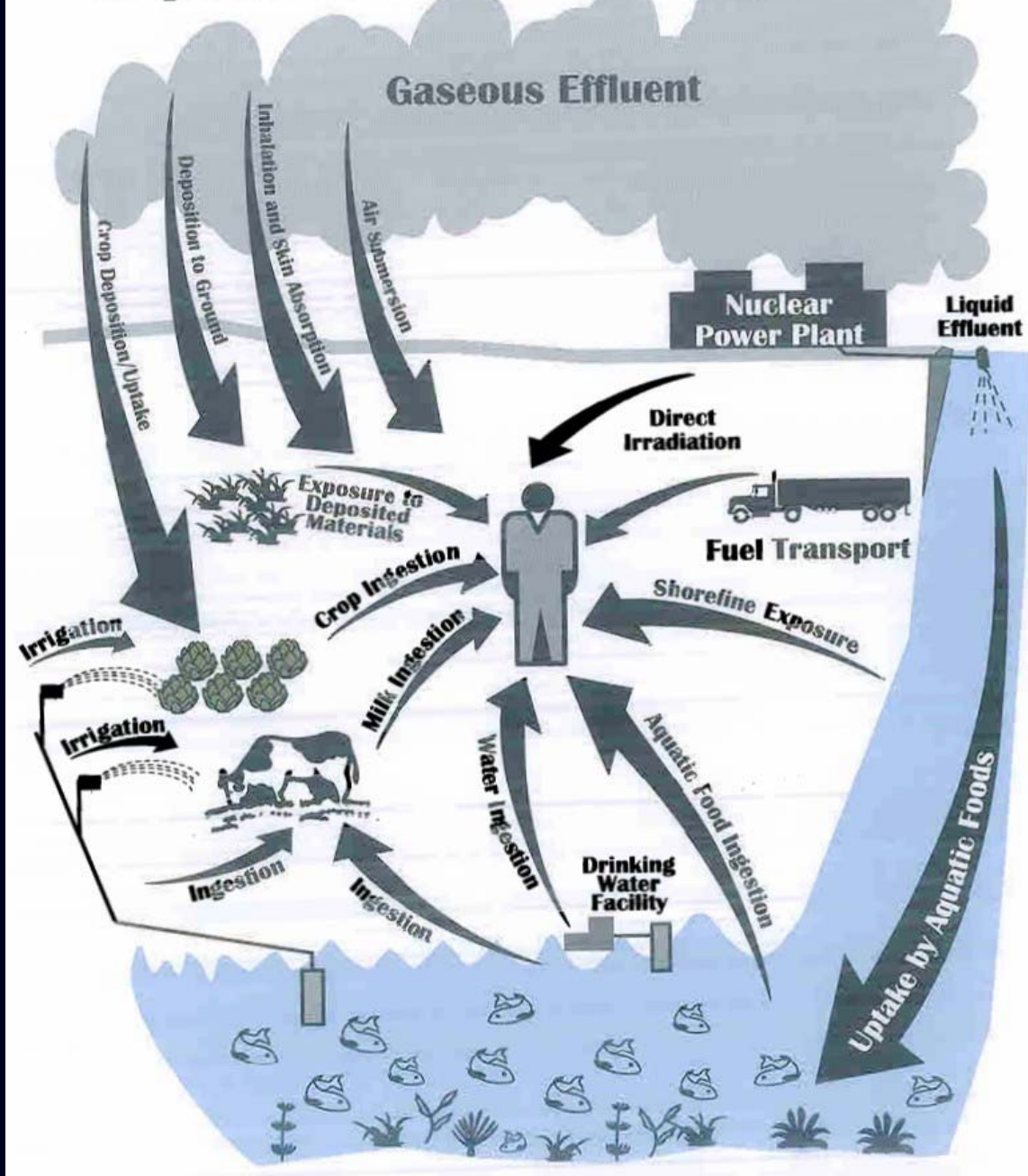
PA 10 and 50 mile EPZs



Legislative Authority

- **Radiation Protection Act (Act 1984-147, amended Act 2007-31)**
 - **Nuclear Safety Oversight**
 - **Emergency Response and Preparedness**
 - **Environmental Surveillance**
 - **Radiation Control (RAM and X-ray)**
- **EPA's Safe DW Act & Regs (PA equivalents)**

Exposure Pathways to Humans



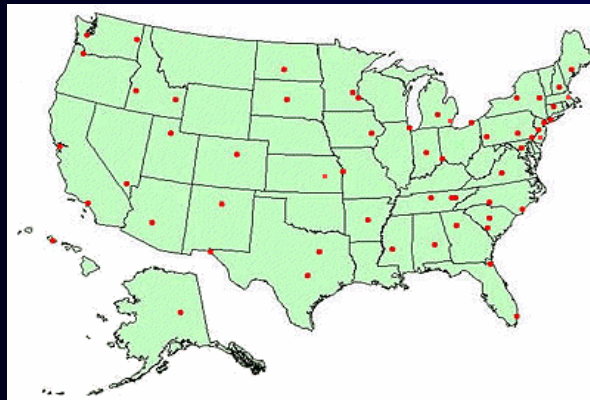
PA Environmental Surveillance

Sampling:

- Air
- Soil
- Water / rain
- Food stuffs
- Direct radiation



EPA's
RadNet



National Response Framework

NRF – published January 2008

- **Roles and Responsibilities (federal and state)**
- **Response Actions (prepare, respond, recover)**
- **Response Organization (local, state and federal) – Incident Command System (ICS)**
- **Planning (nuclear and radiological scenarios)**
- **Resources (ESFs and Incident Annexes)**

Nuclear / Radiological Annex

Nuc/Rad Annex – published November 2004

- **Type of Incident**
 - **Terrorism (RDD or IND)**
 - **Nuclear facility (NRC, DOE or DoD)**
 - **Transportation of RAM**
 - **Space vehicle re-entry**
 - **Foreign, unknown or unlicensed material**
 - **Nuclear weapon accident or incident**
- **Coordinating Agency**
- **Incident of National Significance**
- **Notifications**
- **Protective Action Recommendations**
- **Federal Resource Support**
- **Responsibilities**

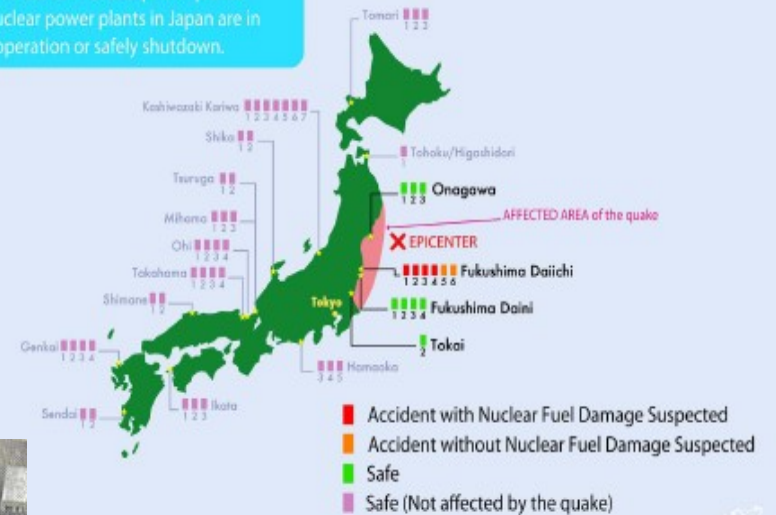
Japan

March 11, 2011

Multiple Reactors, with damaged SNF Pools

Status of the Nuclear Power Plants after the Earthquake

Every efforts and measures have been taken at Fukushima Daiichi nuclear power plants. Other nuclear power plants in Japan are in normal operation or safely shutdown.



Issues

- **Communications**
- **NRF lead federal agencies**
- **Public messaging – “Below public health concern.”**
- **Media SMEs**
- **Limited data sharing**
- **Plume modeling**

Issues (cont.)

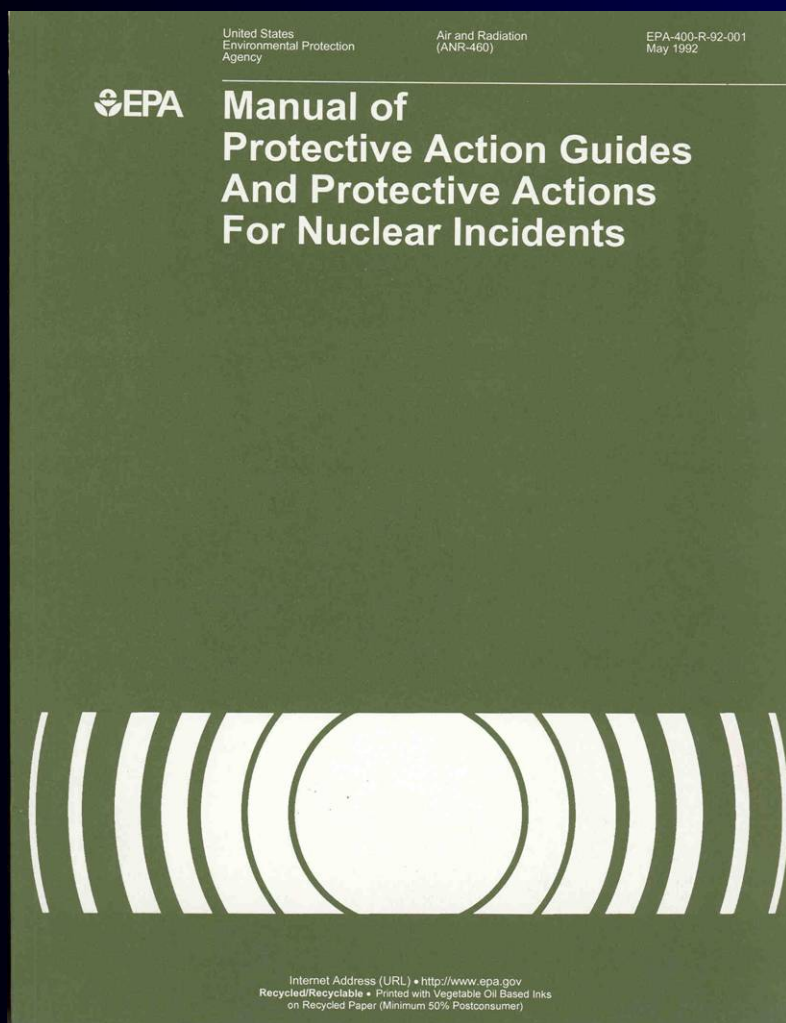
- **Potassium iodide**
- **U.S. Ports / radiological screening**
- **Environmental monitoring data**
- **EPA RadNet data access / posting**
- **Public health standards**

Issues (cont.)

- **EPA drinking water alternate MCL;
3 pCi/L iodine-131 (c1960 ICRP 2 Rpt.)**
- **FDA food and milks DILs;
~4,600 pCi/L I-131 (1990s Stds.)**
- **FR 1961 Presidential Guidance for
fallout containing I-131 and Sr-90;
500 mrem/y**

Protective Action Guides Manual

PAGs in EPA 400-R-92-001, or “EPA 400”



Incident Phase:

- Early (hr – days)
- Intermediate (week - months)
- Late (months – years)

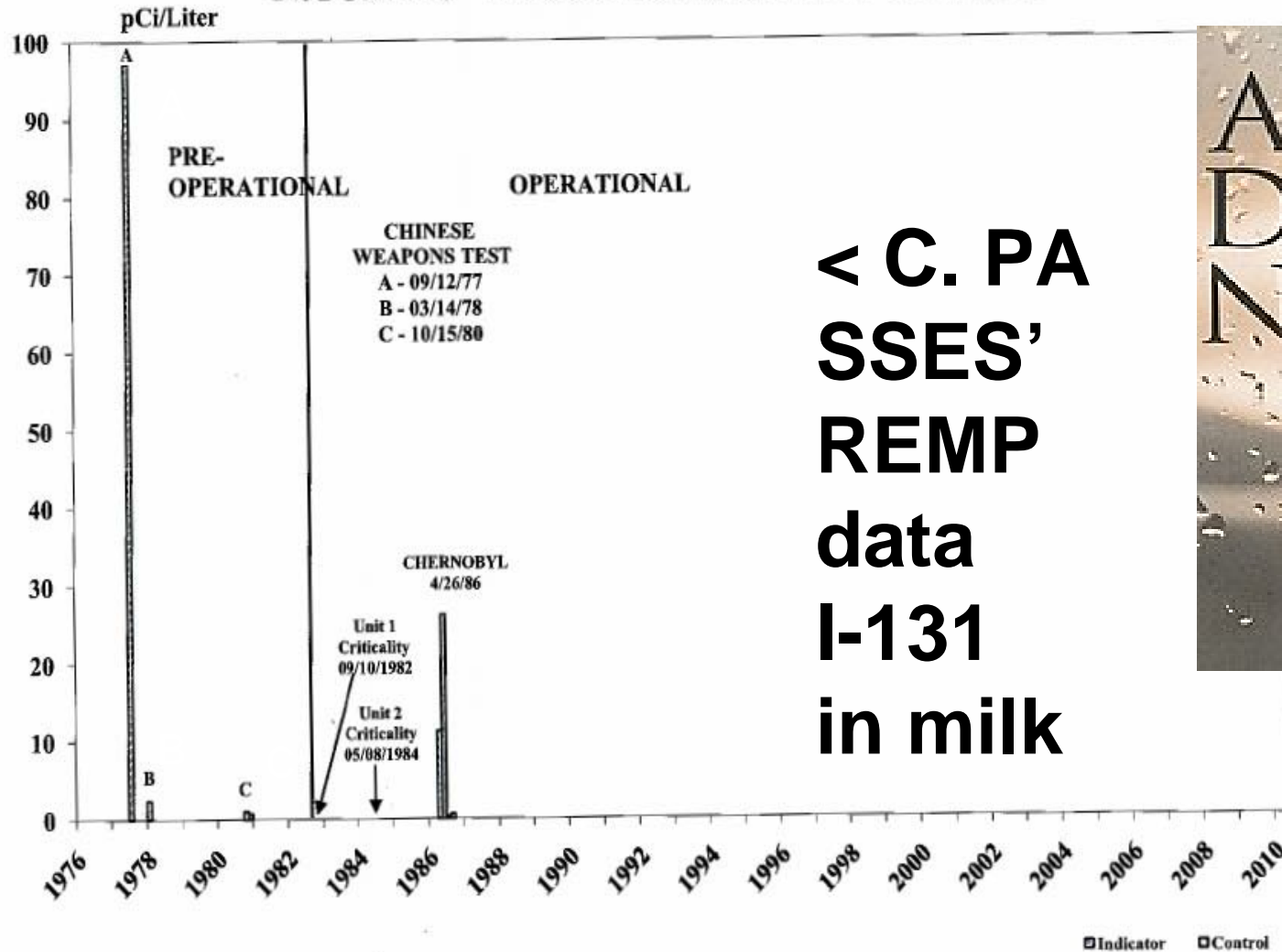
*Note: no DW
PAGs!*

*1961 Federal Guidance
and FDA DILs*

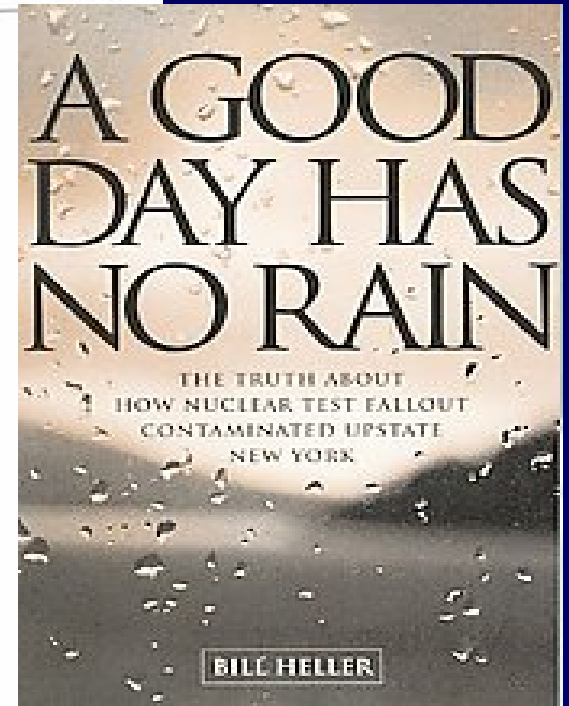
Fallout 1950s-1980s



FIGURE 13 - IODINE-131 ACTIVITY IN MILK



< C. PA
SSES'
REMP
data
I-131
in milk

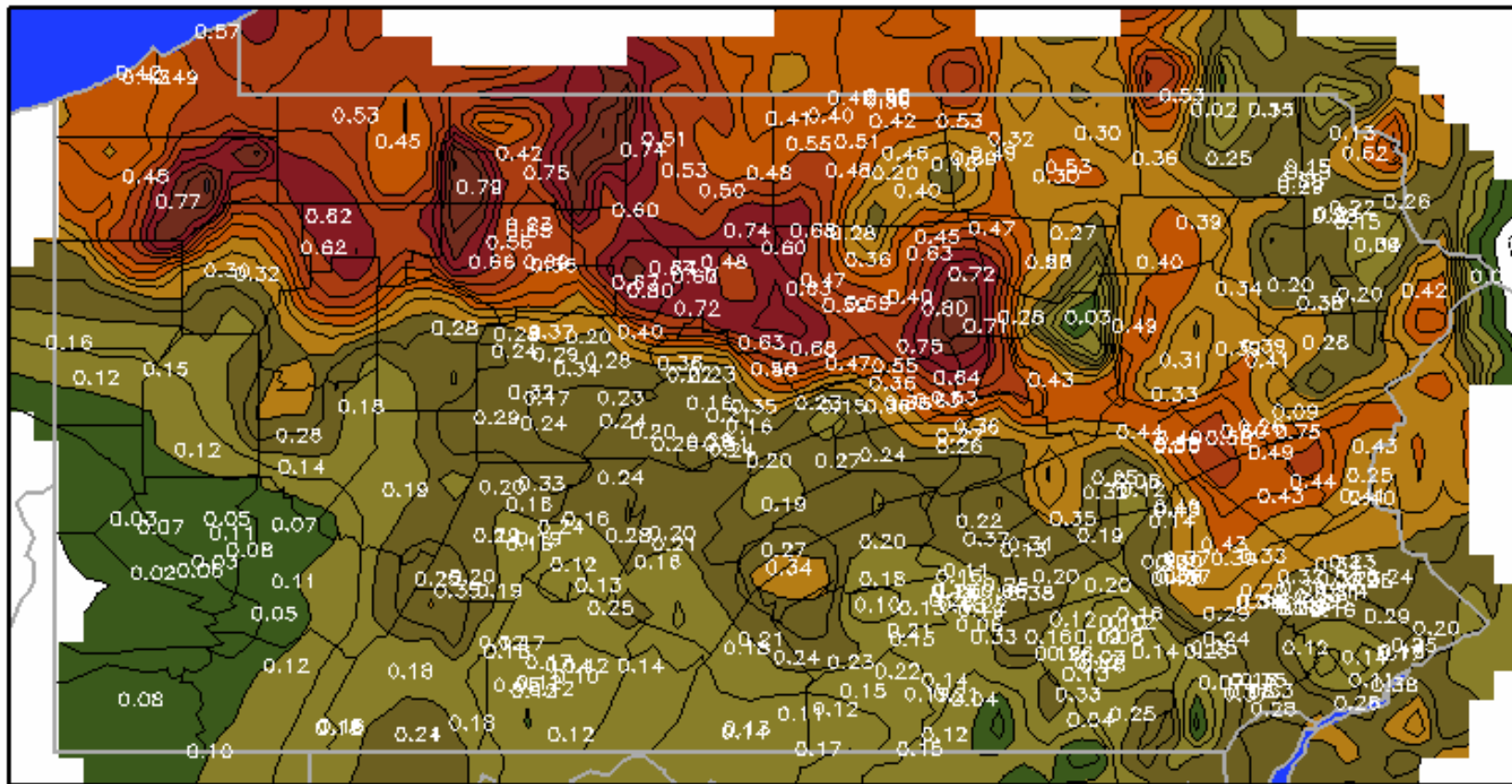


^ Troy, NY
April 1952

PA Japan Response

- **State Government: initial notification and reporting**
- **States: requests for information, HHS-CDC conference calls**
- **Radioactivity Detection: west coast, eastern states rain-out March 22-23**
- **Environment Surveillance: enhanced data review and sampling**

Precipitation Total (inches)
past 24 hours ending 7:00 AM Mon Mar 21 2011
Updated: 04:30 PM 03/21/11



PA Japan Response (cont.)

- **Rain-out March 22nd: 40-100 pCi/L**
- **Sampling PA Surface DW Supplies**
- **Radioactivity Analysis: March 26-27, just I-131 in PA**
- **Governor's Press Conference Monday, March 28, 2011**
- **Continued enhanced sampling: DW, surface water, air samples, PA Report**
- **Japan I-131 decayed by June 1st**



Radiation Protection



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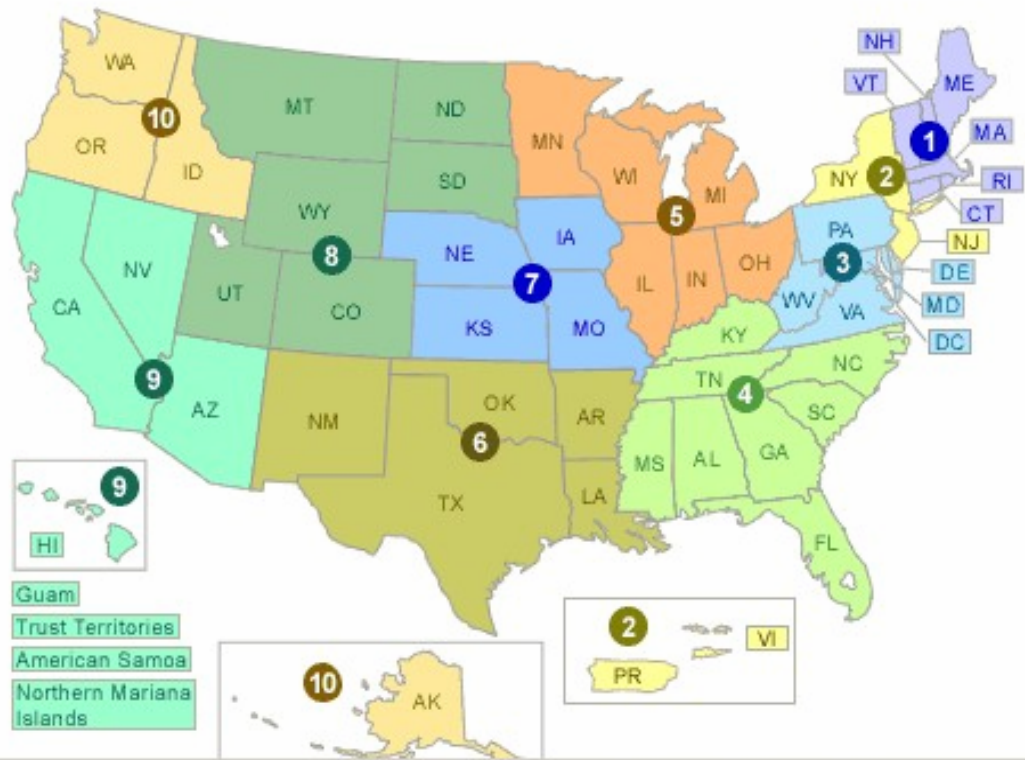
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EPA Regional Radiation Protection Programs

EPA has ten regional offices across the country, each of which is responsible for several states and in some cases, territories or special environmental programs. Each region has a radiation protection program. To find more information about the radiation protection program where you live, click on the number of the region in which you live.



EPA RadNet Data

The screenshot shows the EPA RadNet search results page. At the top, the EPA logo and navigation links are visible. The search results are for I-131 in drinking water. The page includes a breadcrumb trail, search filters, and a table header for the results.

RadNet - DRINKING WATER

<< Return

Location: PA
Medium: DRINKING WATER

Nuclides/Radiation: Iodine-131
Units: Traditional

Year Date Range: 1978 - 2011

The following results are based on the temporal changes in radiation level or radionuclides concentration over a specific date range for a specified location and medium, or the nationwide distribution radiation level, or nuclide concentration for a specified date and medium.

Location Average vs. Overall Average Results or [Graph it](#)

Location	Medium	Sample Date	Procedure Name	Nuclides / Radiation	Result	Combined Standard	MDC	Unit
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**I-131:
ND
to
> 3 pCi/L**

PA Report



Report

Fukushima Dai-ichi Nuclear Accident

**Department of Environmental
Protection's Response and Findings
Regarding Air and Water Resources and
Public Health and Safety within the
Commonwealth**

EPA DW Regs



ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 9, 141, and 142

[FRL-6909-3]

RIN 2040-AC98

National Primary Drinking Water Regulations; Radionuclides; Final Rule

Agency: Environmental Protection Agency.

Action: Final rule.

SUMMARY: Today, EPA is finalizing maximum contaminant level goals (MCLGs), maximum contaminant levels (MCLs), and monitoring, reporting, and public notification requirements for radionuclides. Today's rule is only applicable to community water systems. Today's rule includes requirements for uranium, which is not currently regulated, and revisions to the monitoring requirements for combined radium-226 and radium-228, gross alpha particle radioactivity, and beta particle and photon radioactivity. Based on an improved understanding of the risks associated with radionuclides in drinking water, the current MCL for combined radium-226/-228 and the current MCL for gross alpha particle radioactivity will be retained. Based on the need for further evaluation of the various risk management issues associated with the MCL for beta particle and photon radioactivity and the flexibility to review and modify standards under the Safe Drinking Water Act (SDWA), the current MCL for beta particle and photon radioactivity will be retained in this final rule, but will be further reviewed in the near future.

Some parts of EPA's 1991 proposal, including the addition of MCLGs and the National Primary Drinking Water Regulation (NPDWR) for uranium, are required under the SDWA. Other portions were intended to make the radionuclides NPDWRs more consistent with other NPDWRs, e.g., revisions to monitoring frequencies and the point of compliance. Lastly, some portions were contingent upon 1991 risk analyses, e.g., MCL revisions to the 1976 MCLs for combined radium-226 and -228, gross alpha particle radioactivity, and beta particle and photon radioactivity. The portions required under SDWA and the portions intended to make the radionuclides NPDWRs more consistent with other NPDWRs are being finalized today. The portions contingent upon the outdated risk analyses supporting the 1991 proposal are not being finalized today, in part based on updated risk analyses.

DATES: This regulation is effective December 8, 2003. The incorporation by reference of the publications listed in today's rule is approved by the Director of the Federal Register as of December 8, 2003. For judicial review purposes, this final rule is promulgated as of 1 p.m. Eastern Time on December 7, 2000. **ADDRESSES:** The record for this regulation has been established under the docket name: National Primary Drinking Water Regulations for Radionuclides (W-00-12). The record includes public comments, applicable **Federal Register** notices, other major supporting documents, and a copy of the index to the public docket. The record is available for inspection from 9 a.m. to 4 p.m., Eastern Standard Time, Monday through Friday, excluding Federal holidays, at the Water Docket, 401 M Street SW, East Tower Basement (Room EB 57), Washington, DC 20460. For access to the Docket materials, please call (202) 260-3027 to schedule an appointment.

FOR FURTHER INFORMATION CONTACT: For technical inquiries, contact David Huber, Standards and Risk Management Division, Office of Ground Water and Drinking Water, EPA (MC-4607), 1200 Pennsylvania Avenue, NW., Washington, DC 20460; telephone (202) 260-9566. For general inquiries, the Safe Drinking Water Hotline is open Monday through Friday, excluding Federal holidays, from 9:00 a.m. to 5:30 p.m. Eastern Standard Time. The Safe Drinking Water Hotline toll free number is (800) 426-4791.

SUPPLEMENTARY INFORMATION:

Regulated Entities

Entities potentially regulated by this rule are public water systems that are classified as community water systems (CWSs). Community water systems provide water for human consumption through pipes or other constructed conveyances to at least 15 service connections or serve an average of at least 25 people year-round. Regulated categories and entities include:

Category	Examples of regulated entities
Industry	Privately-owned community water systems.
State, Tribal, Local, and Federal Governments.	Publicly-owned community water systems.

This table is not intended to be exhaustive, but rather, provides a guide for readers regarding entities likely to be regulated by this action. Other types of entities not listed in the table could also

be regulated. To determine whether your facility is regulated by this action, you should carefully examine the applicability criteria in §§ 141.26(a)(1)(i), 141.26(a)(1)(ii), 141.26(b)(1), and 141.26(b)(2) of this rule. If you have questions regarding the applicability of this action to a particular entity, consult the person listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

Abbreviations and Acronyms Used in This Document

- ASTM: American Society for Testing and Materials
- AWWA: American Water Works Association
- BAT: Best available treatment
- BEIR: Biological effects of ionizing radiation
- CFR: Code of Federal Regulations
- CWS: Community water systems
- EDE: Effective dose equivalent
- EML: Environmental Measurements Laboratory
- FR: Federal Register
- ICRP: International Commission on Radiological Protection
- IE: Ion exchange
- kg: Kilogram
- L/day: Liter per day
- LET: Low energy transfer
- LOAEL: Lowest observed adverse effect level
- MCL: Maximum contaminant level
- MCLG: Maximum contaminant level goal
- mg/L: Milligram per liter
- µg/L: Microgram per liter
- mCy: Milligray
- mrem: Millirem
- mrem/yr: Millirem per year
- NBS: National Bureau of Standards
- NDWAC: National Drinking Water Advisory Committee
- NIRS: National Inorganic and Radionuclide Survey
- NIST: National Institute of Standards and Technology
- NODA: Notice of Data Availability
- NPDWRs: National Primary Drinking Water Regulations
- NRC: National Research Council
- NTIS: National Technical Information Service
- NTNC: Non-transient, non-community water systems
- NTNCWS: Non-transient, non-community water systems
- pCi: Picocurie
- pCi/L: Picocurie per liter
- PE: Performance evaluation
- PNR: Public Notification Rule
- PDE: Point-of-entry
- POU: Point-of-use
- PQL: Practical quantitation level
- PT: Performance testing
- RADRISK: A computer code for radiation risk estimation
- RII: Reference dose
- RO: Reverse osmosis
- SM: Standard methods
- SMF: Standardized monitoring framework
- SSCTL: "Small Systems Compliance Technology List"
- SWTR: Surface Water Treatment Rule
- TAW: Technical Advisory Workgroup
- UCMR: Unregulated Contaminant Monitoring Rule

MCL - "zero" for radionuclides

Alternate MCL -

Ra-226 & Ra228: 5 pCi/L

Gross alpha: 15 pCi/L

Uranium: 30 ug/L

Photon + beta: "4 mrem/yr"

Gross beta screening:

50 and 15 pCi/L

EPA DW Guidance

Derived Concentrations (pCi/l) of Beta and Photon Emitters in Drinking Water

Yielding a Dose of 4 mrem/yr to the Total Body or to any Critical Organ as defined in NBS Handbook 69

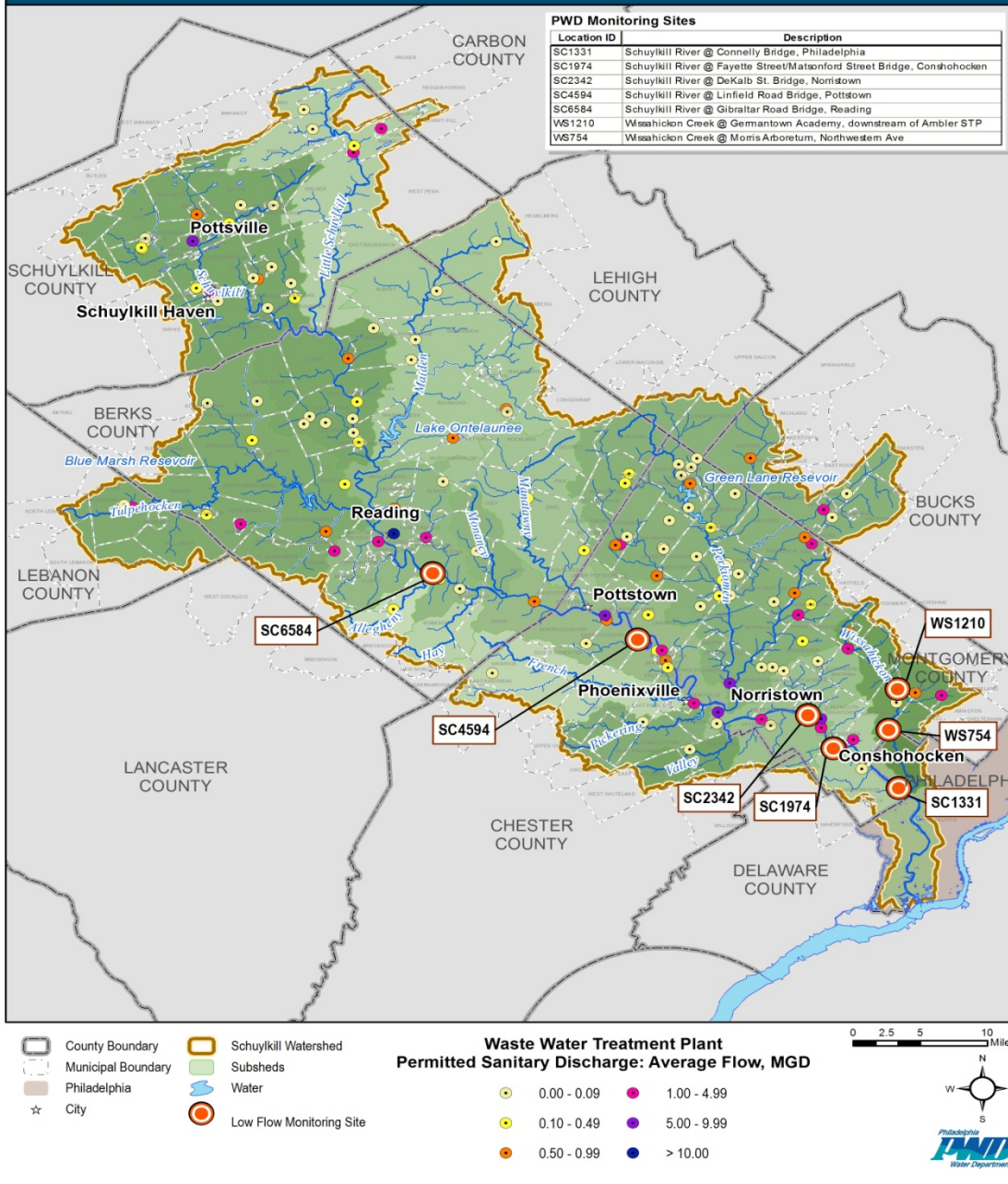
Nuclide	pCi/l	Nuclide	pCi/l	Nuclide	pCi/l	Nuclide	pCi/l	Nuclide	pCi/l	Nuclide	pCi/l
H-3	20,000	Ni-65	300	Nb-95	300	Sb-124	60	Nd-147	200	Os-191	600
Be-7	6,000	Cu-64	900	Nb-97	3,000	Sb-125	300	Nd-149	900	Os-191m	9,000
C-14	2,000	Zn-65	300	Mo-99	600	Te-125m	600	Pm-147	600	Os-193	200
F-18	2,000	Zn-69	6,000	Tc-96	300	Te-127	900	Pm-149	100	Ir-190	600
Na-22	400	Zn-69m	200	Tc-96m	30,000	Te-127m	200	Sm-151	1,000	Ir-192	100
Na-24	600	Ga-72	100	Tc-97	6,000	Te-129	2,000	Sm-153	200	Ir-194	90
Si-31	3,000	Ge-71	6,000	Tc-97m	1,000	Te-129m	90	Eu-152	200	Pt-191	300
P-32	30	As-73	1,000	Tc-99	900	Te-131m	200	Eu-154	60	Pt-193	3,000
S-35 Inorg	500	As-74	100	Tc-99m	20,000	Te-132	90	Eu-155	600	Pt-193m	3,000
Cl-36	700	As-76	60	Ru-97	1,000	I-126	60	Gd-153	600	Pt-197	300
Cl-38	1,000	As-77	200	Ru-103	200	I-129	200	Gd-159	200	Pt-197m	3,000
K-42	900	Se-75	900	Ru-105	200	I-131	3	Tb-160	100	Au-196	600
Ca-45	10	Br-82	100	Ru-106	30	I-132	60	Dy-165	1,000	Au-198	100
Ca-47	80	Rb-86	600	Rh-103m	30,000	I-133	10	Dy-166	100	Au-199	600
Sc-46	100	Rb-87	300	Rh-105	300	I-134	100	Ho-166	90	Hg-197	900
Sc-47	300	Sr-85 m	20,000	Pd-103	900	I-135	30	Er-169	300	Hg-197m	600
Sc-48	80	Sr-85	900	Pd-109	300	Cs-131	20,000	Er-171	300	Hg-203	60
V-48	90	Sr-89	30	Ag-105	300	Cs-134	80	Tm-170	100	Tl-200	1,000
Cr-51	6,000	Sr-90	8	Ag-110m	90	Cs-134m	20,000	Tm-171	1,000	Tl-201	900
Mn-52	90	Sr-91	10	Ag-111	100	Cs-135	900	Yb-175	300	Tl-202	300
Mn-54	300	Sr-92	200	Cd-109	600	Cs-136	800	Lu-177	300	Tl-204	300
Mn-56	300	Y-90	60	Cd-115	90	Cs-137	200	Hf-181	200	Pb-203	1,000
Fe-55	2,000	Y-91	90	Cd-115m	90	Ba-131	600	Ta-182	100	Bi-206	100
Fe-59	200	Y-91m	9,000	In-113m	3,000	Ba-140	90	W-181	1,000	Bi-207	200
Co-57	1,000	Y-92	200	In-114m	60	La-140	60	W-185	300	Pa-230	600
Co-58	300	Y-93	90	In-115	300	Ce-141	300	W-187	200	Pa-233	300
Co-58m	9000	Zr-93	2,000	In-115m	1,000	Ce-143	100	Re-186	300	Np-239	300
Co-60	100	Zr-95	200	Sn-113	300	Ce-144	30	Re-187	9,000	Pu-241	300
Ni-59	300	Zr-97	60	Sn-125	60	Pr-142	90	Re-188	200	Bi-249	2,000
Ni-63	50	Nb-93m	1,000	Sb-122	90	Pr-143	100	Os-185	200		

I-131:
3 pCi/L

4 mrem
to the
thyroid

c1960
ICRP-2
dose
calc
methods

PWD I-131 Low Flow Sampling Schuylkill Watershed



Philly DW Supply

- Major City
- Low flow
- STP / POTWs

- I-131 in STP effluents
- I-131 in river
- Not LGS or other licensee
- Source - medical patients

ISCORS POTW Survey

United States
Environmental Protection
Agency

United States
Nuclear Regulatory
Commission

EPA 832-R-99-900
March 1999



Joint NRC/EPA Sewage Sludge Radiological Survey: Survey Design & Test Site Results



Sewage Subcommittee of the
Interagency Steering Committee on
Radiation Standards (ISCORS)

I-131 Results

**Detection: 246 of 311
samples**

Range: ND - 840 pCi/g



UDaily

Sediment sleuthing

Radioactive medicine being tracked through rivers

<http://www.udel.edu/udaily/2012/mar/medicine-rivers-sediment-032212.html> accessed 3-23-2012

10:56 a.m., March 22, 2012 -- A University of Delaware oceanographer has stumbled upon an unusual aid for studying local waterways: radioactive iodine. Trace amounts of the contaminant, which is used in medical treatments, are entering waterways via wastewater treatment systems and providing a new way to track where and how substances travel through rivers to the ocean.

"This is a really interesting convergence of medicine, public health and environmental science," said Christopher Sommerfield, associate professor of oceanography in UD's College of Earth, Ocean, and Environment.



Chris Sommerfield is tracking radioactive iodine, used in medical treatments, through waterways to learn how substances travel along rivers to the ocean.

Sommerfield found small quantities of radioactive iodine, also called radioiodine or I-131, by accident while sampling the Delaware River, the main source of freshwater to Delaware Bay. The amounts were at low concentrations that do not pose a threat to humans or the environment, according to the Environmental Protection Agency (EPA).

NRC vs. EPA Regs



Iodine-131

In patients 0.005 to 0.2 curies

DW MCL_a 0.00000000000003 Ci per liter

Media Reporting

philly.com | article collections

Cancer patients' urine suspected in Wissahickon iodine-131 levels

July 21, 2011 | By Sandy Bauers, Inquirer Staff Writer

http://articles.philly.com/2011-07-21/news/29798099_1_drinking-water-radioactive-iodine-water-department

Three weeks after an earthquake and tsunami severely damaged Japan's Fukushima nuclear power plant, Lisa Daniels opened an e-mail with test results of river water samples from Southeastern Pennsylvania.

It was just after lunch April 1. Nationwide, officials were testing rain, rivers, milk, and other substances to learn if radioactivity from the stricken plant was present.



Stan Popewing, an aquatic biologist with the Philadelphia Water Department, takes... (CHARLES FOX / Staff Photographer)

Media Reporting



RADIOACTIVE IODINE FOUND

QUEEN LANE

STATE ROAD

FORD ROAD

my FOX

6:03 PM

25 TANKS USED BY FORCES LOYAL TO THE LIBYAN LEADER FOX T

611

76

95

130

30

1

Embed Email

Video Photo



JOE MANGANO
RADIATION & PUBLIC HEALTH PROJECT

6:04 PM

INSON SAYS THE CITY OF CHESTER IS BECOMING "A WAR ZONE"

Embed Email

01:14 / 03:19

Embed Email

Media Reporting (cont.)



Is Iodine-131 Killing Babies In Philly?

http://www.myfoxphilly.com/dpp/news/local_news/is-iodine-131-killing-babies-in-philly-061611

<http://ennews.com/fox-is-iodine-131-killing-babies-in-philly-deaths-up-48-percent-since-radiation-levels-spiked-in-tap-water-video>

accessed 6-17-2011

A researcher says the death rate among babies is up 48 percent since iodine-131 was found in Philadelphia's drinking water. Joseph Mangano is the executive director of the Radiation And Public Health Project in New York, which is made up of scientists and health professionals. There has been a recent spike in infant deaths in Philadelphia, and Mangano says radioactive levels in our water could be to blame.



Gaps & Path Forward

- **ISCORS Sludge Survey c2002, I-131 widely present in POTW across the country**
- **EPA RadNet data supports this observation**
- **EPA - DW MCL calculation for photon / beta needs an update, e.g., United Nations WHO uses 10 mrem or 270 pCi/L for I-131); 4 mrem = 108 pCi/L**
- **EPA action - national review of DW supplies**
- **EPA action - amend its gross beta screening**
- **NRC needs to review the DW pathway for public dose with patient release scenarios**
- **Philly DW, PA DEP and EPA R3 I-131 investigations**
- **This is a DW compliance issue – not a Health or Safety concern!**

Contact information -

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<http://www.dep.state.pa.us> “radiation”



Thank you!



Questions?