Long-term Recovery from a Radiological Dispersal Device (RDD)

Waste Management Challenges

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Session 15 Panel Discussion
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Overview of Presentation

RDD Waste Management Challenges

Estimating RDD Waste Volumes

Liberty RadEx Scenario and Waste Volumes

RDD Waste Management Challenges

Wide-scale radiological incidents present significant and unique circumstances for waste management

- Significant waste volumes
- Time and public pressures for action (days vs. years)
- Logistical and resource limitations (e.g., sampling)
- Coordination of multiple agencies/activities

EPA is the lead Federal agency for long-term recovery and cleanup (Emergency Support Function #10)

- How will we address events of this nature?
- Agency is studying disposal issues for chem, bio, rad

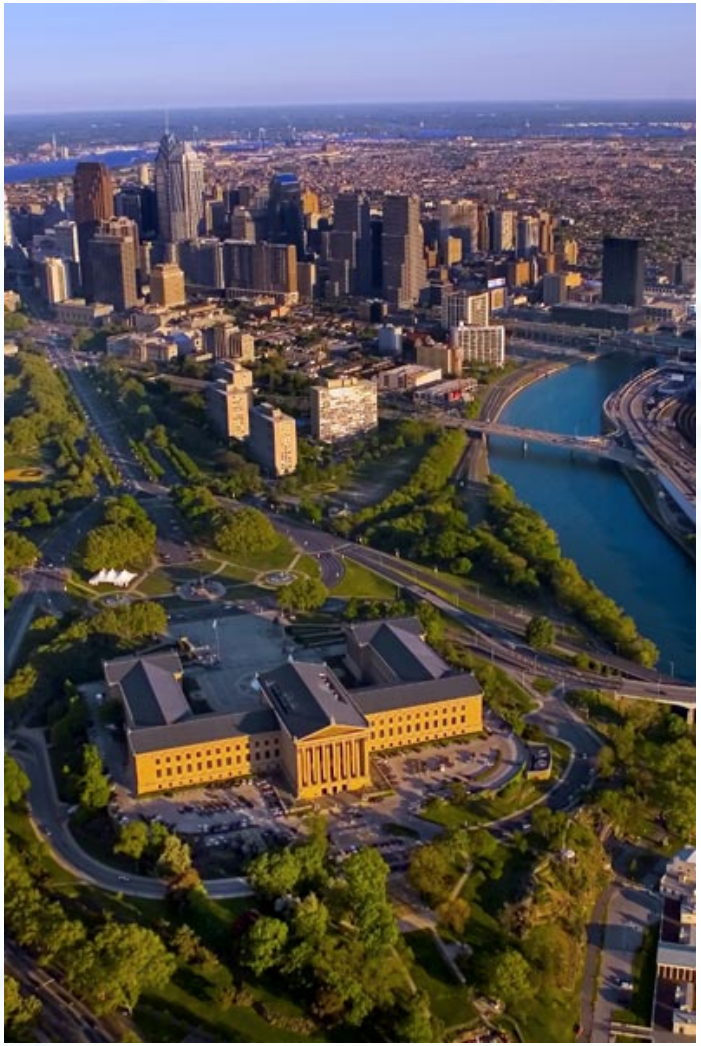
Estimating RDD Waste Volumes

EPA is developing a method to generate first-order estimates of potential RDD waste volumes

- Plume maps generated by DOE (IMAAC)
- Census tract data from FEMA HAZUS program
  - Building types and numbers
  - Used for insurance purposes
- Databases of typical building construction materials
- Estimates of deposition/penetration
- Estimates of green space/roads between buildings
- Paper presented at WM10 (based on TOPOFF4)
- Method applied to Liberty RadEx, SOE/PLE 3-10

Liberty RadEx

- April 26-30, 2010
- Downtown Philadelphia, PA
- Sponsored and designed by EPA
- Co-sponsors: City of Philadelphia-OEM & PADEP
- Scenario focus: post-emergency phase response to a radiological dispersal device (RDD) detonation



Exercise Scope

- 900+ participants: planners, players, controllers, & evaluators
- Post-emergency phase: 30-90 days past detonation
- Multiple, varied venue sites- Navy yard, subway, office building, water plant, etc.

Main Exercise Goals

-Test/assess ESF-10 response (local, state, & federal management of assessment, mitigation, cleanup of contamination in urban environment)

-Test/assess Nuclear/Radiological Incident Annex of National Response Framework in *post-emergency phase*

-Exercise the lead-agency, coordinating agency, and support agency roles and interface with ESF-3 (public works), ESF-8 (public health), and ESF-15 (external affairs)

Liberty RadEx Scenario

DHS National Planning Scenario 11

- Center City Philadelphia – Federal Building
- 3000 lbs ammonium nitrate mixed with diesel fuel and 2300 curies of cesium-137
- Winds carry radiation contamination NNE through Philadelphia
- Deposition nearly 50 miles out and into north central New Jersey

Exercise began 30-45 days after blast

- Already excavating/demolishing 100s tons/day
- How will cleanup decisions affect waste volumes?

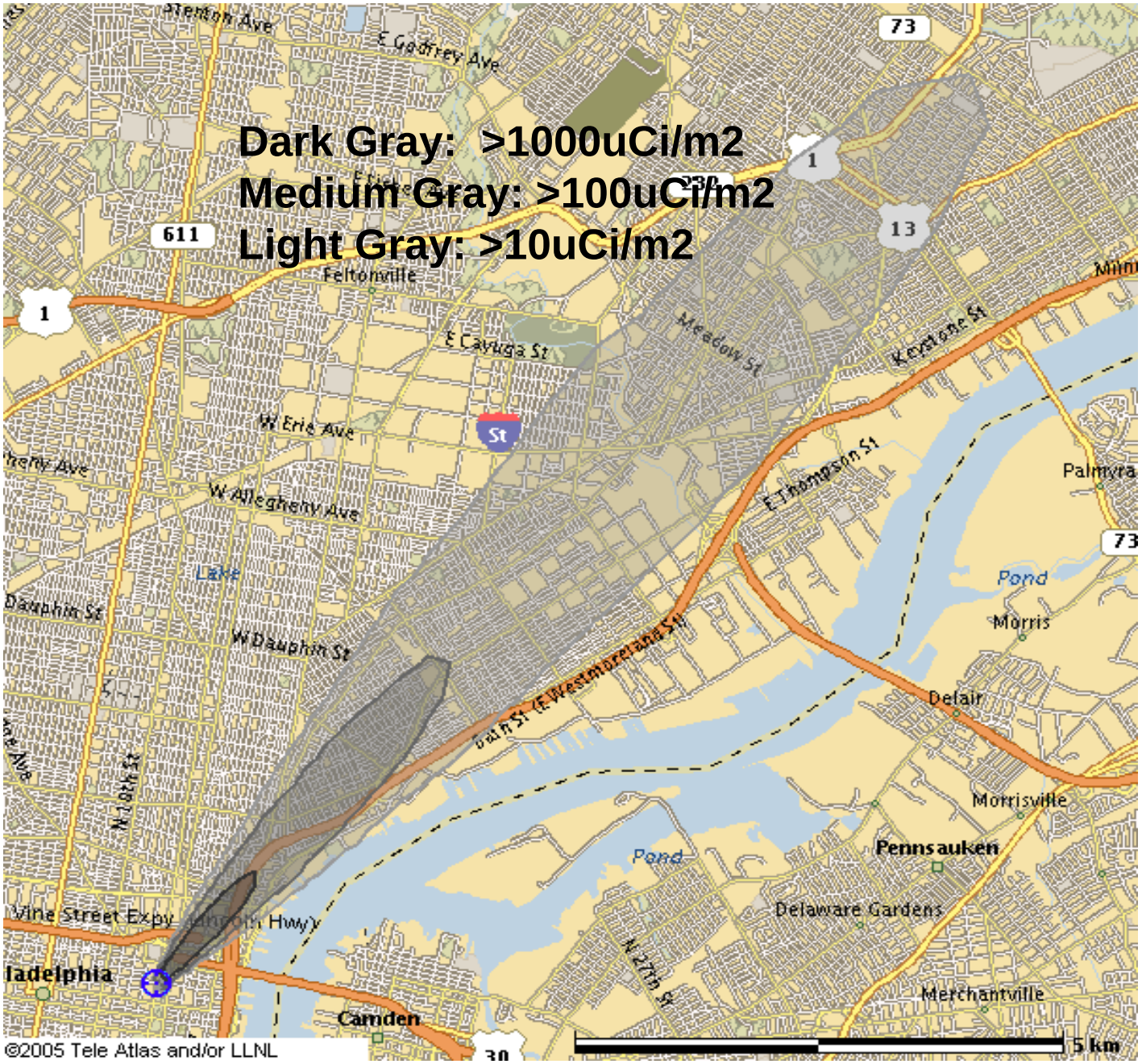
Liberty RadEx Waste Management

Interagency waste team tasked with developing a waste management plan for the incident

- EPA (HQ, Regions 2 and 3)
- NRC
- USACE
- State of Pennsylvania

Team worked through issues related to

- Staging (several sites identified w/help of citizens)
- Characterization (including identifying special waste)
- Management (logistics – treat, package, transport)
- Disposal (all potential options considered)


Dark Gray: >1000uCi/m2
Medium Gray: >100uCi/m2
Light Gray: >10uCi/m2
73
611
1
13
Feltonville
E Cayuga St
Meadow St
Keystone St
W Erie Ave
W Allegheny Ave
Lake
W Dauphin St
Dauphin St
E Thompson St
Palmyra
Pond
Morris
Delair
Morrisville
Pennsauken
Delaware Gardens
Merchantville
Camden
Pond
5 km
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Liberty RadEx Deposition Zones

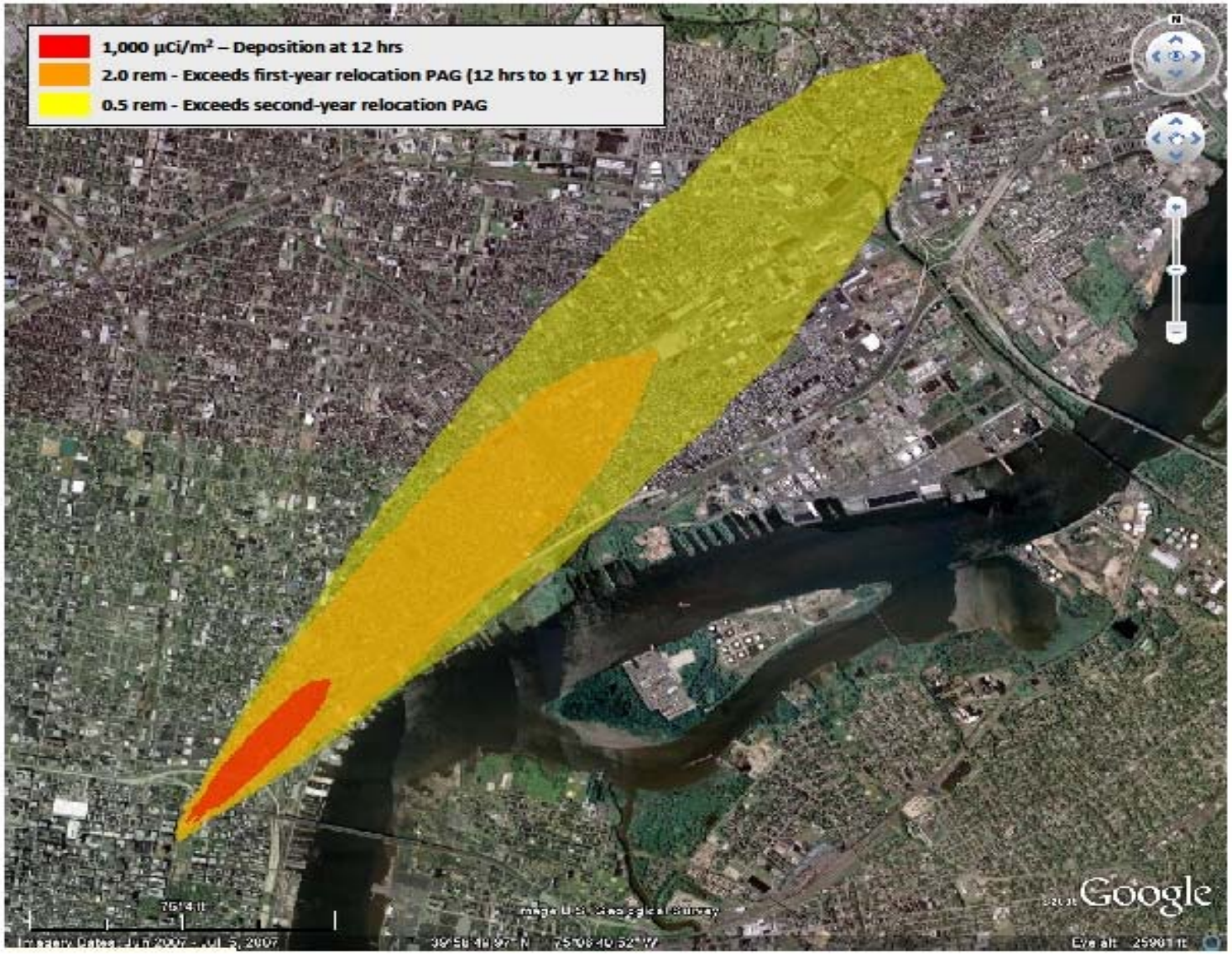
Medium Gray Zone > 100 uCi/m^2

Dark Gray Zone > 1000 uCi/m^2

Total Affected Area ~ 1 square mile

Estimated Waste Generation 500,000 tons

- 25,000 trucks
- Assumes 10% of buildings, all roofs, 6” soil, 1” pavement, all floors removed/demolished
- Does not address water, trees, blast zone debris


1,000 µCi/m² – Deposition at 12 hrs
2.0 rem - Exceeds first-year relocation PAG (12 hrs to 1 yr 12 hrs)
0.5 rem - Exceeds second-year relocation PAG
Google

Relocation Zone: Cleanup or Abandon

Based upon Protective Action Guides (PAGs)

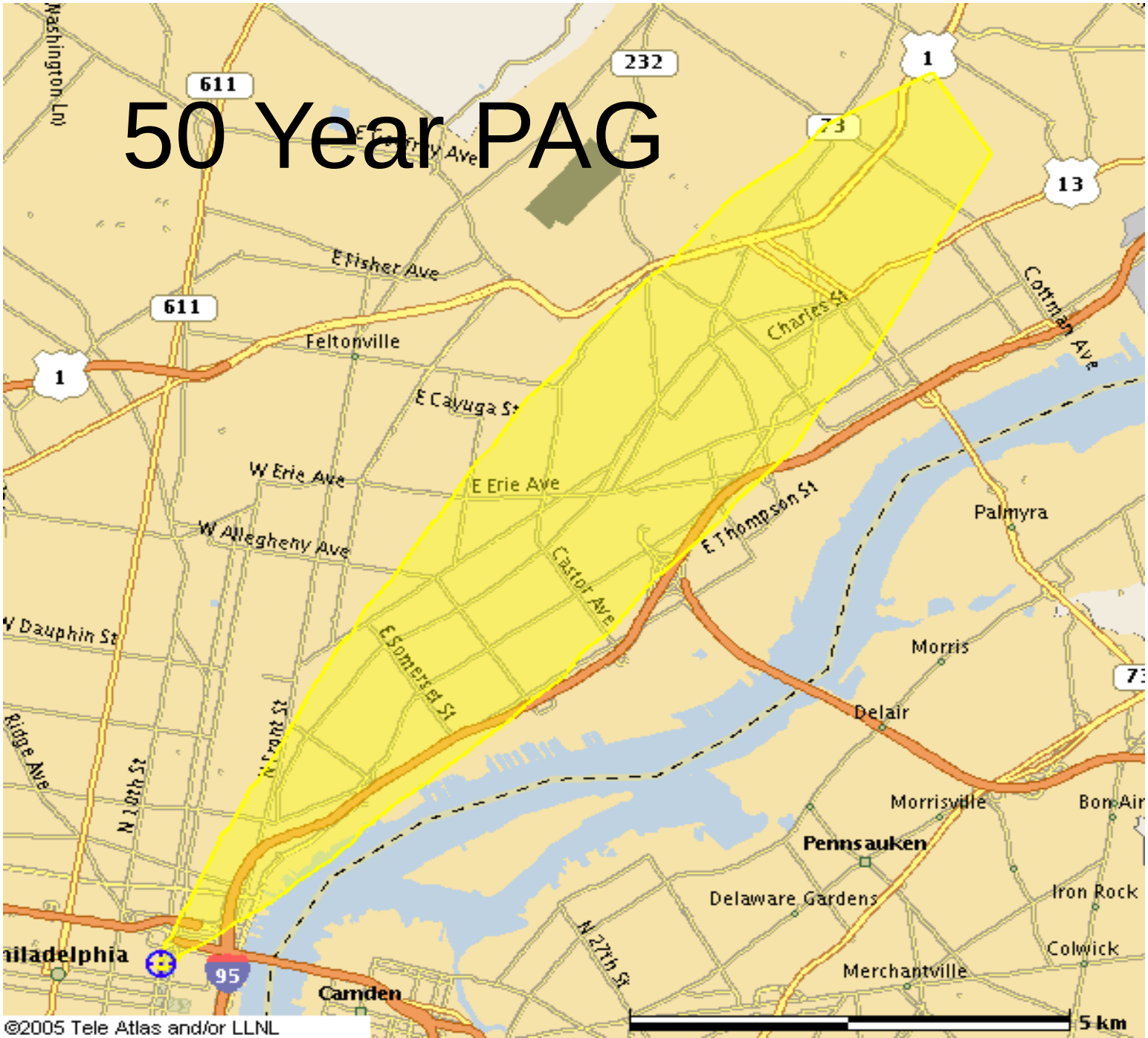
- Zone 2 – First year relocation at 2 rem (Federal)
- Zone 3 – Second year relocation at 0.5 rem (State)

Impacted population ~ 61,000

Affected area 5.5 miles long x 1 mile wide (300-600 city blocks)

~1,400,000 tons of waste (70,000 trucks)

- ~11 billion gallons of liquid waste


50 Year PAG
611
232
1
73
13
611
1
E Fisher Ave
Feltonville
E Cayuga St
Charles St
Cottman Ave
W Erie Ave
E Erie Ave
W Allegheny Ave
Castor Ave
E Thompson St
Palmyra
W Dauphin St
E Somerset St
Morris
Delair
Ridge Ave
N 12th St
N Front St
Morrisville
Pennsauken
Delaware Gardens
Iron Rock
N 27th St
Colwick
Merchantville
95
Camden
5 km
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50-Year PAG Zone

Based on projected 5 rem over 50 years

Impacted population ~ 148,000

Affected area ~ 9 miles long x ~ 2 miles wide

Likely *minimum* cleanup zone

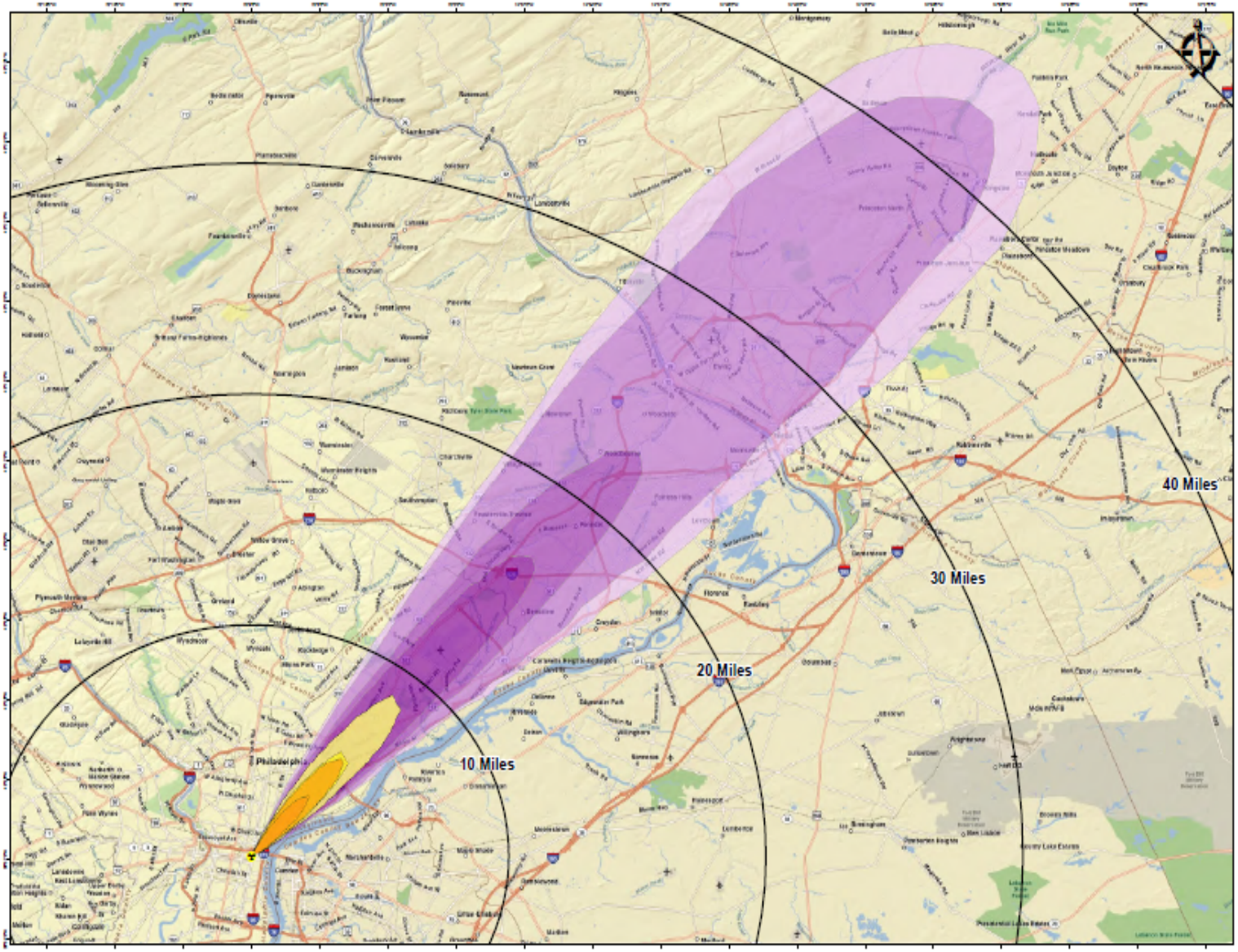
~4,000,000 tons of waste (200,000 trucks)

EXERCISE

Liberty RadEx Relocation and Deposition

Federal and State PAGs with Deposition Data

SET 01
Liberty RadEx
Philadelphia, PA



Release Point

EPA Relocation PAG

NARAC Product for CS-137 Radiological Release Intermediate Phase PAGs

- > 2.0 rem
  Exceeds first-year relocation PAG (12 hrs to 1 yr 12 hrs).
  Population : 22,700
- > 0.5 rem
  Exceeds second-year relocation PAG.
  Population : 59,800
- > 5.0 rem
  Exceeds fifty-year relocation PAG
  Population : 148,000

PA State Specific 1st year PAG

NARAC Product for CS-137 Radiological Release Intermediate Phase (State Levels)

- > 500 mrem
  Exceeds first-year relocation (state requested level) (12 hrs to 1 yr 12 hrs).
  Population : 61,200

Ground Deposition Levels

µCi/m2

- > 5x background (0.09 – 0.2 µCi/m2)
- > 10x background (0.2 – 1.0 µCi/m2)
- > 1.0 µCi/m2
- >100 x background (2.2 – 7985.48 µCi/m2)

Not Intended For Public Distribution

This map was produced by the Geographic Information Systems department of NNSA's Remote Sensing Laboratory (RSL) at Nellis AFB, Las Vegas, Nevada. NSP Gold 2007, ESRI World Street Map, and FRMAC databases were used for map generation.
RSL map identification number is:
GroundDepositionLevels.mxd

1:150,000

0 2 4 6 8 10 Kilometers
0 2 4 6 8 10 Miles

NNSA Consequence Management Home Team
Contact (702) 794 - 1665

Additional Cleanup Zone?

For an area at ~5 times background radiation, cleanup to typical Superfund standards results in

- Impacted population ~ 1,000,000
- Affected area ~ 50 miles long x ~ 10 miles wide
  - ~ 300 square miles total
- ~ 40,000,000 tons of waste
  - 2,000,000 tri-axle dump trucks
  - Assuming 1 cubic yard ~ 1 ton, estimated volume is in excess of 1 billion cubic feet

Thoughts on the Exercise

Diligent effort produced a draft plan addressing important aspects

- Policy and logistical issues much broader than can be addressed in a short-term exercise
- Extensive planning allowed the team to focus on the endpoint rather than basic information gathering

State officials forthright about action to be taken

- Would this be true in all states?
- Political support may be critical

Identified gaps in guidance for decision-making