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Texas Radiological Incident and Emergency Response

September 28, 2022

Chris Moore, Emergency Planner/Investigator
Rae Walker, Emergency Preparedness/COOP Coordinator

Outline

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- DSHS Radiation Program
- Radiological Incident Examples
- Radiological Emergency Response
- SMOC support
- Federal Radiation Programs
- Radiological Dispersion Device (RDD) and Improvised Nuclear Device (IND)
- Population Monitoring/Community Reception Center
- Hospital & EMS Radiological Response

Radiation Control

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DSHS prevents unnecessary radiation exposure to the public by licensing, inspection, enforcement, and emergency response.

- 1,600 RAM Licensees
- 18,000 X-ray Registrants
- 2,000 Laser Registrants

Radioactive Material Licensees

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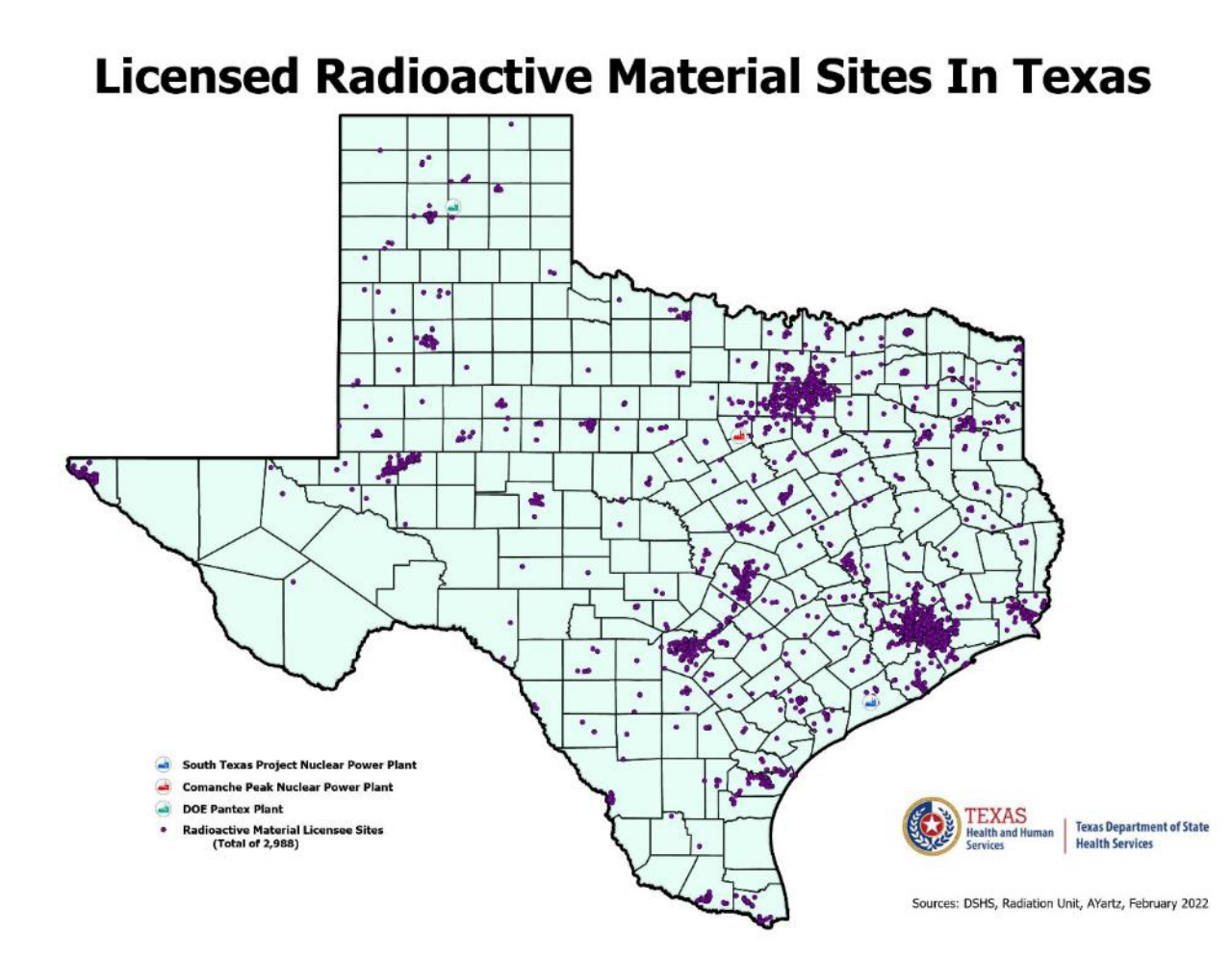

- Approx. 3,000 sites
- Inspectors:
  - 15 RAM
  - 21 X-ray
  - 11 Mammo
- Investigators
  - 5

Incidents & Complaints

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- **Annually**
  - 170 Incident and Complaint investigations
  - 130 Technical Assist
  - 120 DOT Exemptions

Incident Investigations

- Radioactive contaminated tissue boxes
- Radioactive contaminated stainless-steel filters used for airplanes and trucks
- Stolen and lost radioactive sources and equipment
- Illegal gambling operation with dice laced with Strontium-90
- Radiation burns from Fluoroscopy procedures

Public Health Concerns: Exposure and Radiation Sickness

Regulatory Concerns: Public health/safety and Exceeding Permissible Regulatory Limits

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Radioactive Contamination

Contamination – Unwanted radioactive material in or on the body or spread about the environment (radioactive material in unwanted places).

If someone is externally contaminated, they can spread contamination:

-About 80% can be removed by taking off clothing

-Most remaining contamination can be removed by gently washing skin and hair

Internal Contamination – can result from inhalation, ingestion, absorption, puncture or open wound.

Contamination poses minimal risk to responders

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Radioactive Exposure

Exposure – Radiation waves or particles penetrate the body.

If someone is exposed to external radiation:

- Do not become radioactive
- Pose no hazard to nearby individuals
- Do not become contaminated

We use the principle of time, distance, and shielding to protect the public and responders.

Can be a significant risk to responders and the public.

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Contamination Incident

- April 14, 2015 in Sugar Land, Texas – A nuclear gauge with a 1200 mCi Cs-137 source leaks during removal from the gauge, contaminating a worker and the facility.

- Poor contamination control during first 2 days of the event resulting in the spread of radioactivity in a two-story office building.

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Off-Site Surveys

- >160 people surveyed with articles of clothing
- 19 had contaminated articles of clothing (all remediated or disposed)
- >165 vehicles surveyed

  29 vehicles contaminated (1 not releasable)
- 41 residences surveyed

  15 residences contaminated (All remediated)

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On-Site Contamination

- Contamination is found throughout the building, concentrated in source handling room
- Ventilation ducts contaminated
- Ramp outside source handling room

  Back parking lot
- Grassy areas in back of building
- Outside source storage area including storm drain
- Both Cesium-137 and Americium-241 found

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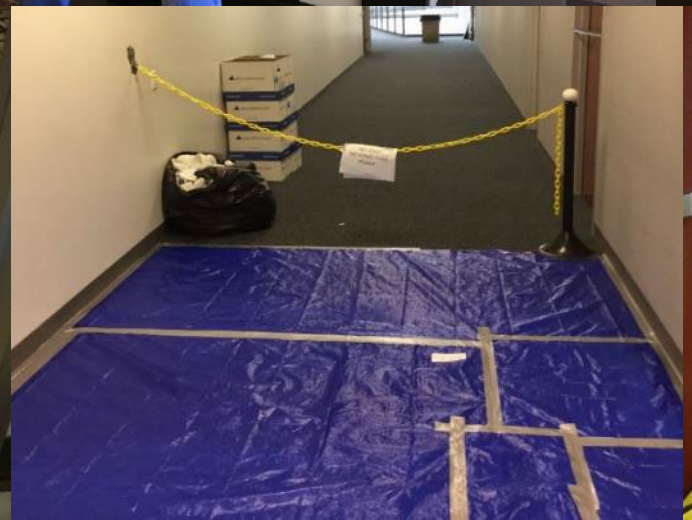

Cleanup

- Contractor took control of all licensed activities, remediated the off-site contaminated areas and decommission the facility.
- Separate contractor packaged and shipped the waste.
- DSHS investigated, provided regulatory oversight, and performed confirmatory surveys.
- Building purchased and decommissioned; 28,000 sources removed.
- Additional testing of 8 personnel for internal contamination.

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Radiographer Exposure Incident

A radiographer trainee received an overexposure to his right hand and sought medical attention three days later.

DSHS was notified that the trainee was performing radiography using a camera containing a 73 Ci Ir-192 source. After completing the last shot, he removed the guide tube to move the camera. He saw the source sticking out of the front of the camera about 2 inches. He immediately retracted the source to its locked position.

His right thumb, index finger, and middle finger began to swell and turn yellow.

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Several days to weeks Later

-Night of incident swelling started and blisters formed in three days (Sept 2011)

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Mid 2012

Dec 2012

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Early 2013

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Transportation Accident

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A truck carrying a radiography camera containing 13.7 curies of iridium (Ir) - 192 was involved in a traffic accident.

The radiography truck struck a large item lying in the road, catapulted into the air, and burst into flames when it landed back on the highway. The two radiographers were able to evacuate from the truck without injury.

The radiographers set up a barrier to limit access to the area until the integrity of the camera could be determined. Texas DPS and the local fire department responded to the event. When the fire was extinguished, the camera was found still locked inside its transportation container. A survey of the camera indicated that dose rates from the camera were normal.

Radiological Emergency Response

DSHS is the lead State Agency for radiological emergency response in Texas.

Comanche Peak

Pantex

South Texas Project

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Mobilization

- 24 hr notification
  - team members selected & contacted
- Dispatch initial team to scene
  - report to the Incident Commander
- Mobilize additional teams as necessary via air and ground transportation.
- Approximately 100 team member,
  - sustain 24 hr operations.
- Send SOC/SMOC/EOC LNOs, PIOs, CRC support, Field Teams, additional teams as needed

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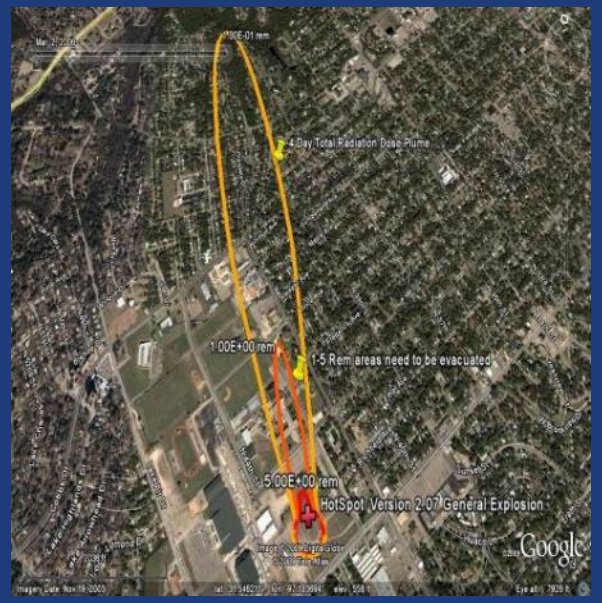
Technical Assistance and Support Operations

DSHS will provide:

- Radiological Monitoring/ Dose Projections
- Protective Action Recommendations
- Decontamination Assistance
- Liaison with Local, State & Federal Governments
- Personnel Monitoring
- Mobile Laboratory
- Shelter Support
- Contacts/info for Emergency Medical Care



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DSHS Roles in Rad Incidents

1. DSHS is responsible for enforcing state and local public health laws, rules, requirements, and ordinances regarding radioactive material
   a. Exposure
   b. Storage
   c. Transport
   d. Disposal
2. Based on the scope of locally provided environmental health services, LHAs and LHDs support DSHS Regional Office and Radiation Control Program
3. As with any other incident or state declared disaster, LHAs and LHDs will be expected to maintain their usual authority roles and responsibilities

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ESF-8 Support During Rad Incidents

1. RERT is Scalable
2. Full RERT Activation = SMOC Activation
   a. Disaster Declaration Likely
   b. Unified Command Approach at SOC anticipated
3. Region MOCs
4. Local EM/HD EOCs

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Available State Resources

1. DSHS Radiation Emergency Response Team
2. National Guard
   a. 6th Civil Support Team (CST)
   b. Mass Decon Unit (CERF/P)
3. Texas Parks & Wildlife Hazmat/Tech Hazards Team
4. Equipment
   a. Portal Meters
   b. Hand-Held Meters
   c. Dosimetry
5. Long-Term Environmental Monitoring / Remediation Efforts
6. Long-Term Exposure Tracking

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Available Federal Resources

1. Federal Advisory Team
   a. Center for Disease Control/ASPR
   b. Federal Radiological Monitoring & Assessment Center (FRMAC)
   c. Other Federal agencies as needed
2. Radiation Emergency Assistance Center / Training Site (REAC/TS)
3. Radiation Injury Treatment Network (RITN)
4. Veterans Affairs Medical Emergency Radiation Response Team (VA-MERRT)

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RITN

1. Baylor University Medical Center
2. M.D. Anderson Cancer Center
3. Texas Children's Hospital

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VA-MERRT

VHA-OEM
MERRT
MEDICAL EMERGENCY RADIOLOGICAL RESPONSE TEAM

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Hospitals & EMS

1. Pre-Established Process for Requesting Resources
2. Hospital Planning for Radiation Emergency Area (REA) & Treatment of Contaminated Patients
3. EMS Training & Transport
   a. Minimally contaminated victims do not pose a health risk to rescuers or healthcare providers.
   b. It is virtually impossible for a living patient to be so contaminated as to pose a threat to healthcare providers.
   c. Perform life- and limb-saving tasks before managing external or internal radiation contamination.
   d. Do not delay life-saving rescue or transport of a seriously injured or contaminated person.

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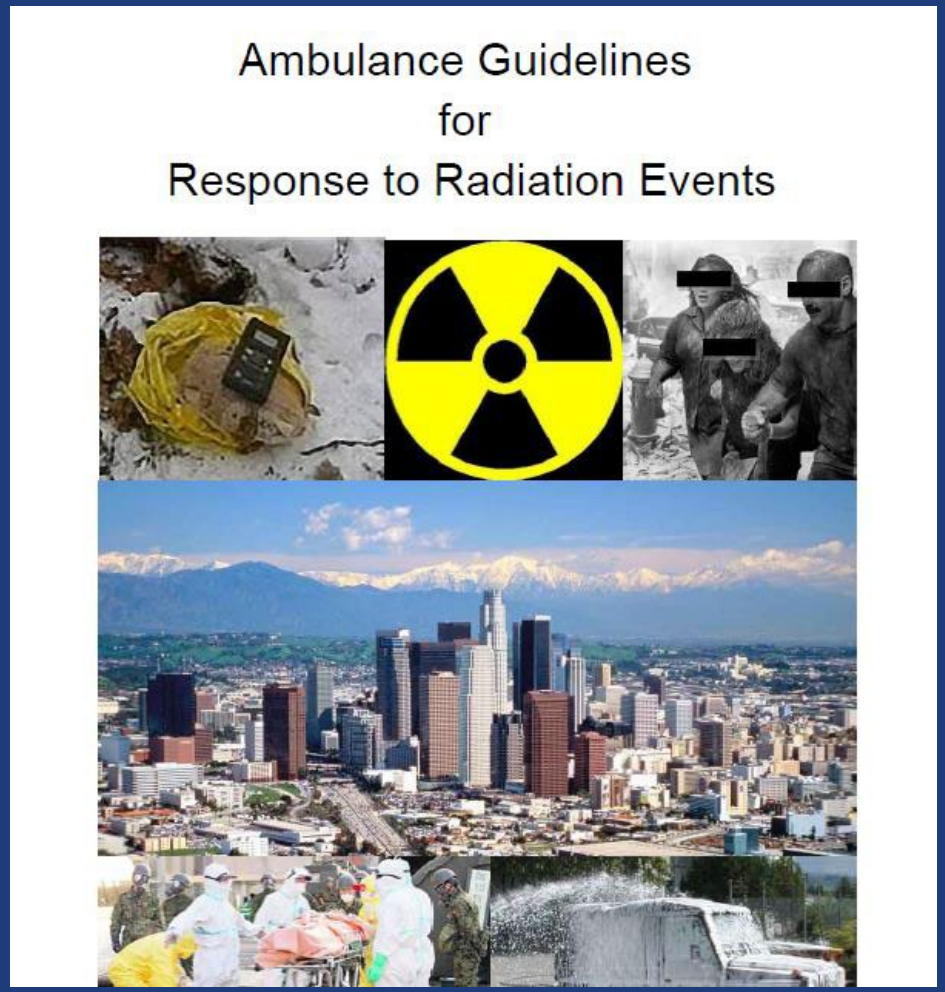
EMS Guidance



1. EMS Technical Guidance/Procedures
   https://remm.hhs.gov/lifesavingtasks.htm
2. How-To Videos
   https://remm.hhs.gov/imagegallery_cat6.htm
   https://vimeo.com/352986276
3. Ambulance Guidance
   http://file.lacounty.gov/SDSInter/dhs/216885_AmbulanceGuidelinesforResponsetoRadiationEventsRev7-20131030.pdf

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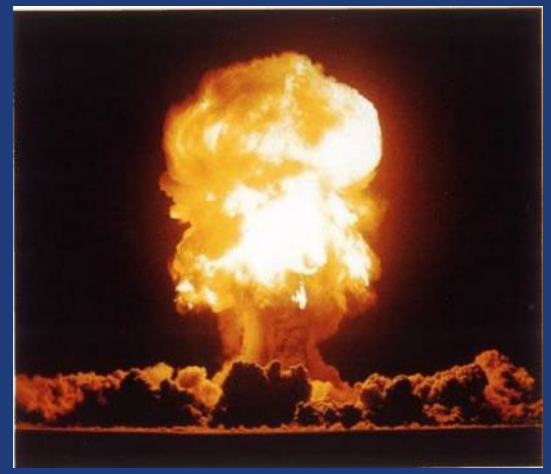
Radiological Terrorism

- Radiological Dispersal Device (RDD)
- Radiation Exposure Device (RED)
- Improvised Nuclear Device (IND)



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Radiological Dispersion Devices (RDD)

- A "dirty bomb" is a terrorist weapon. It is not an "atomic" bomb. The dirty bomb is a conventional weapon using conventional explosives (such as dynamite or TNT) to disperse or spread radioactive material. Typically, more danger from the explosion than the radioactive material.
- Passive or active dispersion of unsealed radioactive sources, e.g., deposit in soil or water, drop from airborne device.
- Radioactive sources can be solid, aerosol, gas, or liquid.
- **Contamination** of people may occur via air, water, soil or food.

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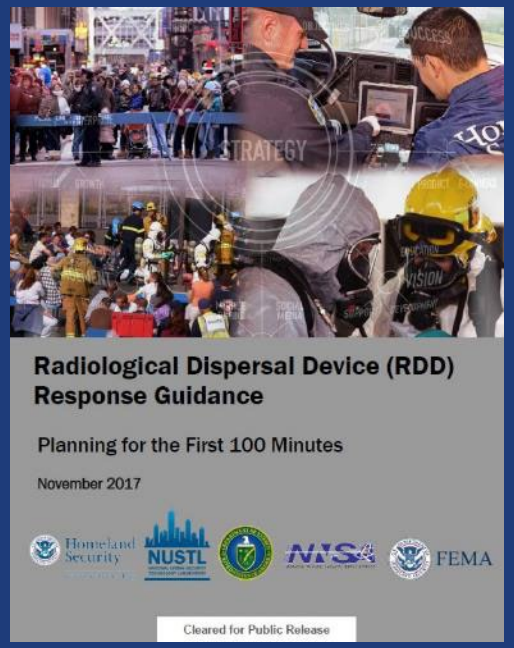
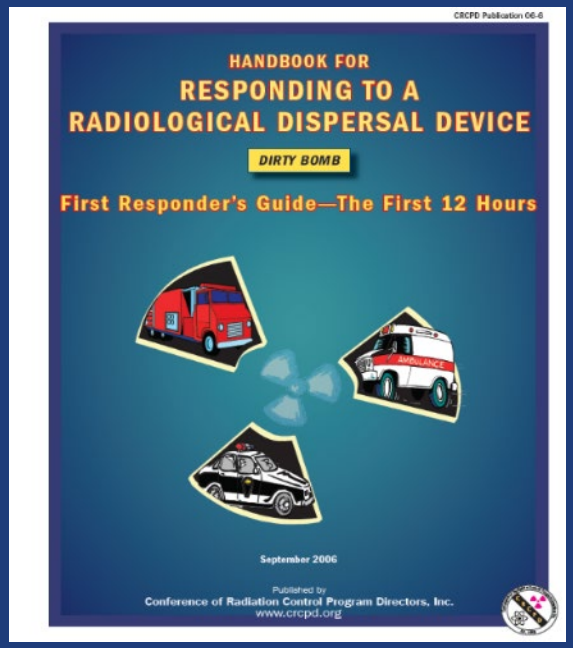
RDD (cont'd)

Long Term Economic Impact

- Long recovery times
- Assessment of building structures
- Restricted occupation of buildings/residences
- Costly decontamination/waste disposal





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RDD Rules of Thumb

(Developed after 500 explosive test completed and reviewed by 200 first responders)

- For outdoor explosions, most of the airborne radioactive dust will have settled to the ground within about 10 minutes. Individuals not wearing protective clothing and a respirator when entering a radiation hazard area should wear a dust mask and overshoes.
- In the absence of any other information, evacuate to 1650 ft (500 m) from the detonation site in all directions.
- Sheltering initially lowers airborne exposure, secure ventilation.
- You will not be able to perform decontamination on-site if many people are affected.
- Removing outer clothing can eliminate most of the contamination.

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RDD Rules of Thumb cont,

- Absorption in blood via cuts/wounds in the skin. Cuts/wounds should be covered with clean cloth or gauze to reduce contact with loose dust and debris.
- If the event is large and if adequate decontamination resources are not available, the release level can be increased to 10,000 cpm. Instruct people to go home and shower.
- People contaminated to levels greater than 100,000 cpm are likely to have internal contamination and should be identified as a priority for follow-up for internal contamination.

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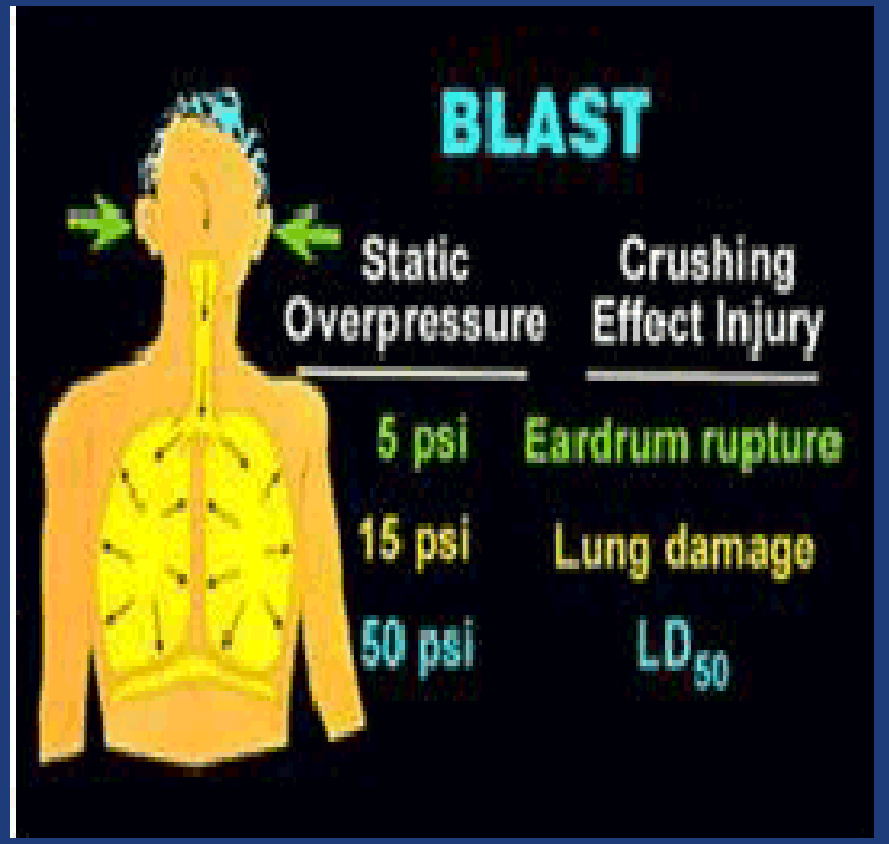
Improvised Nuclear Device

- An illicit nuclear weapon bought, stolen, or otherwise originating from a nuclear state, or a weapon fabricated by a terrorist group from illegally obtained fissile nuclear weapons material that produces a nuclear explosion.
- Results in catastrophic loss of life, destruction of infrastructure, and contamination of a very large area.

Improvised Nuclear Device

- Injury or death (from the blast wave)
- Moderate to severe burns (from heat and fires)
- Blindness (from the intense light)
- Radiation sickness, also known as acute radiation syndrome or ARS (caused by the radiation released)
- Delayed effects of acute radiation, carcinogenesis, mutagenesis (fetal effects).
- Contaminated food and water sources

IND effects



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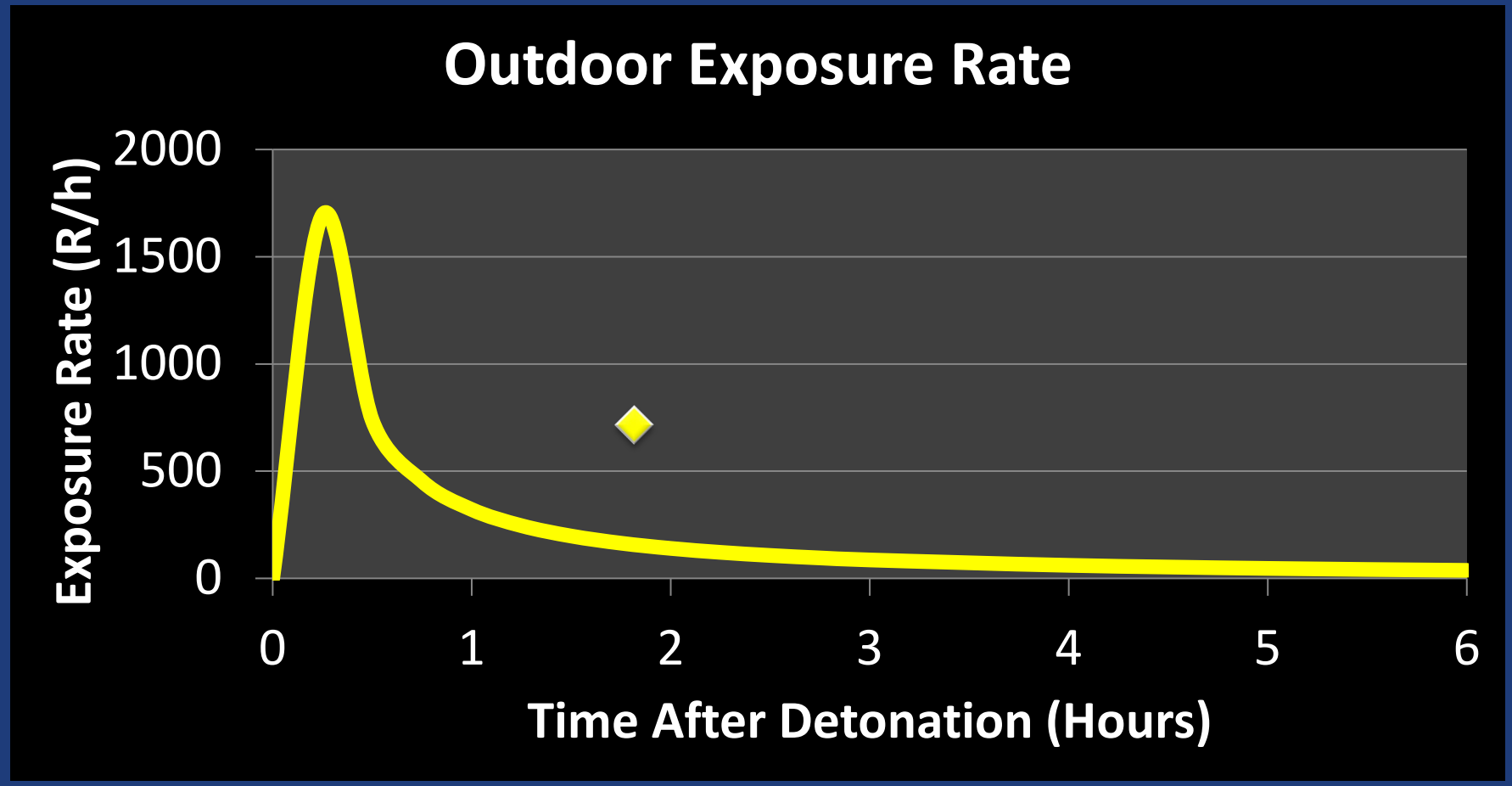
Exposure Rate
(2 miles from Ground Zero)



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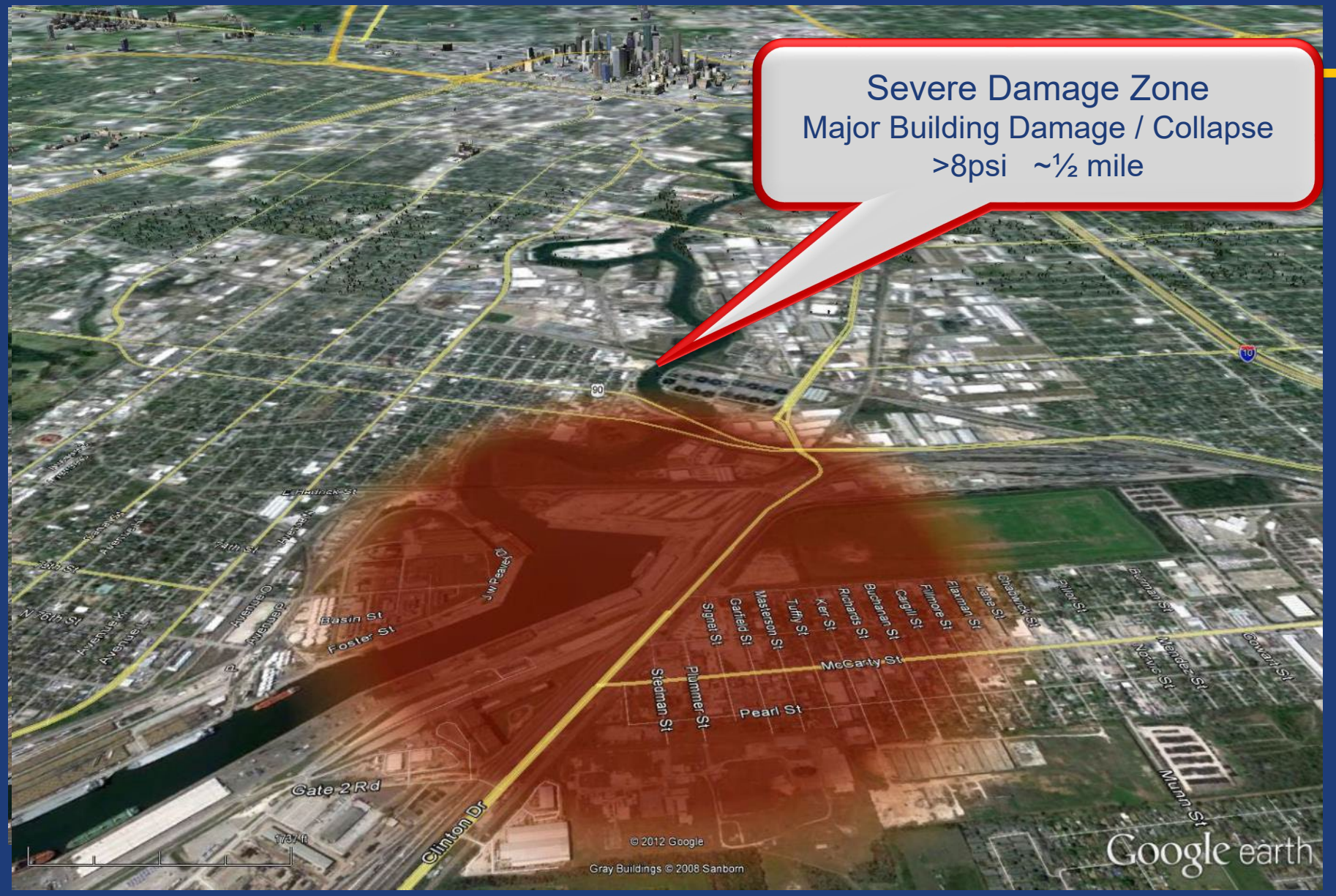
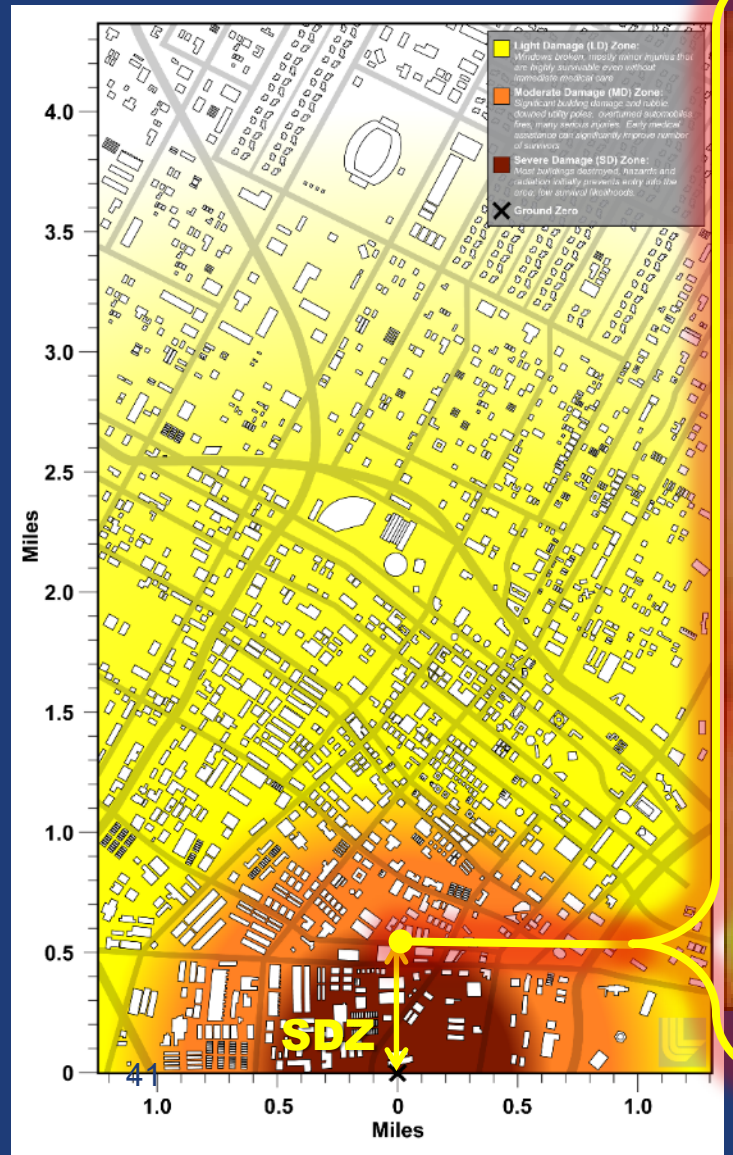
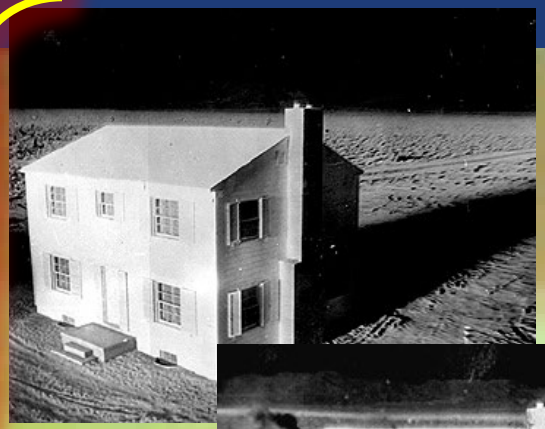
Severe Damage Zone (SDZ)



Outer Edge of Severe Damage Zone

~ ½ Mile from 10KT





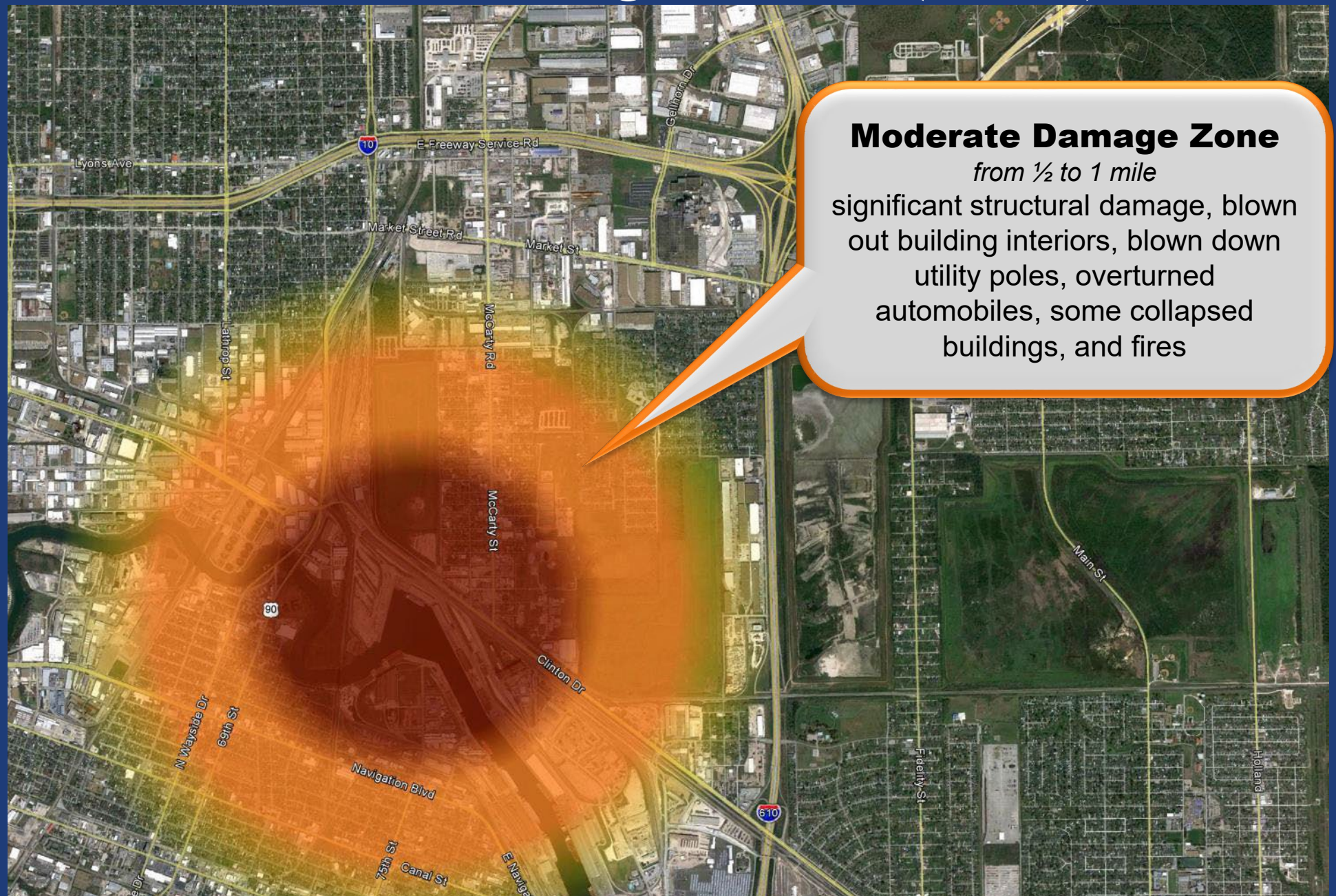
Nighttime shot, the only light is from the blast

Thermal pulse ignites paint and wood

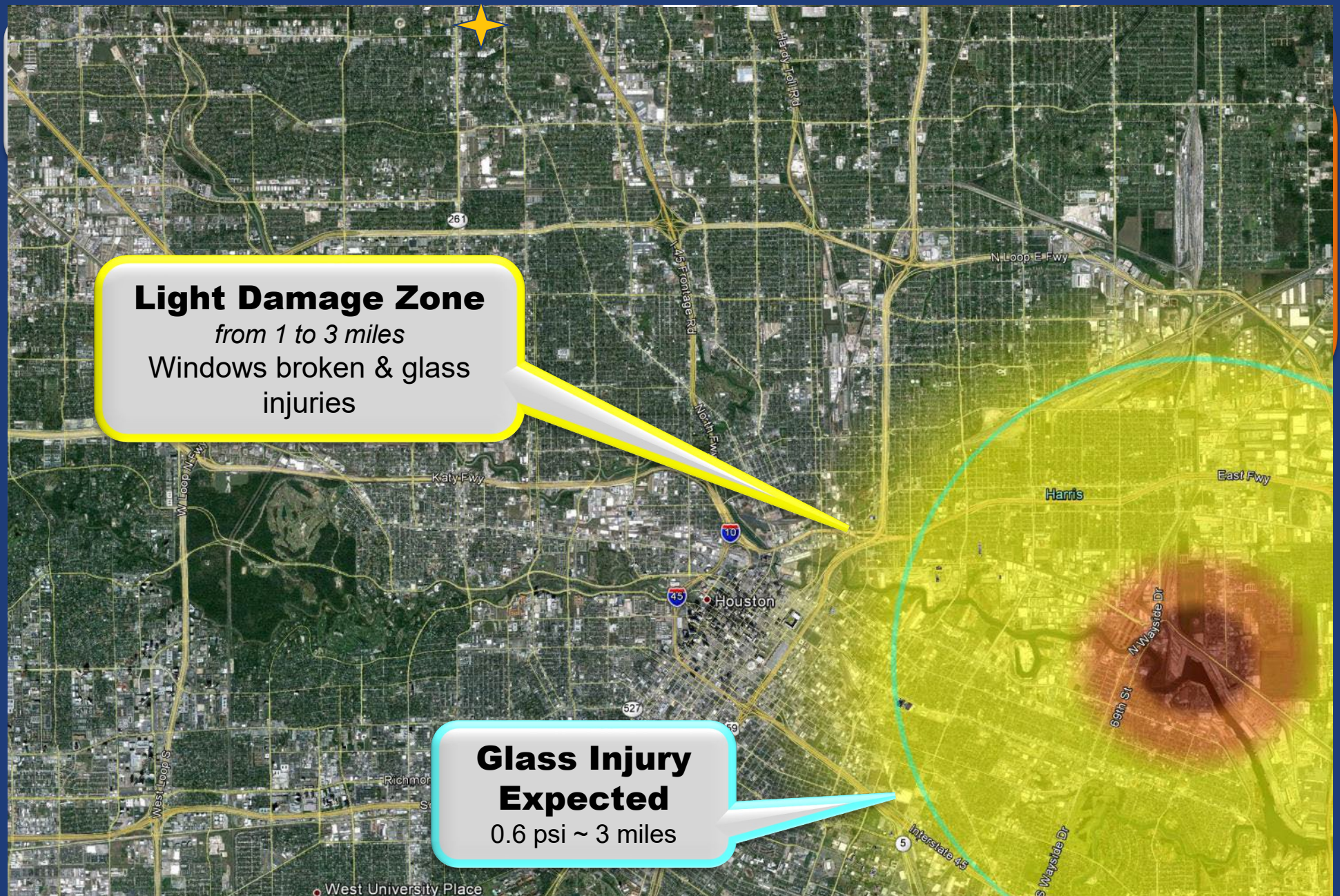
Pressure wave destroys house

Film and images at 1km (0.6 mile) from ~16kT yields (~ 6 psi)

Moderate Damage Zone (MDZ)

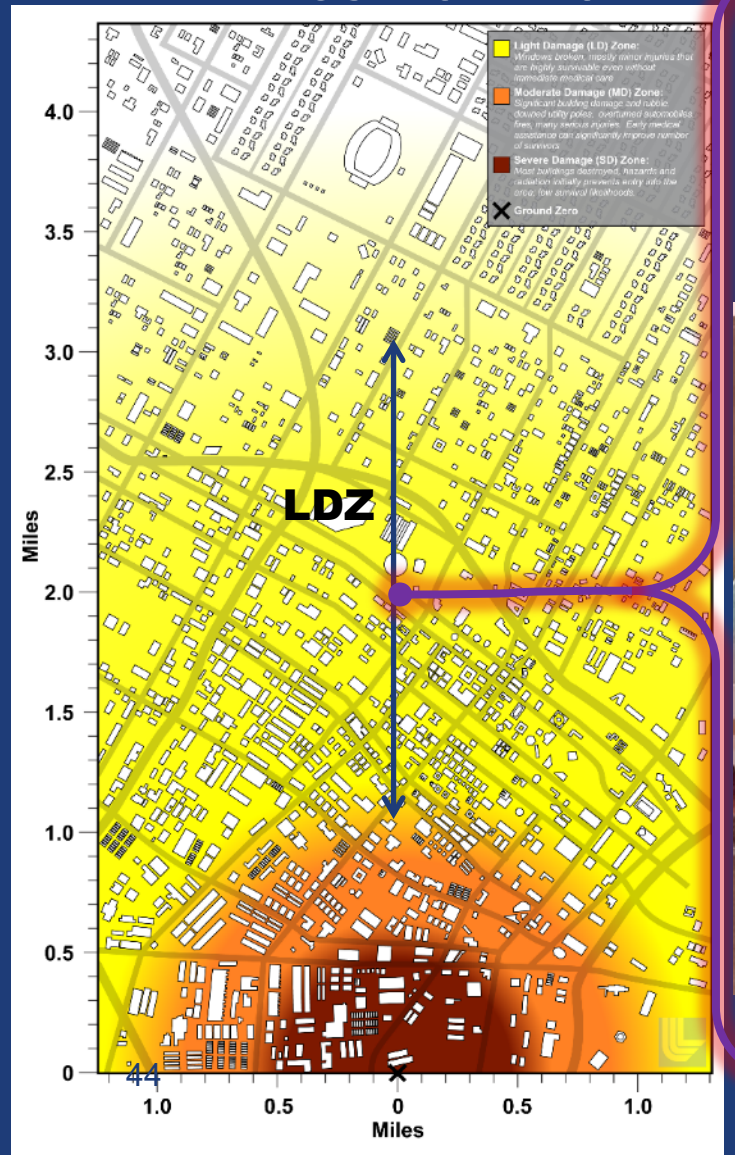


Light Damage Zone (LDZ)



Light Damage Zone (1 to 3 miles)

~ 2 Miles from 10KT



shockwave

Damage to windows and other large area, weak building features

Images taken at 2.6km (1.5 miles) away from PEPCON (conventional accidental explosion estimated to be equivalent to a 1KT free air burst), estimated overpressure shock was ~ 0.9 psi

Zone Priorities From Planning Guidance for Response to a Nuclear Detonation

- Most of the injuries incurred within the LDZ are not expected to be life threatening and would be associated with flying glass and debris from the blast wave and traffic accidents.
- If injured survivors are able to move on their own, they should be directed to medical care or assembly shelters.
- **The MDZ should be the focus of early life-saving operations.** Focus on medical triage with constant consideration of radiation dose minimization.
- Response within the SDZ should not be attempted until radiation dose rates have dropped and the MDZ response is significantly advanced.
- All response missions must be justified to minimize responder risks based on risk/benefit considerations built into worker safety plans.

Priorities for Immediate Life Safety

- **Public Protection Strategy:**
  - Early, adequate shelter followed by delayed, deliberate evacuation.
- **Response Strategy:**
  - *Protect response personnel*
  - *Support regional situational assessment*
  - *Support public safety*
- Difficult decision-making on who to triage.
- Difficult to control contamination.
- Population Monitoring shifts from decon to triage and identification of Acute Radiation Syndrome.

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Public Health Roles/Responsibilities

The Nuclear/Radiological Incident Annex of the NRF and other HHS documents identify five specific public health areas of responsibility:

- Population Monitoring
- Decontamination
- Laboratory Analysis
- Fatality Management
- Communications

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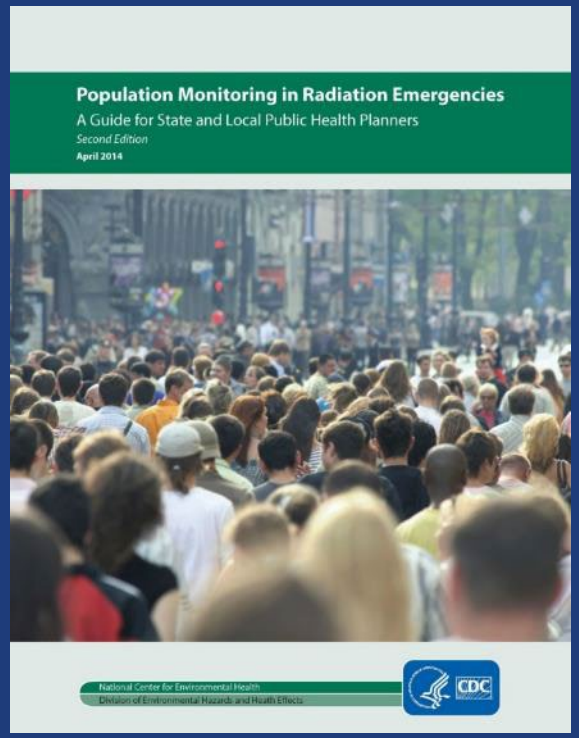
Population Monitoring Guidance

The state radiation control program is a key resource for implementing the CDC population monitoring guidance.

- DSHS CRC planning and preparedness activities
  - Establish relationships with other radiation experts/resources in the community (City/County Health Depts, hospitals, universities, etc.)
  - Actively support the planning and exercising of CRCs statewide



http://emergency.cdc.gov/radiation/pdf/population-monitoring-guide.pdf

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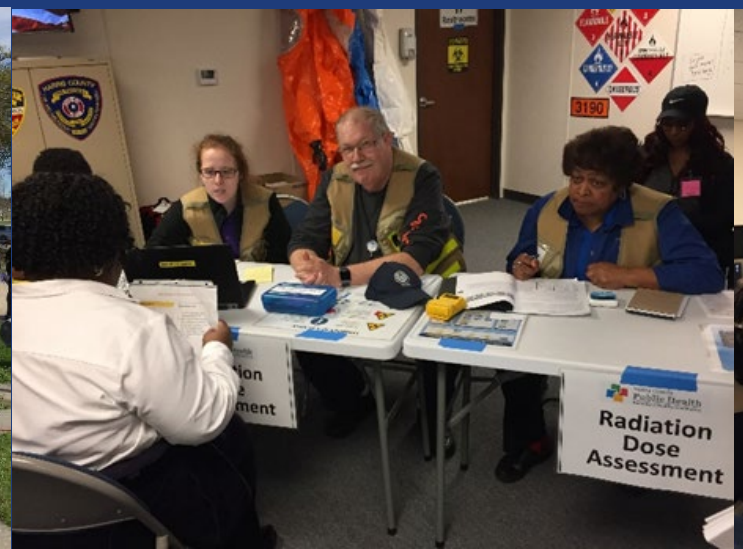
Community Reception Centers (CRC)

Local response strategy for conducting population monitoring

- Multi-agency effort, public health lead
- Staffed by government officials and organized volunteers
- Opened 24-48 hours post incident
- Located outside of hot zone
- Comparable to PODs



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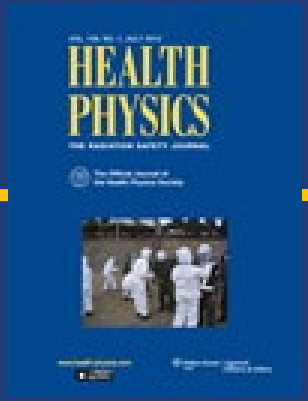
SCREENING OF RESIDENTS FOLLOWING THE TOKYO ELECTRIC FUKUSHIMA DAIICHI NUCLEAR POWER PLANT ACCIDENT

Hisayoshi Kondo,* Jiro Shimada,† Choichiro Tase,† Takako Tominaga,‡ Hideo Tatsuzaki,‡ Makoto Akashi,‡ Koichi Tanigawa,§ Yasumasa Iwasaki,§ Tatsuo Ono,* Masayuki Ichihara,* Yoshitaka Kohayagawa,* and Yuichi Koido*



July 2013 Issue

1. 72,660 people screened at 142 sites (March 11-21)
   a. Peaked at 14,000 per day
2. 244,281 people screened (3/12/11 – 2/10/12)
3. 901 cases, between 13-100 kcpm
4. 110 cases, > 100 kcpm
5. All cleaned by removal of clothing and wiping. Showering was not needed.

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DSHS CRC Support

- 2-3 DSHS personnel per CRC.
- Coordinate to bring in more Radiation SMEs as needed to support the local government.
- Just in Time training as needed.
- Provide or locate needed radiation equipment.
- Assist with recommendations of layout.
- Provide recommended contamination limits.
- Answer any technical or health physics questions.

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Volunteers

- Texas Disaster Volunteer Registry Project
- Medical Reserve Corps Radiation Teams
- Nuclear Medicine Technicians
- Community Emergency Response Teams
- Colleges with Radiation Technical Programs

Training Efforts

- Counterterrorism Operations Support (CTOS) Center for Radiological/Nuclear Training, Nevada
- Radiological Emergency Assistance Center & Training Site (REAC/TS), Tennessee

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Portal Monitors in Texas

Location	Qty	Organization	Type
Austin	2	DSHS	Ludlum Model 52-5-1
Houston	1	Michael E. DeBakey Veterans Affairs Medical Center	Ludlum Model 52-1-1
Amarillo	2	DSHS	Eberline PCM-1B
Austin	3	DSHS	Eberline PCM-1B
Dallas	2	UT Southwestern	Thermo TPM-903B
Dallas	2	Parkland Hospital	Thermo TPM-903B
Dallas	1	Children's Medical Center	Area-RAE
Dallas	2	Dallas Fire/Hazmat	
Fort Worth	1	Fort Worth Fire/Hazmat	
Benbrook	2	Benbrook Fire Department	SAIC PPM 2000a
Cleburne	3	City of Cleburne	Thermo TPM-903B
Stephenville	3	City of Stephinviile	Thermo TPM-903B
Bay City	3	Matagorda County	Thermo PPM-1
DFW	6	North Central Texas Trauma Regional Advisory Council (NCTTRAC)	Thermo TPM-903B
San Antonio	12	Southwest Texas Regional Advisory Council (STRAC)	Thermo TPM-903B
Dallas	2	Veterans Hospital	Thermo TPM-903B
Ft. Worth	2	Veterans Hospital Outpatient Clinic	Thermo TPM-903B
Bonham	2	Veterans Hospital Clinic	Thermo TPM-903B
Fort Bend County	2	Fort Bend County Health & Human Serv.	Thermo TPM-903B
Fort Bend County	2	Fort Bend County Health & Human Serv.	Thermo TPM-903BVK
Total	55		

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CRC Planning Efforts

1. Houston/Harris County
2. Valley
3. El Paso
4. Austin

Many Technical Assistance Requests from Health Departments on CRCs and from Hospitals on Patient Radiation Treatment

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Questions?

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