EMERGENCY MANAGEMENT ROUNDUP

EXPECT THE UNEXPECTED

Shelter or Evacuate?

A Work Aid for Rapid Initial Protective Action Decisions

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05/11/2007

EMERGENCY MANAGEMENT ISSUES

The Issue

- The need: guidance and information to choose between sheltering and evacuation in a hazardous materials emergency

Key Research Results

- Contaminants enter a building via natural ventilation or HVAC systems
- Time for contaminants to build up inside is complex function of several factors
- Evaluating building effectiveness is complex, real-time issue
  - Not practical for Incident Commander use in early decisions

Key Research Results

- All buildings (even leaky buildings) can be effective shelters for some period of time
- Buildings can be effective short-term shelters (about 1/2 hour or longer) if doors and windows are closed –
  EVEN IF VENTILATION IS LEFT ON
- Buildings can be effective longer-term shelters (about an hour or longer) if doors and windows are closed
  AND VENTILATION IS TURNED OFF

Key Research Results

- AFTER a plume has passed, the exposure situation usually reverses
- Sheltered personnel should evacuate AFTER plume passage and re-enter after building air has been flushed and monitored
  - Unless outdoor area is contaminated (e.g., particulate release) or
  - Unless released material is heavy gas and may be pooled

Application to SNL/NM

- Many buildings in close proximity
- Many varied events could occur in many locations
- Most analyzed releases are short-term (less than about 1/2 hour)
- Very little time to respond, evaluate event and take protective action for personnel in vicinity of event

Estimate of Time to Completion of Evacuation

Action	Time (minutes)
Detect event (facility)	0
Recognize and notify EOC (911)	2
Dispatch response team	1
Gather and evaluate information Determine safe route and staging area	4
Travel to scene	4
Establish command & size up operation	4
Determine strategic/tactical objectives Reassess PA decisions	4
Make decision and communicate	1
Evacuate personnel beyond PA Zone	20
TOTAL TIME FOR ACTION	**40**

Minimum Distance for Evacuation Before Plume Arrival

Wind Speed (MPH)	Minimum Distance from Event Scene to Consider Evacuation	Minimum PA Plan for this Action to be Viable
1	0.7 miles	4 (> 900 m)
2	1.3 miles	5 (> 2,000 m)
5	3.3 miles	5 (> 2,000 m)
10	6.7 miles	5 (> 2,000 m)

Minimum Distance for Evacuation Before Plume Arrival

- Result: Plume arrival time is not a practical consideration for immediate protective actions for most events
- *Should consider ONLY after near-in protective actions are under control*
- Should consider this ONLY in following circumstances:
  - *Calm / near calm conditions*
  - *Severe events (PA Plan 5 events)*

Description of Work Aid

- Distills key research findings - as applied to SNL/NM
- Is simple reference tool useable in field
- Relates condition of plume release to decisions guidance for
  - Isolation Zone
  - Downwind portion of Protective Action Zone
  - Upwind portion of Protective Action Zone
- Additional work aid used for determining downwind portion of Protective Action Zone

Sheltering / Evacuation Work Aid

Reliable met data available?	Evacuation practical?	Plume release condition	Sheltering and evacuation guidance	
			Isolation Zone	Protective Action Zone
NO	NO	ALL release conditions	Shelter, then monitor or evacuate when practical after plume passes	Shelter, then monitor or evacuate when practical after plume passes
	YES	Release condition is UNKNOWN	Shelter, then determine release condition and reevaluate	Shelter, then determine release condition and reevaluate
		Release is anticipated but not imminent	Evacuate	Shelter, consider evacuation
		Release is occurring or imminent AND…		
		Longer than about 30 min	Evacuate within 30 min if HVAC is turned on; evacuate within 1 hour if HVAC is turned off	Evacuate within 30 min if HVAC is turned on; evacuate within 1 hour if HVAC is turned off
		Shorter than about 30 min	Shelter, then monitor or evacuate after plume passes	Shelter, then monitor or evacuate after plume passes
		Release is over and plume is gone	Monitor or evacuate	Monitor or evacuate

Sheltering / Evacuation Work Aid

Reliable met data available?	Evacuation practical?	Plume release condition	Sheltering and evacuation guidance		
			Isolation Zone	Protective Action Zone	
				Downwind portion	Upwind portion
YES	NO	ALL release conditions	Shelter, then monitor or evacuated when practical after plume passes	Shelter, then monitor or evacuated when practical after plume passes	Precautionary shelter
	YES	Release condition is UNKNOWN	Shelter, then determine release condition and reevaluate	Shelter, then determine release condition and reevaluate	Precautionary shelter, then determine release condition and reevaluate
		Release is anticipated but not imminent	Evacuate	Shelter, consider evacuation	Precautionary shelter, consider evacuation
		Release is occurring or imminent AND…			
		Longer than about 30 min	Evacuate within 30 min if HVAC is turned on; evacuate within 1 hour if HVAC is turned off	Evacuate within 30 min if HVAC is turned on; evacuate within 1 hour if HVAC is turned off	Precautionary shelter, evacuate if wind shifts may occur
		Shorter than about 30 min	Shelter, then monitor or evacuate after plume passes	Shelter, then monitor or evacuate after plume passes	Precautionary shelter, consider evacuation
		Release is over and plume is gone	Monitor or evacuate	Monitor or evacuate	Monitor to confirm no impacts

Using the Shelter / Evacuation Work Aid

- Following session describes step-by-step process for applying the Work Aid
- Example scenario introduced and tracked through the process

An Example Scenario to Illustrate Process

An employee operating a forklift accidentally sheers the valve off of an anhydrous ammonia cylinder. The contents of the cylinder are released quickly, and the employee leaves to report the incident.

The Steps ...

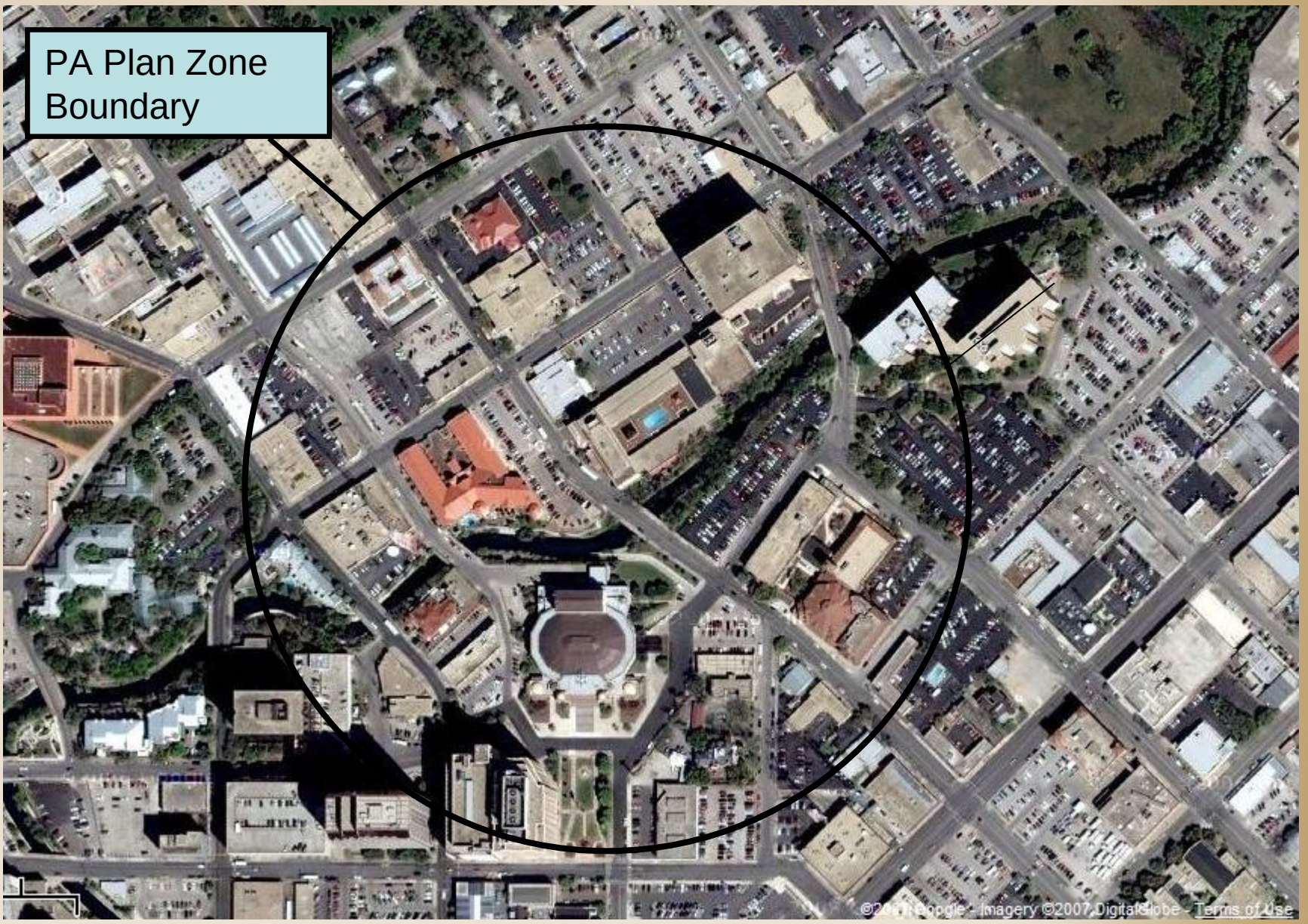
1. Gather information
2. Apply work aid
3. Communicate and act

Step 1. Gather Information - Indicators

- Isolation Zone distance – 291 ft.
- Protective Action Zone distance – 576 ft.
- Plume release conditions
  - Release occurring
  - Shorter than about 30 min.
- Met conditions – (W to E)

Finding the Downwind Portion of the Protective Action Zone

1. Start with the PA Plan Map
2. Draw the wind direction arrow
3. Sketch in the Protective Action Zone
4. Sketch in the downwind box
5. Sketch in the Isolation Zone
6. Identify facilities/people in three Protective Action Zones


PA Plan Zone Boundary
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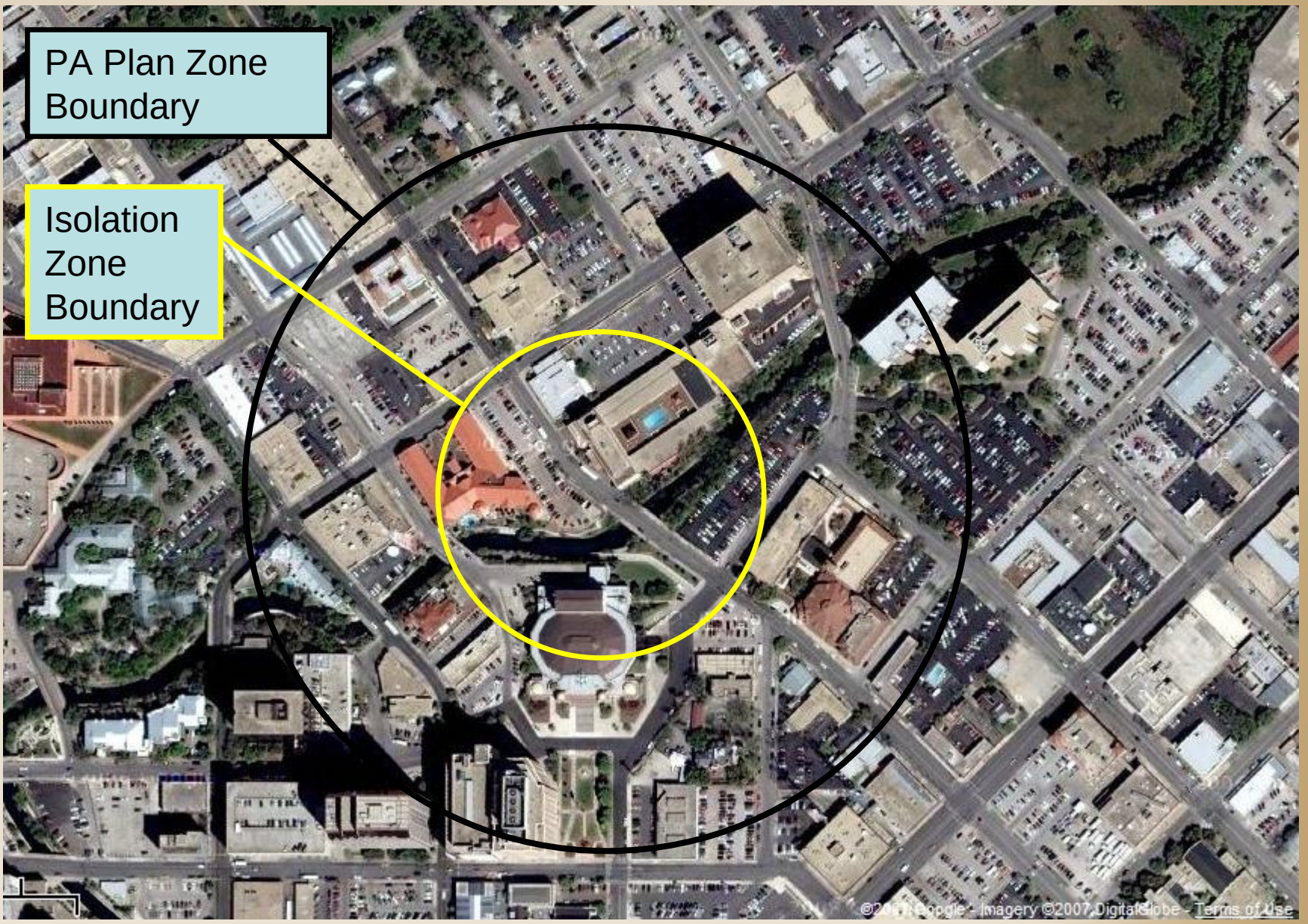
PA Plan Zone Boundary
Isolation Zone Boundary
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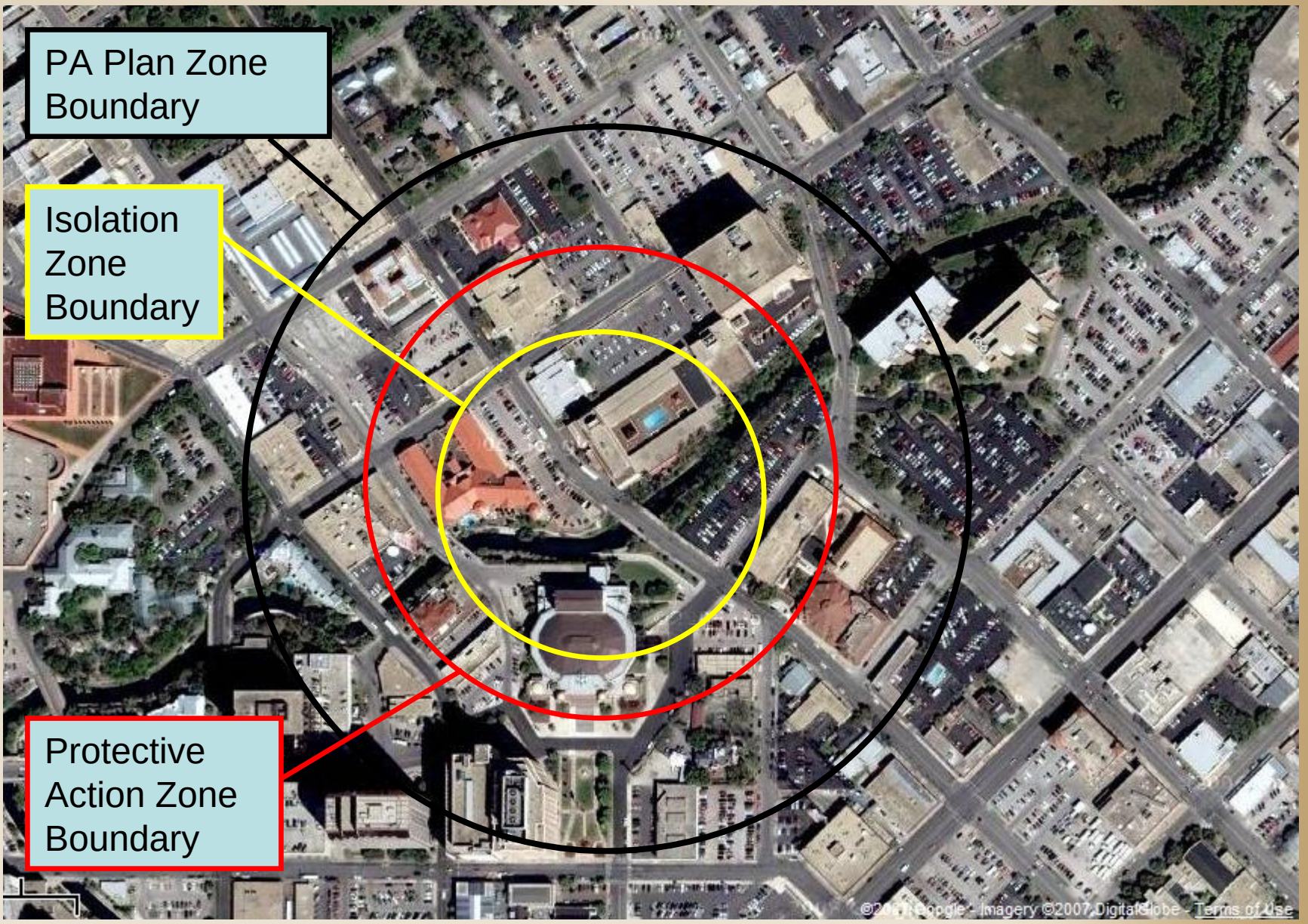
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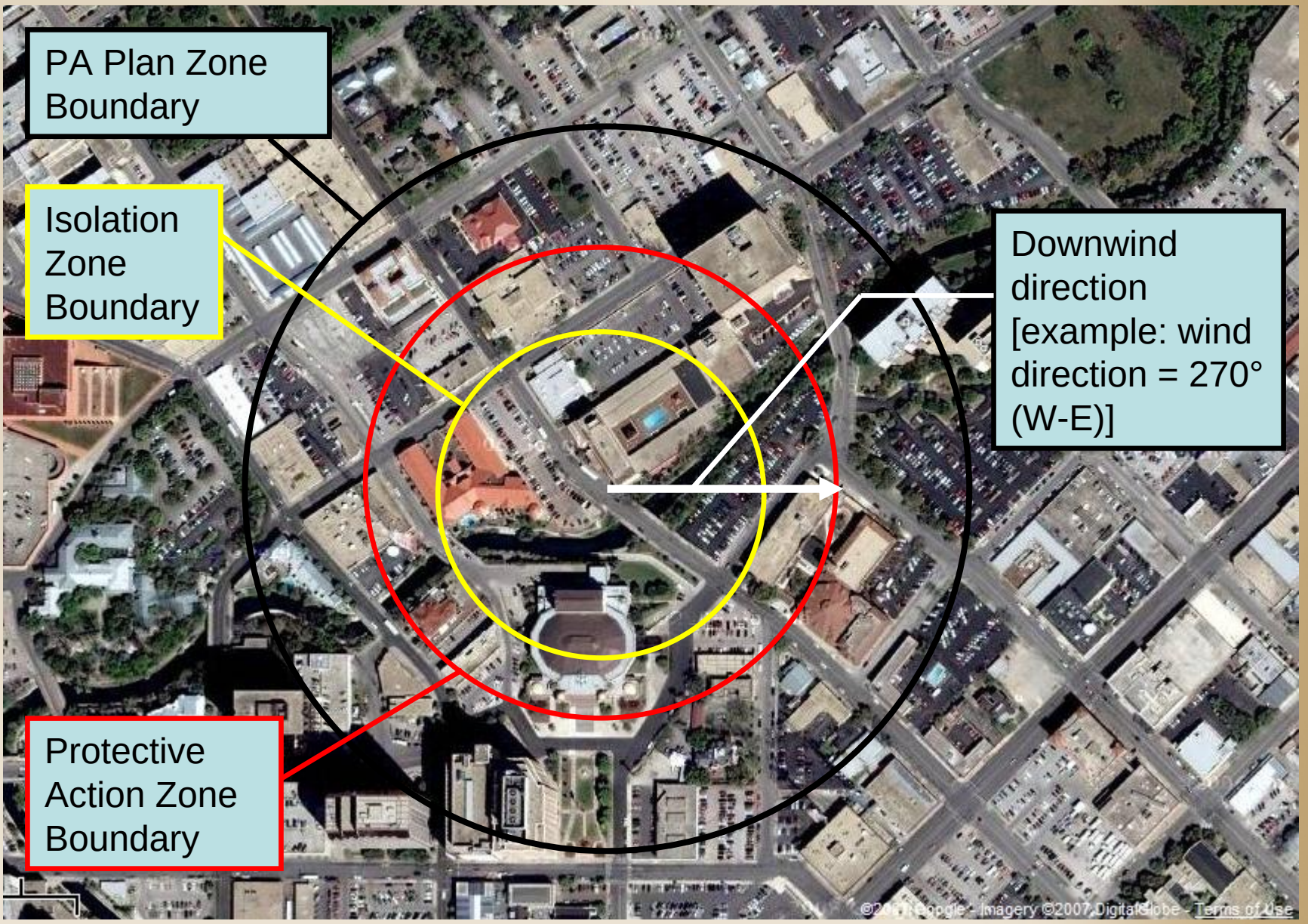
PA Plan Zone Boundary
Isolation Zone Boundary
Downwind direction [example: wind direction = 270° (W-E)]
Protective Action Zone Boundary
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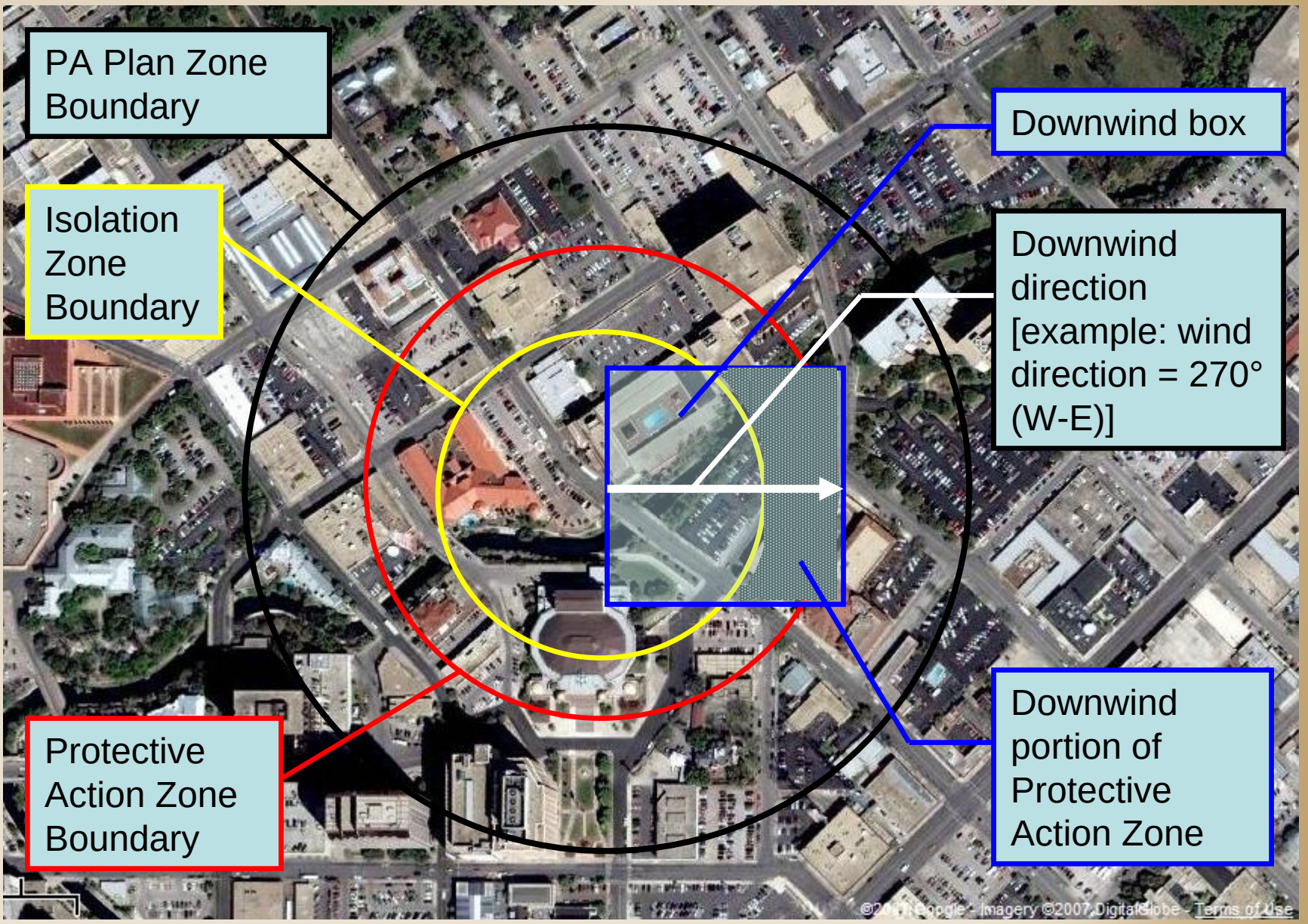
PA Plan Zone Boundary
Isolation Zone Boundary
Protective Action Zone Boundary
Downwind box
Downwind direction [example: wind direction = 270° (W-E)]
Downwind portion of Protective Action Zone
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Step 2. Apply Work Aid

Reliable met data available?	Evacuation practical?	Plume release condition	Sheltering and evacuation guidance	
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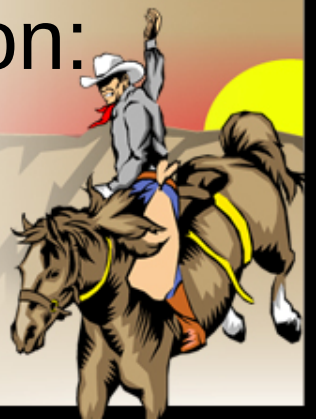
Summary of Step 2

EXAMPLE SCENARIO

- Isolation Zone:
  - Shelter, then monitor or evacuate after plume passes
- Protective Action Zone, Downwind Portion:
  - Shelter, then monitor or evacuate after plume passes
- Protective Action Zone, Upwind Portion:
  - Precautionary shelter, consider evacuation for logistical / control purposes



Step 3. Communicate and Act

- Record results in PA Plan table (receptor list)
- Communicate results
- Take protective actions

Questions