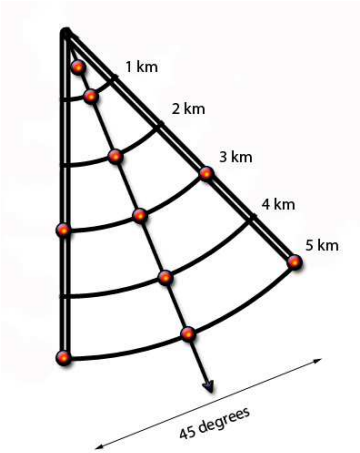
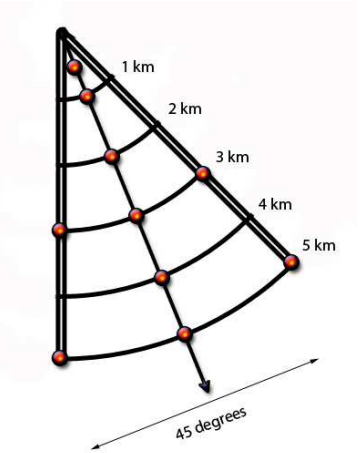
10 Point Monitoring Strategy





Scenario

- It's a sunny day at a baseball park in Arlington, TX
- As you park your car near the Incident command post about ½ mile south of the stadium you hear an explosion.
- You rush into the command post and the initial information you receive is that a small bomb has exploded in a parking lot near the stadium. Dozens of people we injured and some are critical. Windows have been broken in the stadium and nearby buildings. About 5000 people were already in the stadium at the time and many more in the parking lots near the stadium.
- Emergency services start evacuation of the stadium and surrounding areas. During that time, one of the first responders has an alarm on his radiation pager. Within a few minutes other reports of alarms on radiation pagers are called in.

Scenario (cont)

- Many actions start happening simultaneously but information is needed quickly to make decisions on health and safety
- Some of the immediate information needs include:
  - Status of Incident
  - Radiation/Contamination Levels
  - Safety Hazards
  - Toxic Materials
  - Status of Injured/Dead
  - Site Description

Scenario (cont)

Questions:

- As the local radiation expert, what initial steps do you recommend to Incident Command to determine the potential extent of the possible radiation problem?
- As the area around the stadium is secured, how do you follow up to determine the potential scope of the radiation problem?
- As additional radiation monitoring resources are moved to support incident command, how do you best utilize them?

The concepts utilized in the 10 Point Monitoring Strategy will help answer some of these questions and prepare first responders for gathering the data needed to make appropriate decisions quickly.

(to be continued…….)

10 Point Strategy Training Overview

- Purpose
- Scope
- Objectives
- Outline

Purpose

- The purpose of 10 Point Monitoring is to provide a quick and standardized method for rapidly gathering initial monitoring data after a release of radioactive material. It is intended to be used during the initial "crisis" and not intended to be a long term monitoring strategy for detailed characterization of contamination

Scope

- The 10 Point Monitoring Strategy is intended for use by first responders and other initial radiation monitoring personnel during the first 24 hours of a radiological release. After 24 hours, additional monitoring personnel and assets will be at the scene and a longer term strategy and monitoring protocol will be initiated.

Objective

- To train first responders and initial radiation monitoring teams on a standardized protocol that can be used to determine initial extent of the potentially impacted areas and allow sufficient data to be gathered to allow refining initial plume calculations based on actual monitoring results

Outline

- Introduction to Crisis Monitoring
- Sample Scenario
  - Initial Response
  - Monitoring Strategies
- 10 Point Monitoring
- Examples
- Summary

Introduction to Crisis Monitoring

- Suggested Initial Monitoring Priorities
  - Has a radiation release occurred?
  - Is the release significant enough to affect first responder efforts?
  - Who may be affected by the release?
  - Can steps be taken to mitigate dose to people downwind?
  - What are the hazards to site responders?
  - What is the environmental impact of the incident?

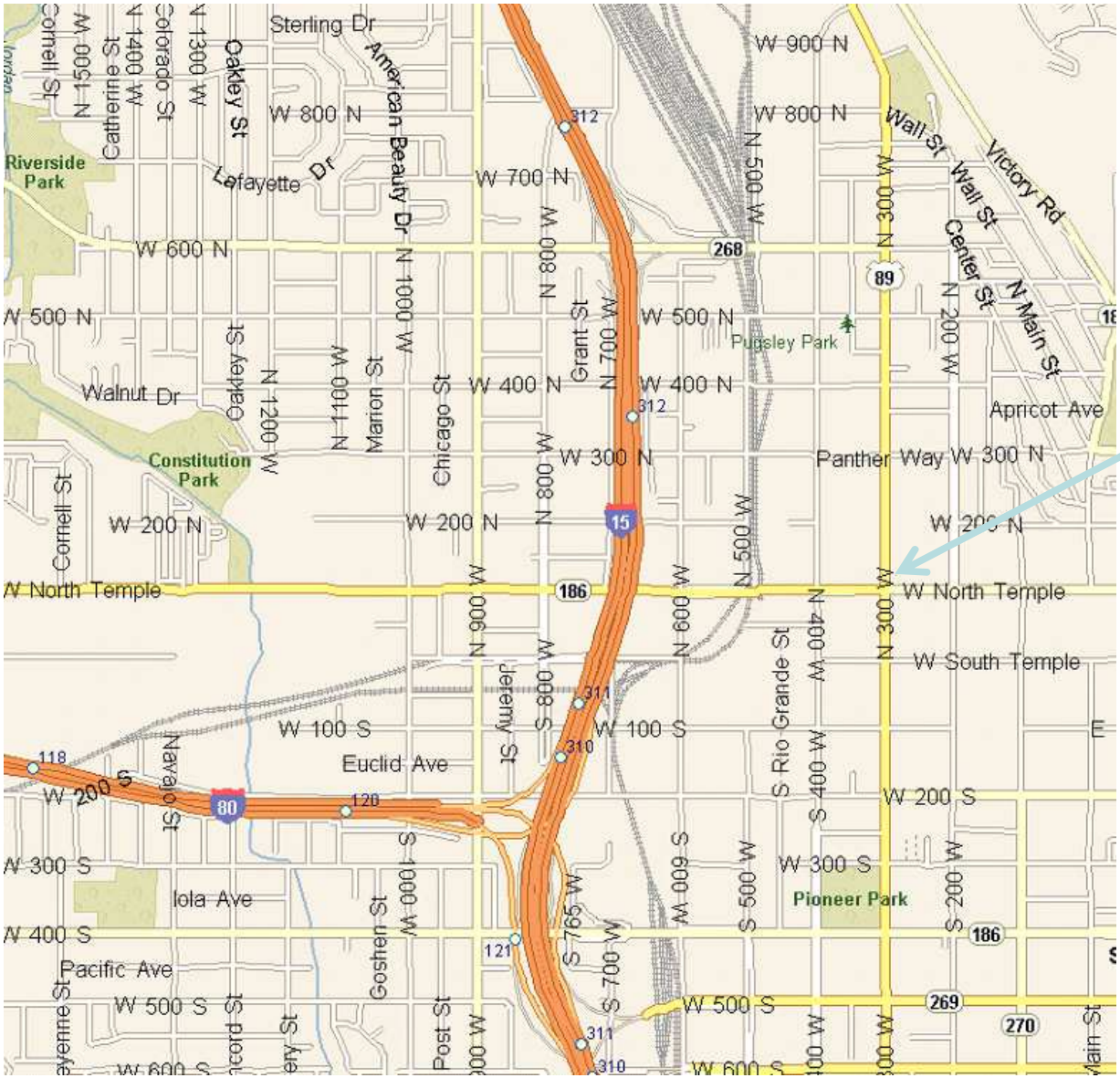
Note: These Priorities will change with time after incident

Sample Scenario

- RDD – 100 lbs HE in downtown Salt Lake City
- 1000 Ci of Cs-137
- Initial NARAC plot

Note: For examples in this presentation, effects of urban environments on dispersion were not taken into account.

Release Location



Release Location

Initial Response

- Immediately after an incident (explosion in the examples used in this presentation), first responders receive 911 calls and move toward the scene.
- Information starts to flow from the incident site to emergency operations centers.
- Once the presence of radiological material is suspected or confirmed, many agencies will begin computer modelling.

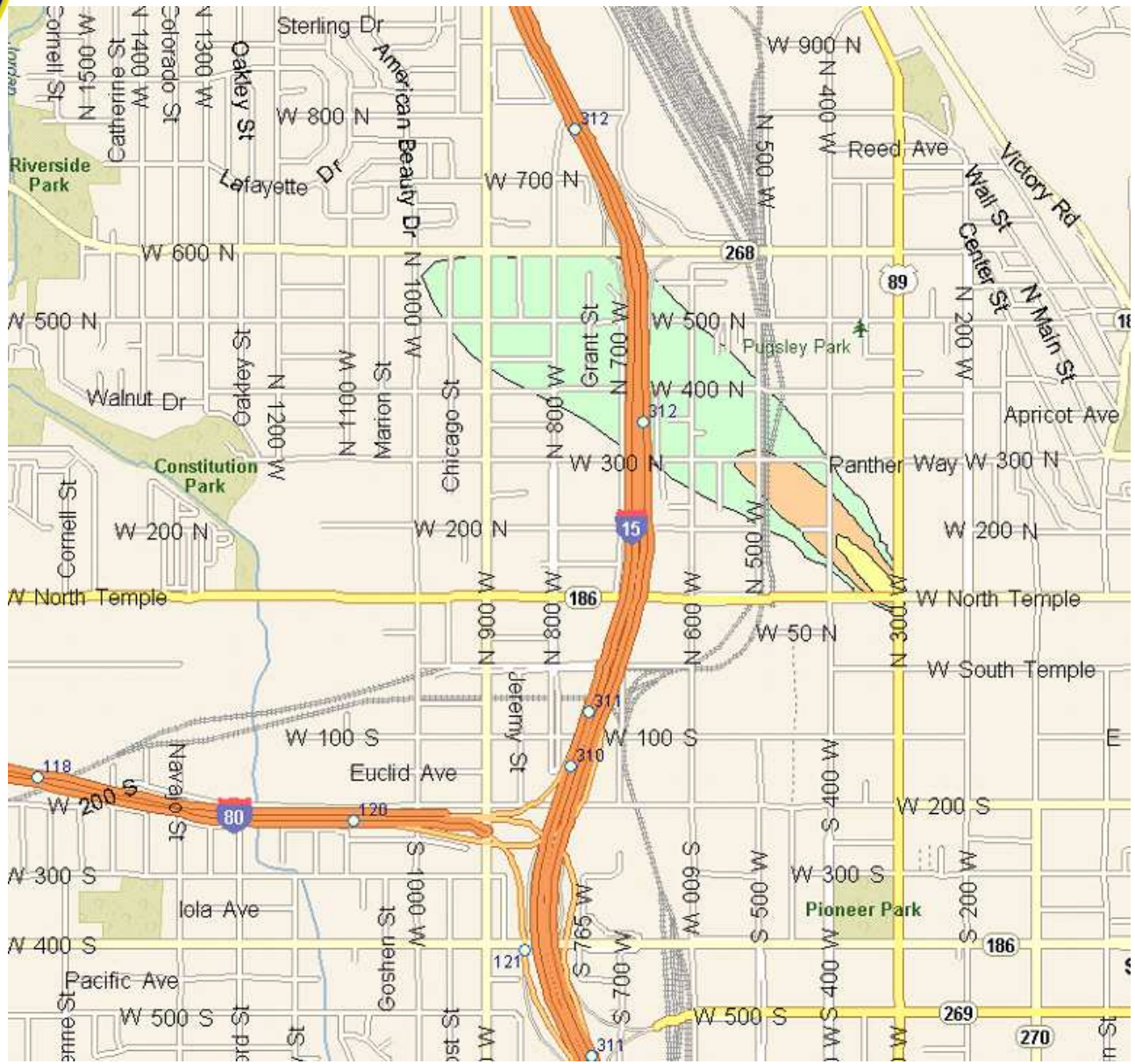
Initial Methods of Obtaining Site Information Immediately after Incident

- Initial Responders
- Live Video (traffic cameras, security cameras)
- Local or Computerized Maps
- Photographs
- Videotapes
- News Media

Follow On Analysis

- After initial information is received from the scene (estimate of explosion size, radioactive material involvement), initial worst case plume projections are developed.
- The worst case models can significantly over-estimate the affected population depending on input parameters.
- This can result in evacuation recommendations or shelter in place recommendations which can significantly affect a large number of people. Remember that evacuation or shelter in place is not a “zero risk” operation.
- Obtaining actual measurements which can be fed back to the computer model is critical to ensuring the appropriate response!

Ground Deposition



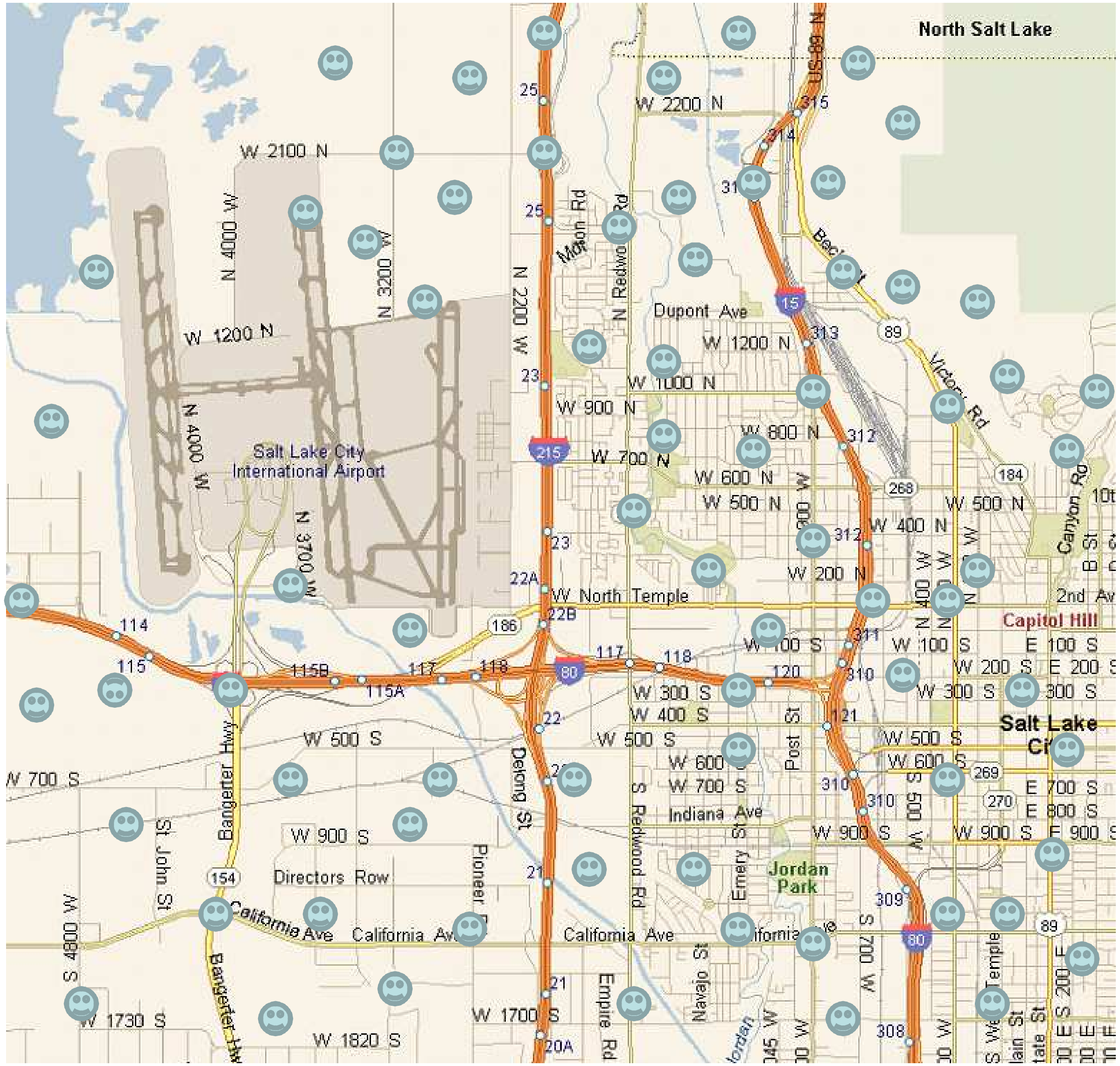
Plume modeled using NARAC

Monitoring Strategies

- Random monitoring
- Follow streets/roads
- Transect Plume
- Monitor everywhere
- Prove zero's
- Focus on Release Site
- Plume Pinch

No standardized strategy is used across response assets at the present time!

Random Monitoring

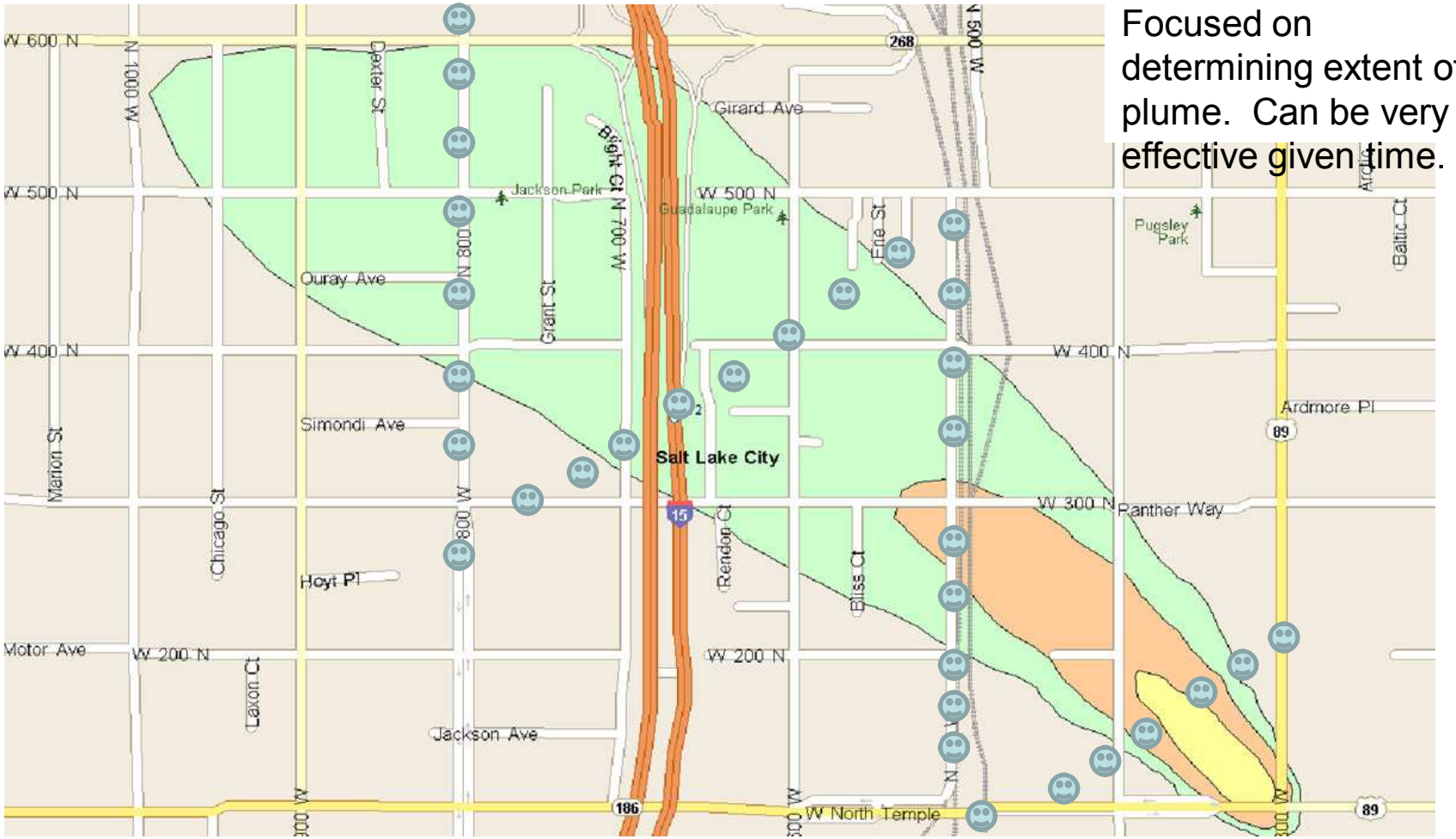


Sending teams out to monitor random locations is probably not the best “strategy”!

Monitor Streets/Roads

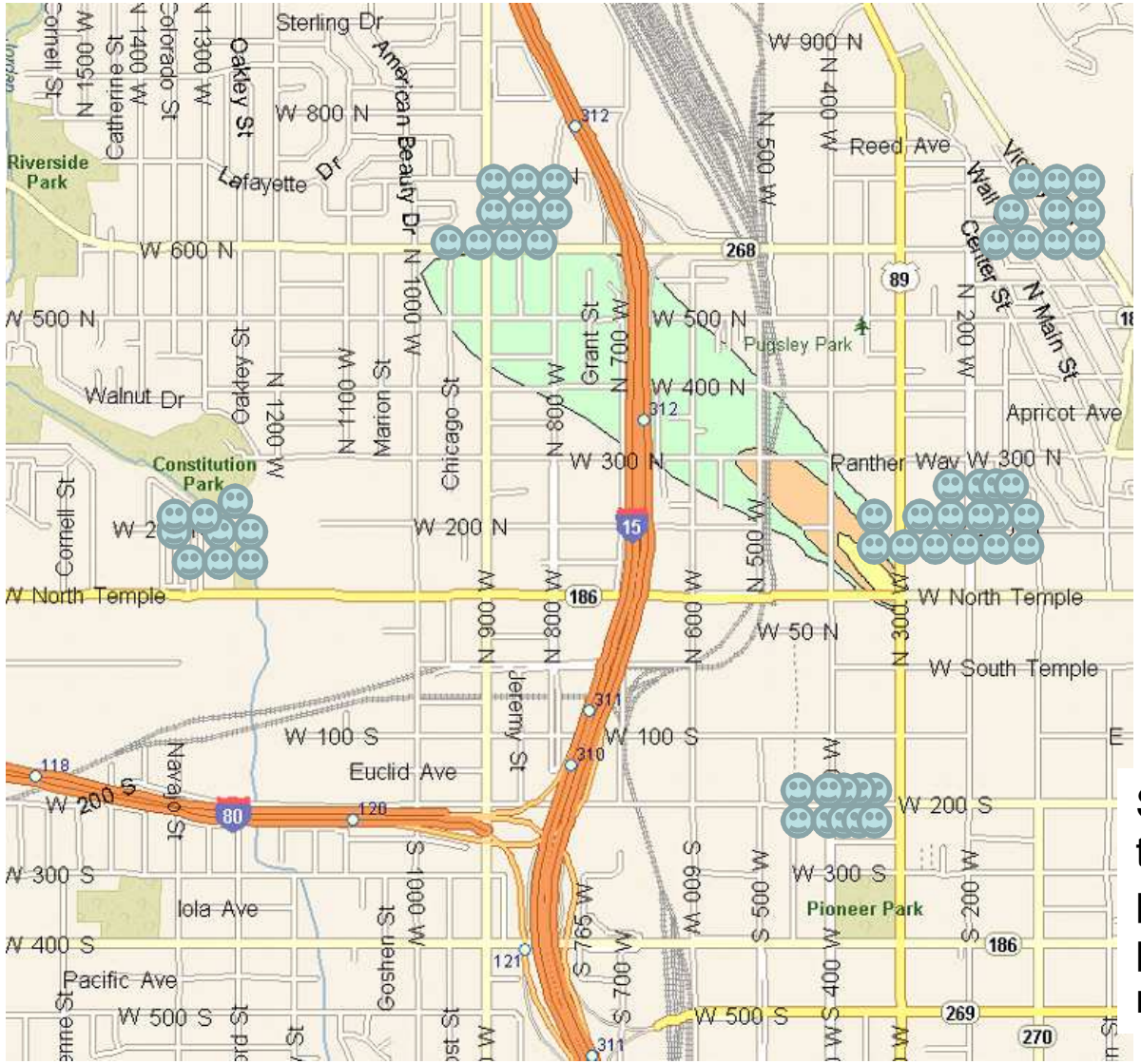
Not a bad strategy, but can take lots of time.

Plume Transect



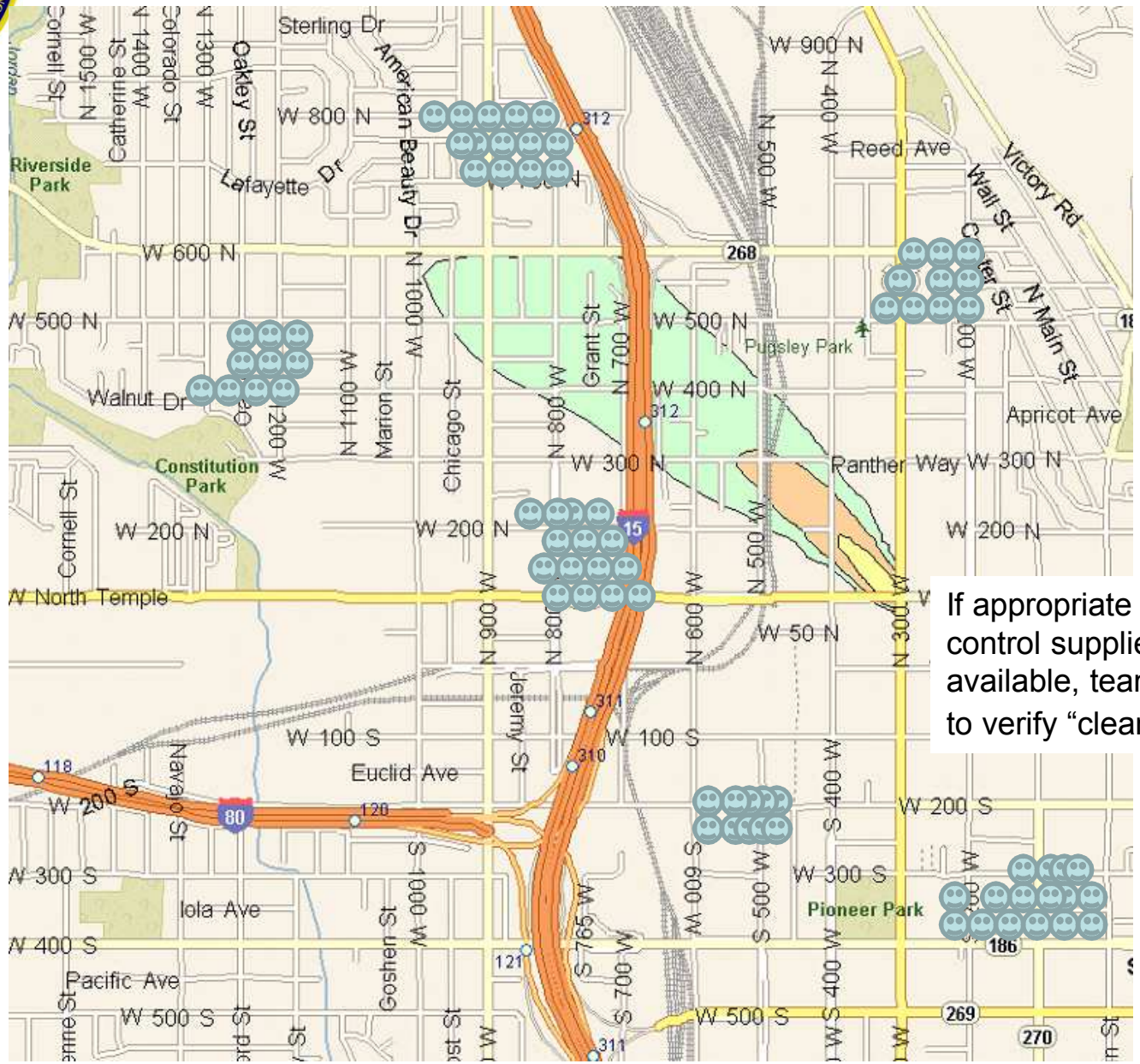
Focused on determining extent of plume. Can be very effective given time.

Monitor Critical Facilities/Locations



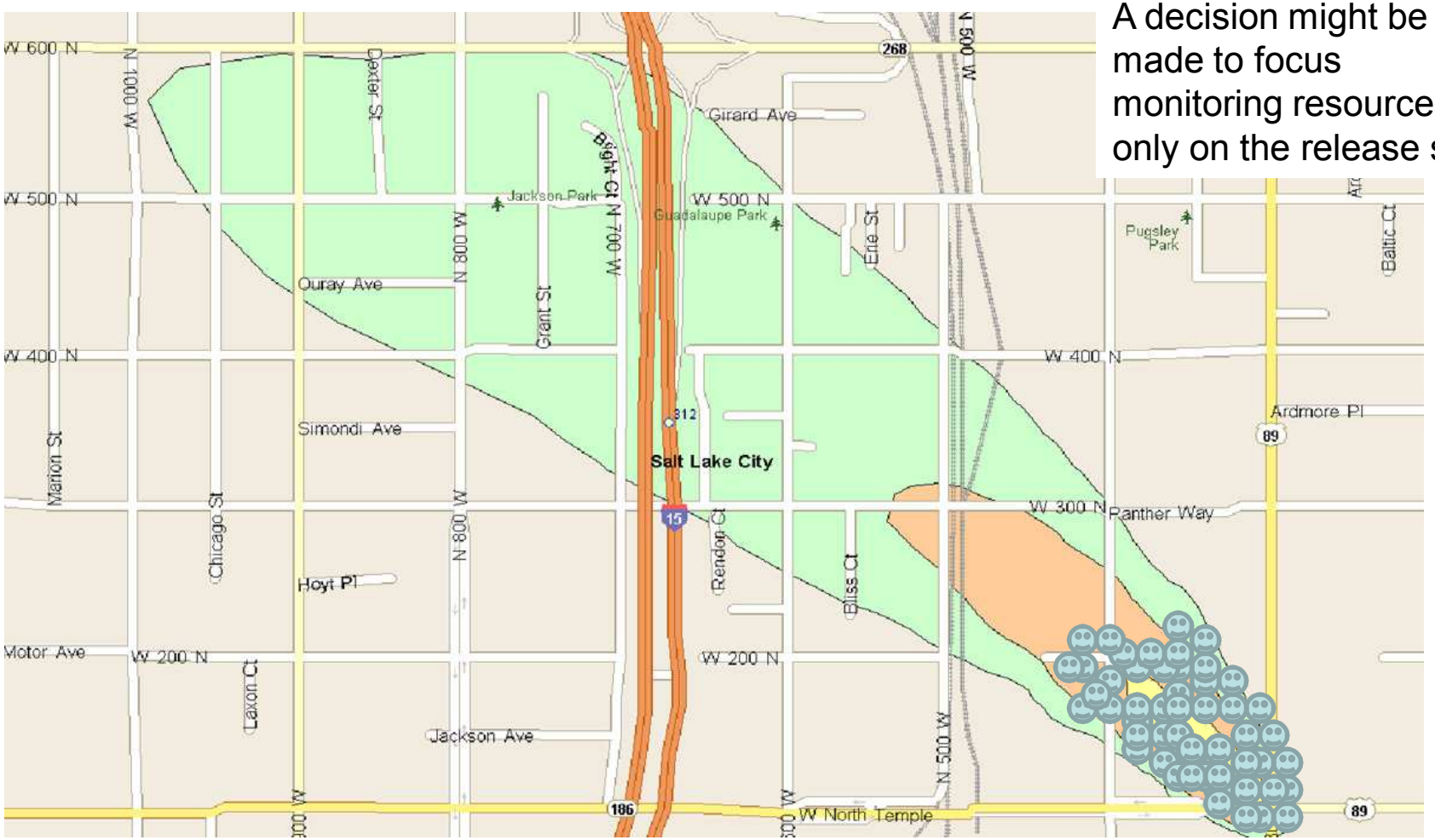
Selection of locations to send monitoring personnel can help prioritize monitoring resources.

Monitor Zeros



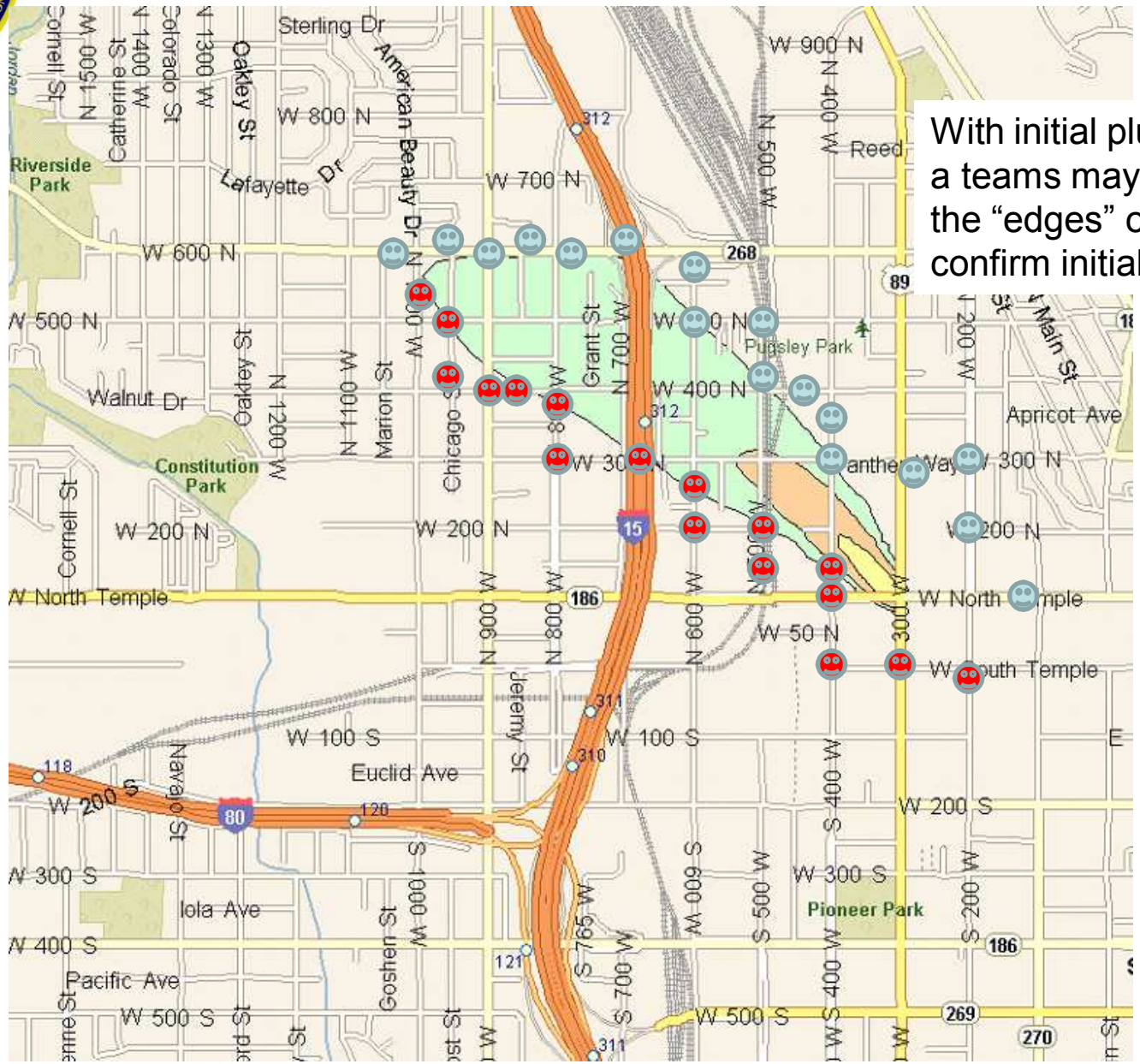
If appropriate contamination control supplies are not available, teams can be sent to verify “clean” locations.

Focus on Release Site



A decision might be made to focus monitoring resources only on the release site.

Plume Pinch



With initial plume projection, a teams may be sent along the “edges” of the plume to confirm initial projections.

Issues

- Current Monitoring Strategies for Initial Responders are based on these or similar protocols
- Some of the ones mentioned may have some uses for “long-term” monitoring protocols
- However, during the first few hours, they may result in ineffective use of resources during the “Golden Hours”
- Prioritization of data may affect verification of evacuation or shelter-in-place decisions
- Gathering important data quickly and focusing on gathering that data is critical!

Considerations

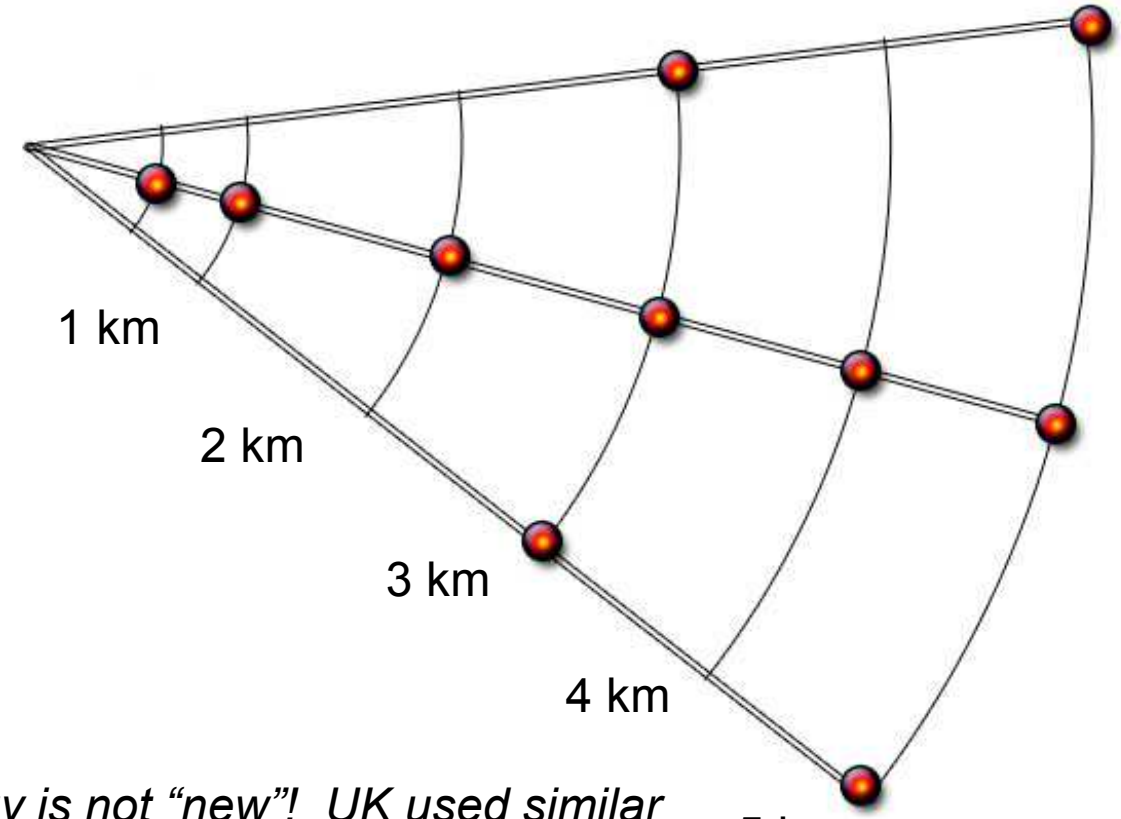
- What initial monitoring data will be available after a incident/accident involving radioactive material?
- Will the data be consistent?
- Will the initial locations chosen have the right priority?
- Do all responders have a consistent strategy?

Development of 10 Point Monitoring Strategy

- Development of a Standardized Monitoring Strategy across response assets could result in enhanced early assessment of the impact of a radiological incidents.
- Development of common initial monitoring will require interagency cooperation.
- Concept was intended initially for weapons accidents but has been modified for use in other radiation incidents

Potential Template

Release Point



Note: Strategy is not "new"! UK used similar strategy for weapons accidents 20 years ago.

Features of 10 Point System

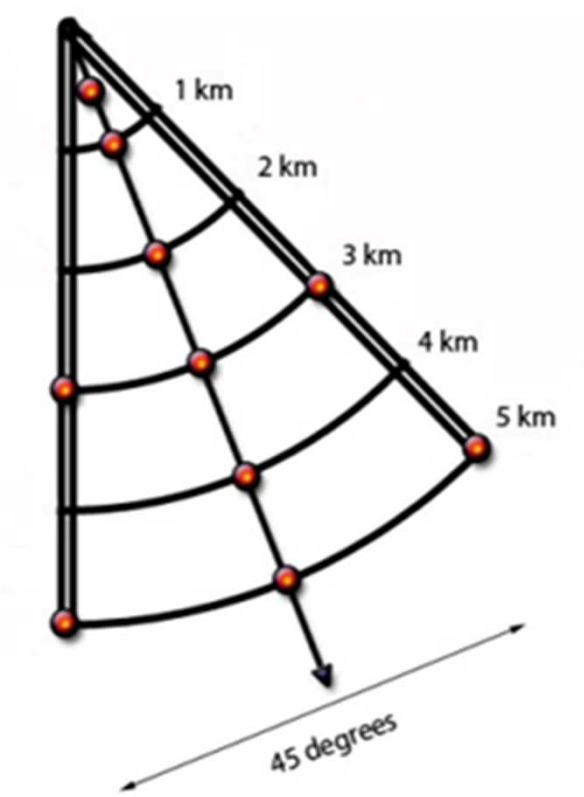
- Relatively easy to implement without performing significant monitoring at the incident scene
- Gives sufficient data to begin plume model refinement to evaluate potential impact of release
- Can be modified as needed if points are inaccessible or if local wind variations exist
- Can be based on initial NARAC “smoke plot” or other initial modeling tools
- Can easily be trained to all responders (DOE, DOD, local, state, etc.)

Location description

- The initial 10 monitoring points are (not in prioritized order):
  - Directly downwind from the release point as close to the release as safe for responders
  - 1km, 2km, 3km, 4km, and 5km directly downwind
  - 3km and 5km downwind at 22.5 degrees on both sides of plume centerline

Ten Point Template

The points for 10 Point Monitoring are shown on the diagram below:



10 Point Process

- Determine the 10 points to be monitored as soon as possible after the incident. The locations are approximate and can be plotted on any map or using Graphic Information System (GIS), Google Maps, Google Earth, etc
- Perform initial plume modeling using NARAC or other resources
- Using the 10 point data, refine the plume plot
- If some points cannot be monitored or if the data seems to indicate that the contamination may not be where expected, refer to Cases 1-4

Potential Issues

After the initial data is obtained, it can be sent to the appropriate dispersion modeling location (NARAC for DOE) and used to further refine the initial model. There are several potential outcomes from the initial monitoring that should be considered:

- No contamination was found
- The selected points were not accessible
- Contamination was found more toward one side of the plume than the other
- Higher contamination levels were found at farther distances than close in points

Case 1

Case 1: No contamination was found – In this case, there are several explanations that need to be evaluated.

- The first consideration is whether any radiological release actually occurred or not. Additional information on the type of incident and the actual configuration of potential source material involved may lead to additional information what could show that the source is still intact at the initial position.
- The second explanation for not finding any contamination is that the initial projected wind direction may not be what was thought by responders. In that case, the 10 Point Monitoring template should be moved 45 degrees in either direction and the initial monitoring strategy repeated.
- The third explanation is that the material was lifted higher into the atmosphere and did not deposit on the ground within the first 5 km. If this is a potential, the template should be repeated but using miles instead of kilometers as the units on the template.

Case 2

Case 2: The selected points were not accessible.

- This example could easily happen near bodies of water or in large urban areas. If this occurs, the location for the individual point can either be taken at the nearest accessible location or not used at all if it is impossible to choose an alternate location. In urban areas, the selected points should be at ground level and not on top of buildings

Case 3

Case 3: Contamination was found more toward one side of the expected centerline than the other.

- If this is found, the 10 Point template should be rotated 45 degree toward the higher levels of contamination and all the points (except those initially taken) should be monitored. This should result in 8 additional data points and should give sufficient data for refining the plume. This can be repeated as necessary to locate the highest areas of contamination

Case 4

Case 4: Higher contamination levels were found at farther distances than close in points.

- This is similar to the 3rd example in Case 1. In this case expand the distances used in the template from km to miles and repeat the monitoring

Sample Scenarios

- Arlington
- New Orleans
- Washington
- San Francisco
- Chicago
- Albuquerque

Sample Scenario Assumptions

- Intelligence had been received that 5000 curie of Cs-137 had been delivered into the U.S. in the form of a seed irradiator
- In the state where the scenario occurs, a theft of approximately 50 pounds of high explosive had occurred
- There was no prior warning of the time or potential location for detonation of an RDD

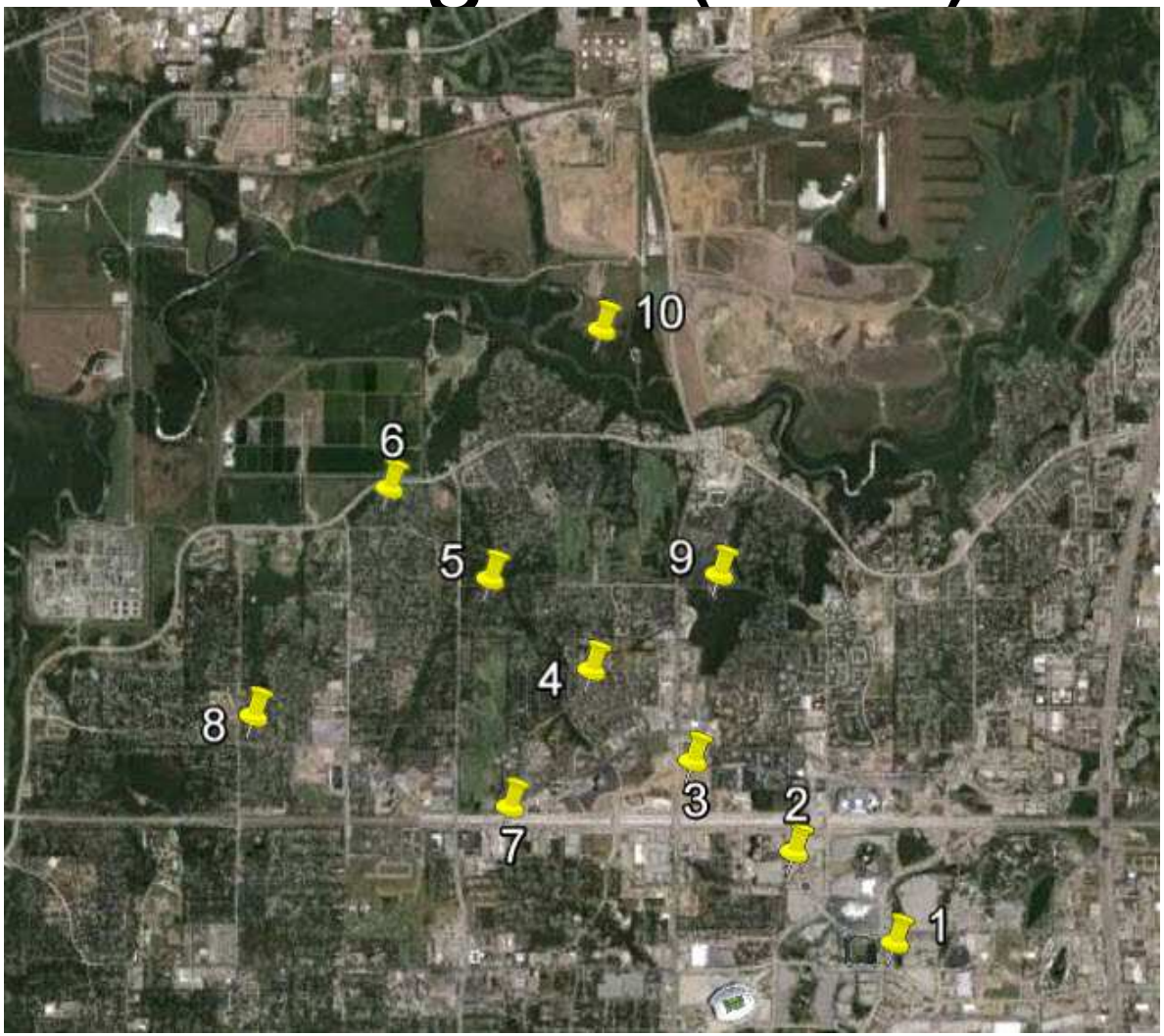
Arlington

Arlington

Arlington (cont)

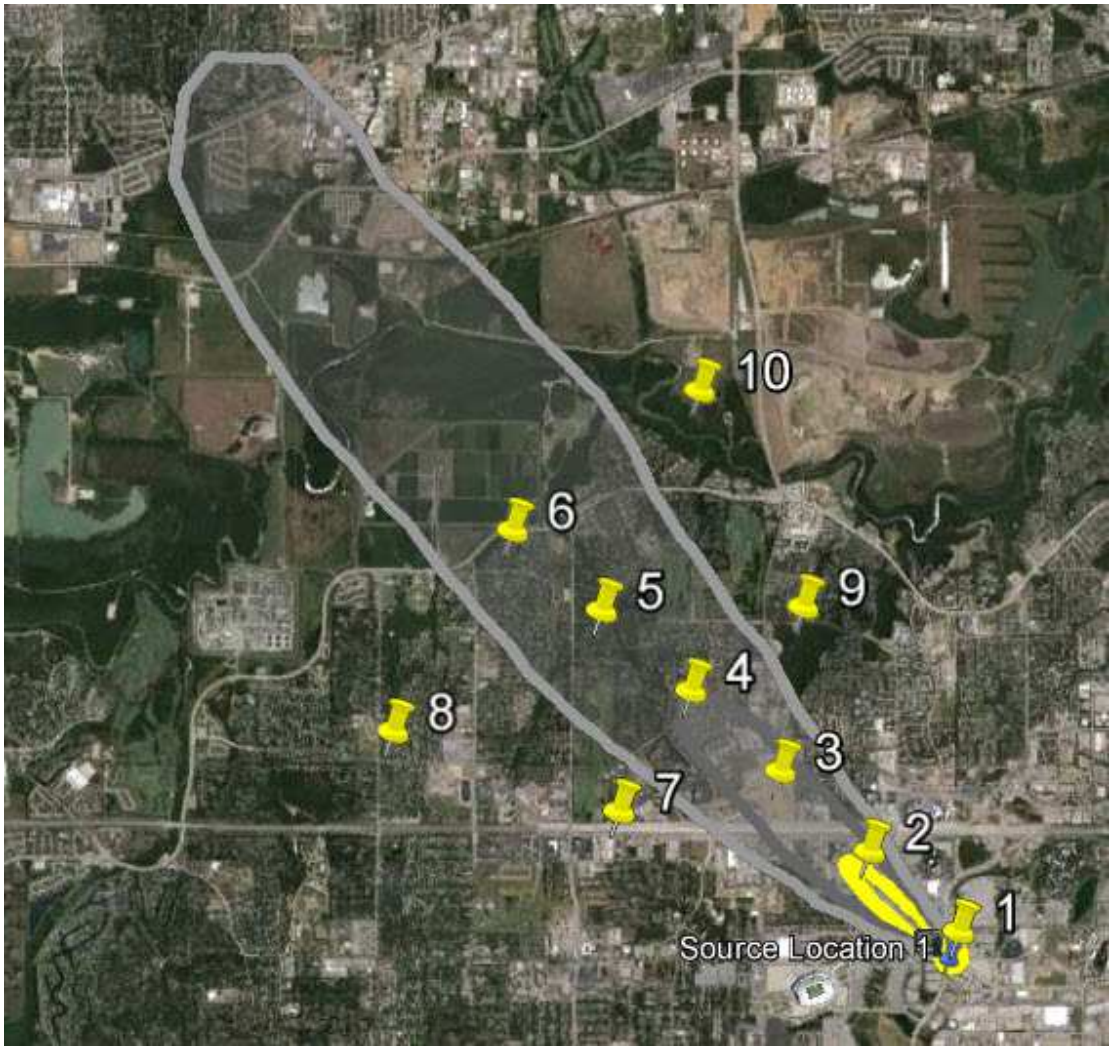
- Based on the assumptions previously given, and the initial NARAC plot, the 10 points can be swiftly selected
- Using Google Earth and a 10 point calculation spreadsheet, a monitoring plan map can be generated
- Initial teams can proceed to each location, take readings using hand held instruments, and report the data back to the command post
- The data can then be used to feed back into the model to refine the plots and make decisions for public protection and responder safety

Arlington (cont)



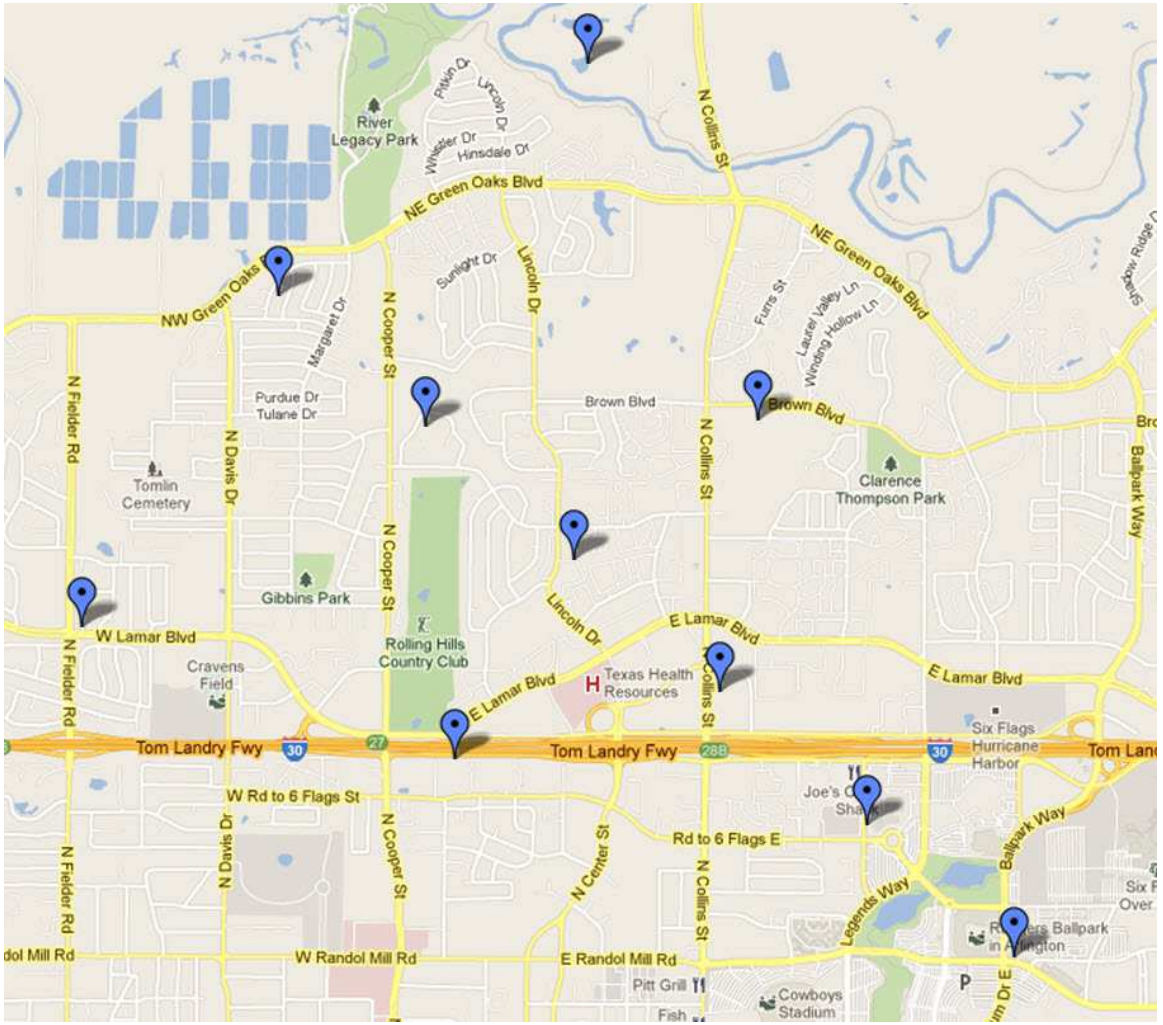
10 Points Selected

Arlington (cont)



10 Points Overlay on Plume

Arlington (cont)



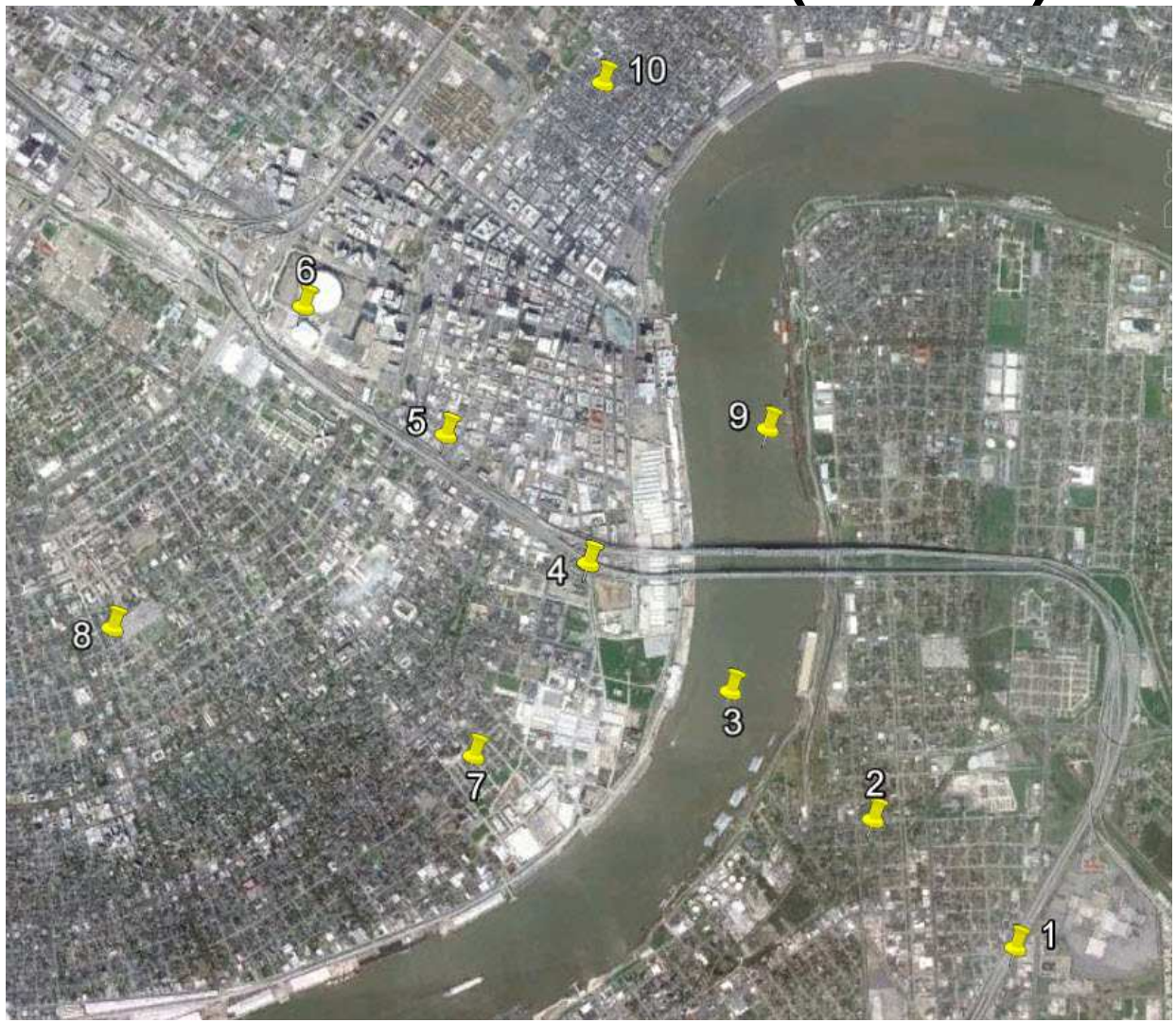
10 Points Overlay on Map

Arlington (cont)

- Note that all 10 points are relatively accessible by road except the northernmost point. That point could be moved slightly to the east near N Collins St.
- Use of those 10 points would quickly verify the initial plume projection and allow follow on detailed monitoring to be performed

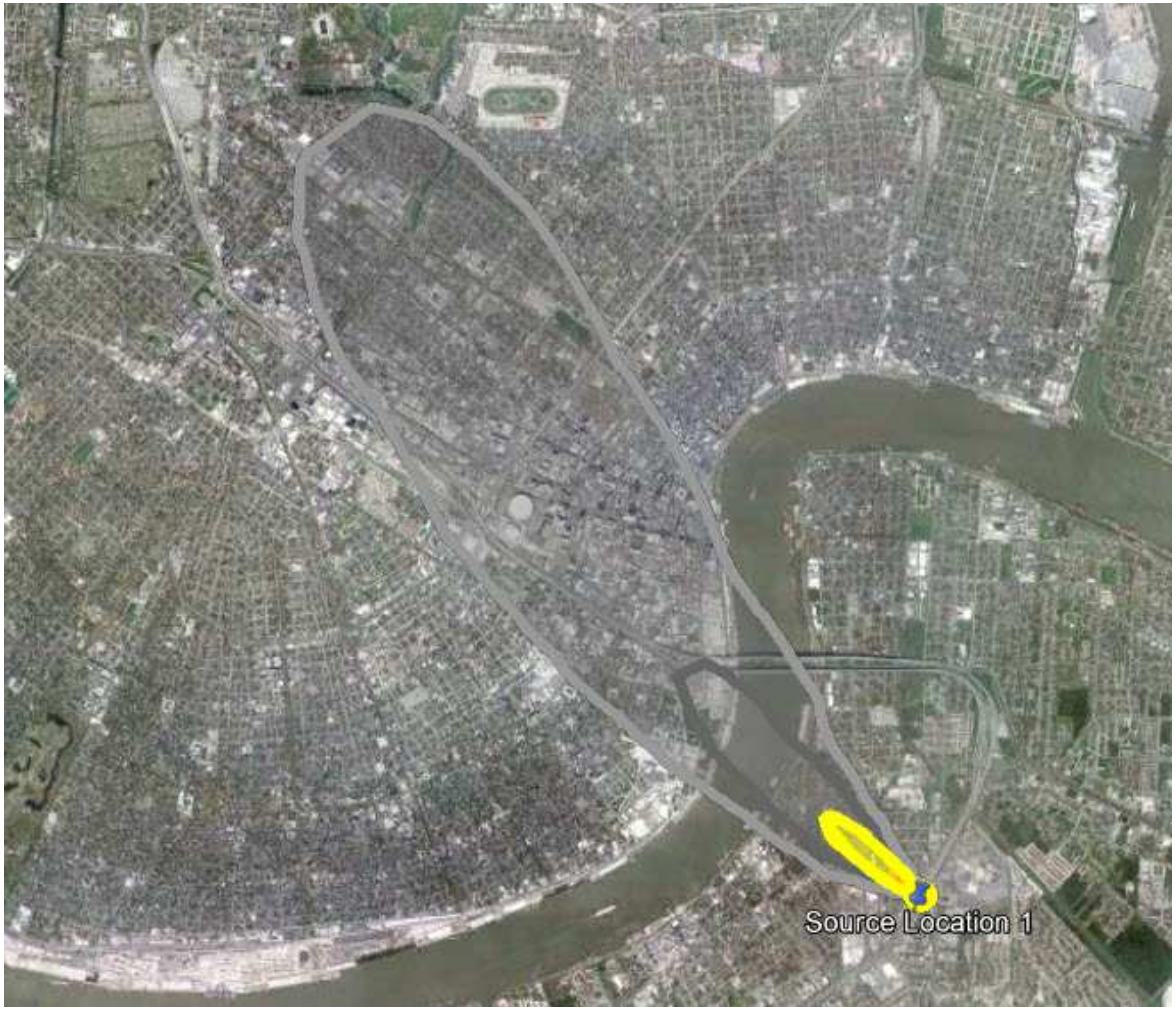
New Orleans

New Orleans (cont)



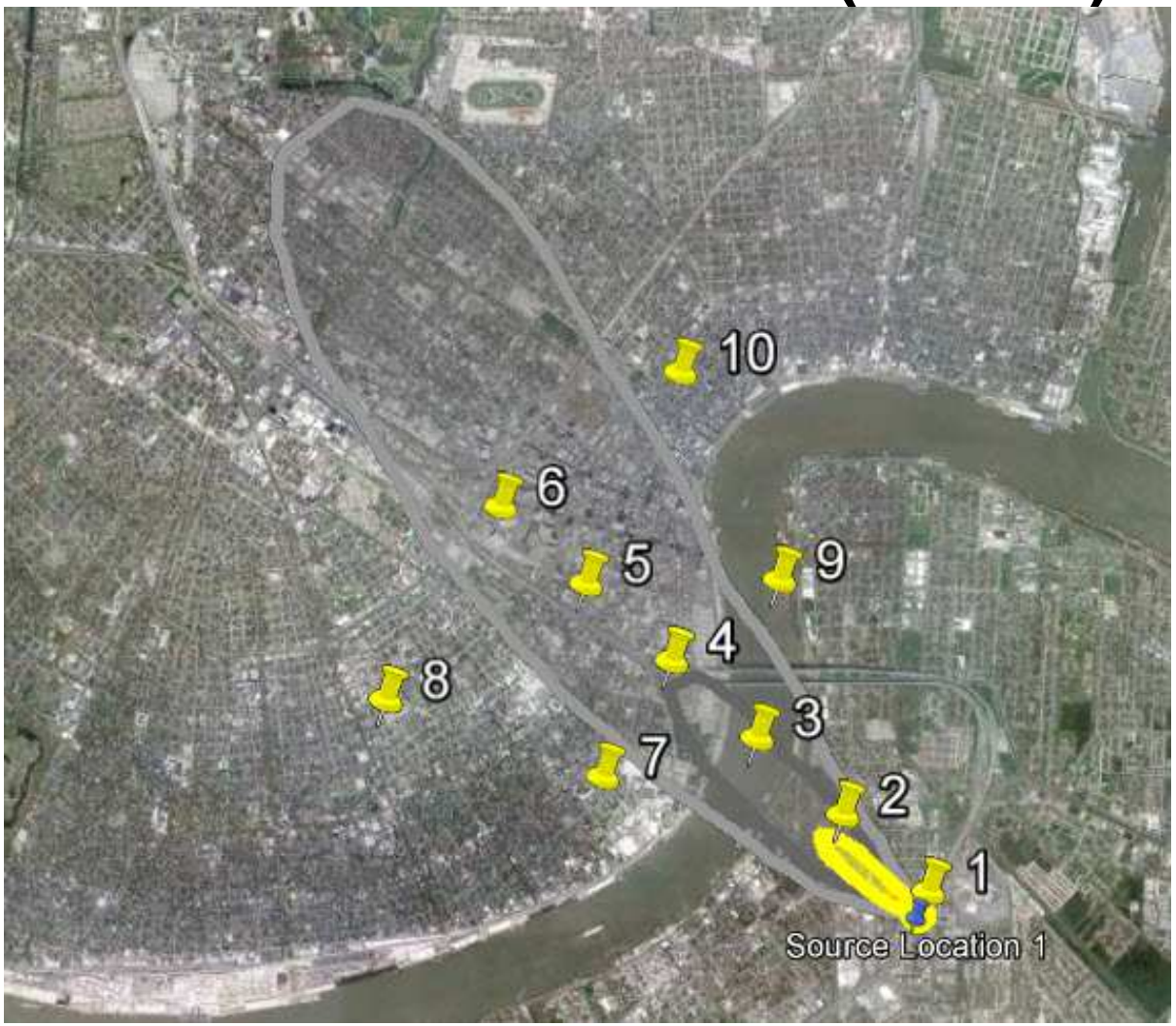
10 Points Selected

New Orleans (cont)



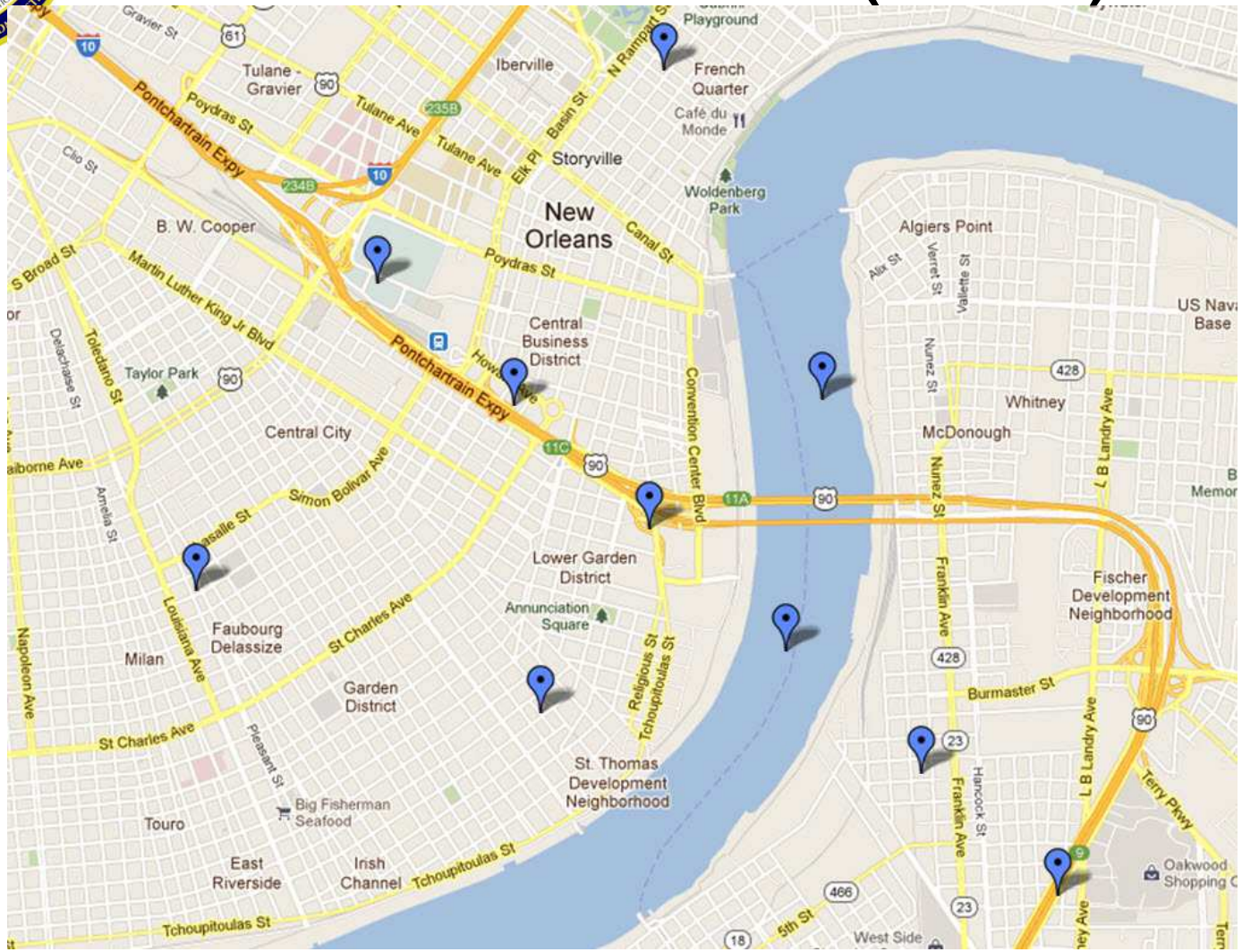
Plume Deposition

New Orleans (cont)



10 Points Overlay on Plume

New Orleans (cont)



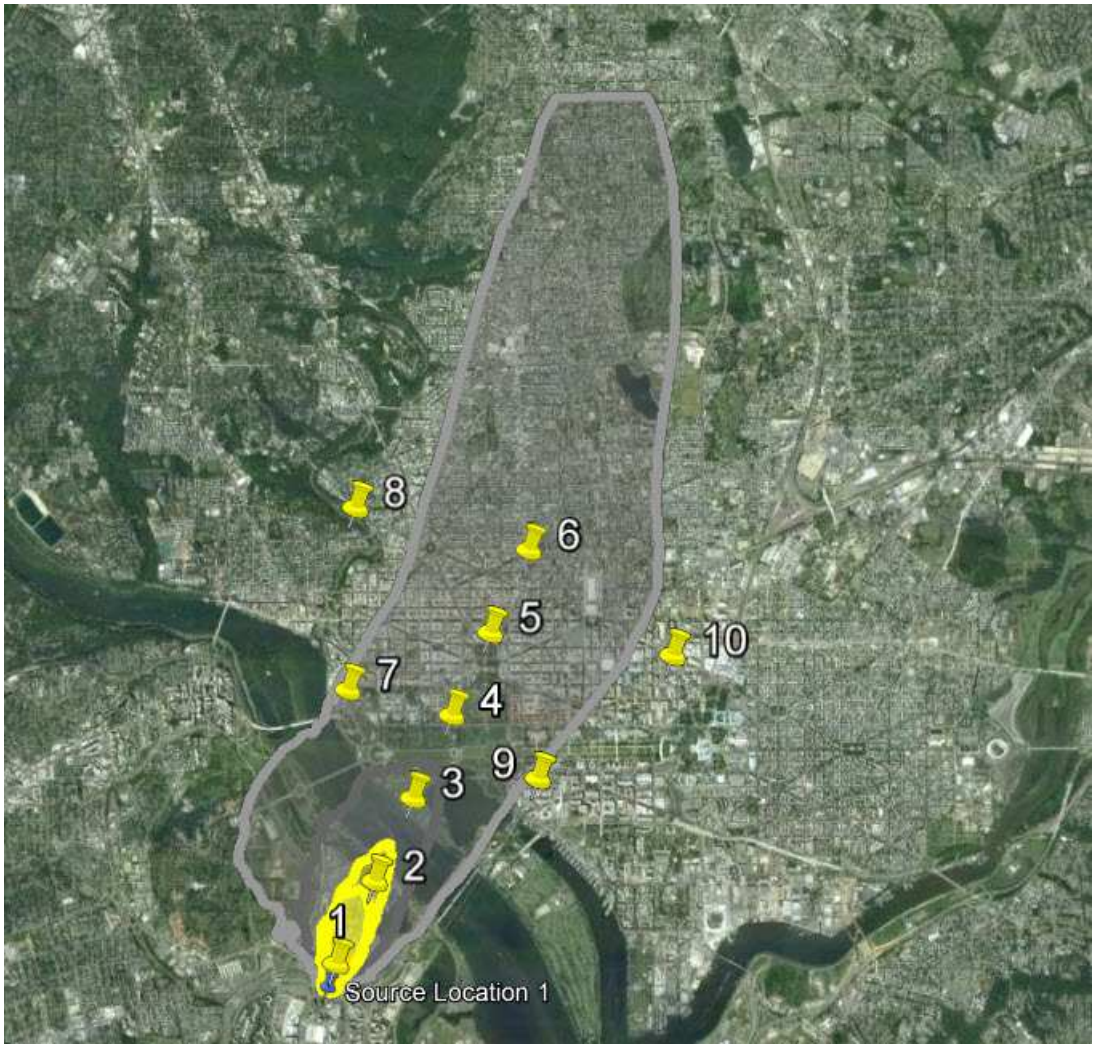
10 Points Overlay on Map

New Orleans (cont)

- Note that most of the points are readily accessible by road. However, two of the points (one on centerline and one to the north of centerline) fall in the river. Either of those locations could either be skipped or monitored at a nearby location on land
- Use of those 10 points would quickly verify the initial plume projection and allow follow on detailed monitoring to be performed

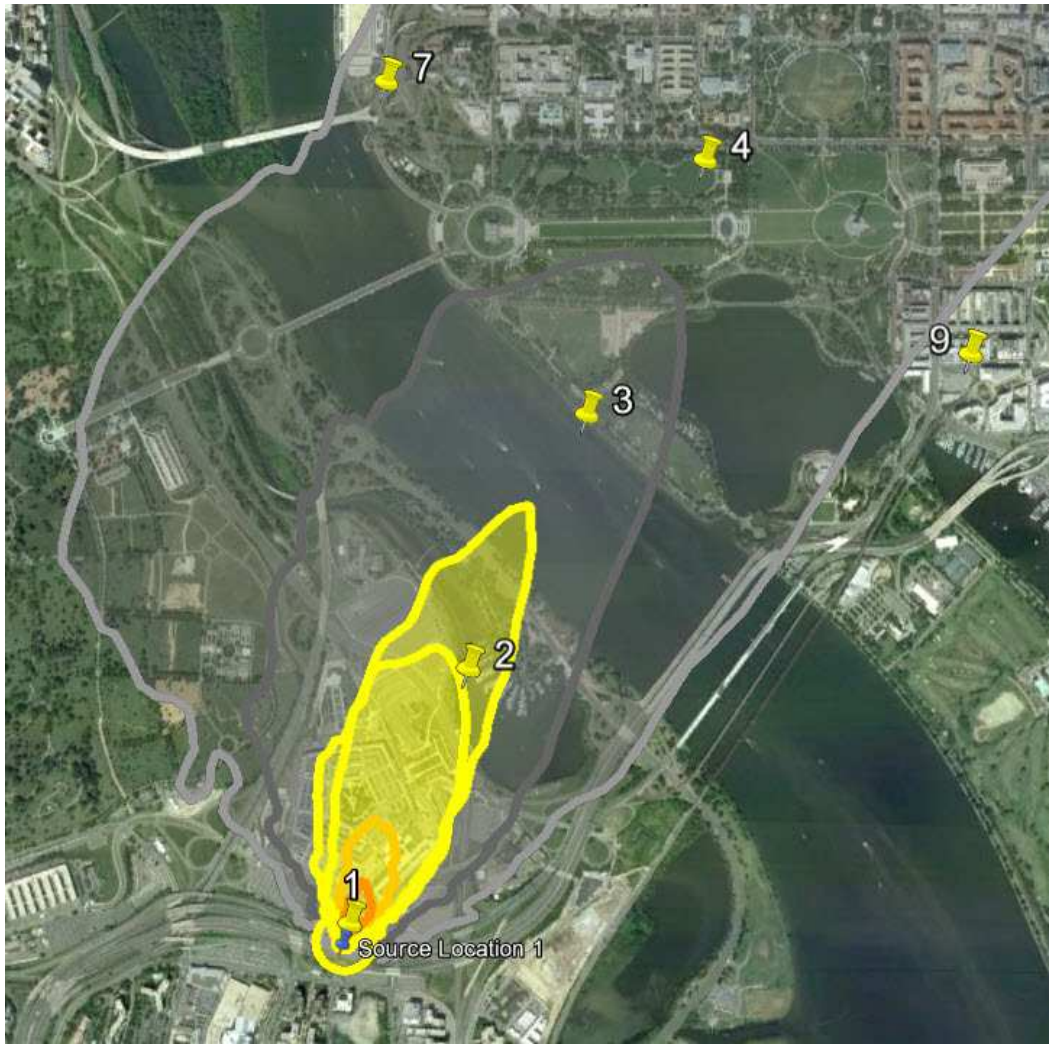
Washington

Washington (cont)



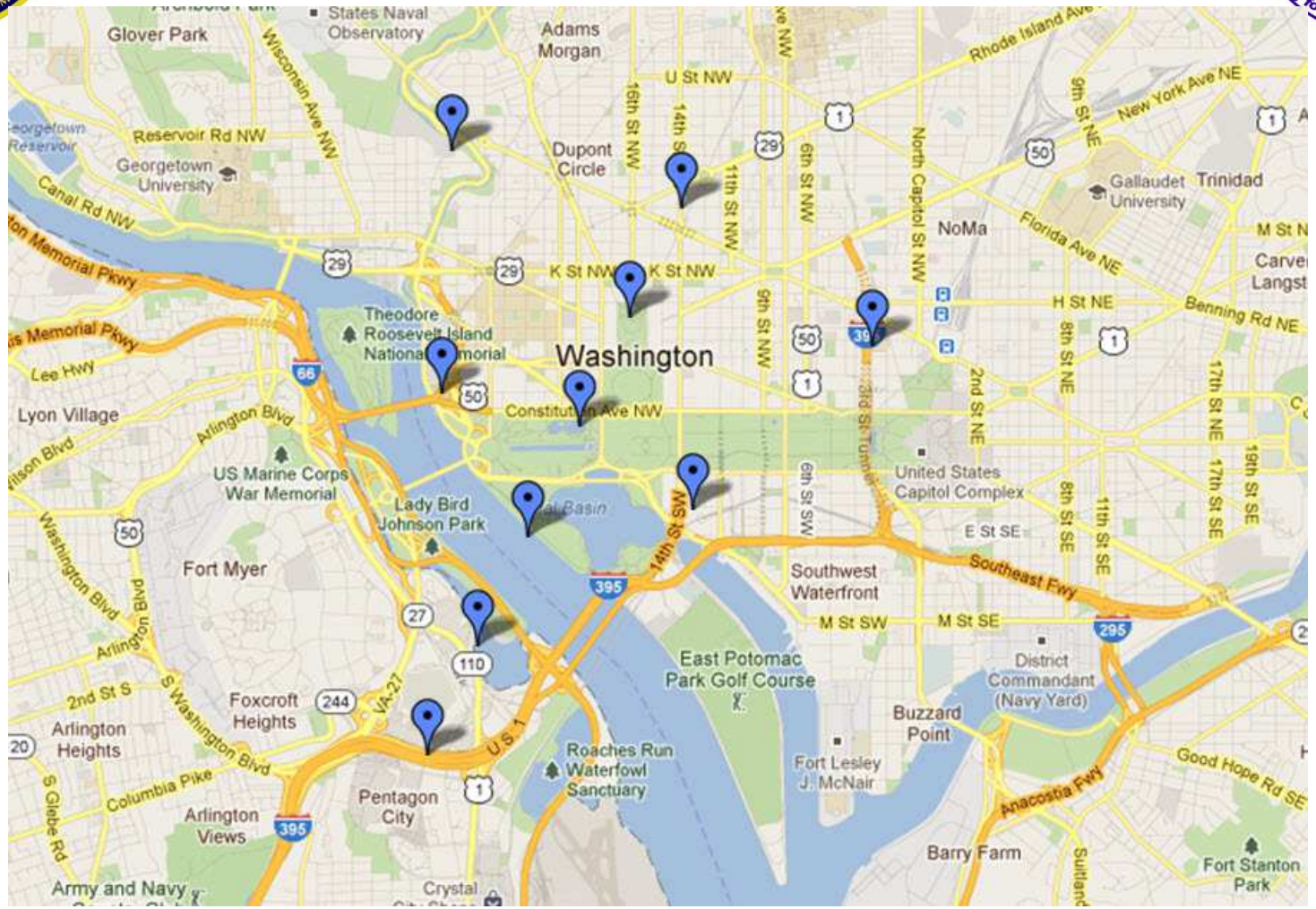
10 Points Selected (Correct Wind Input)

Washington (cont)



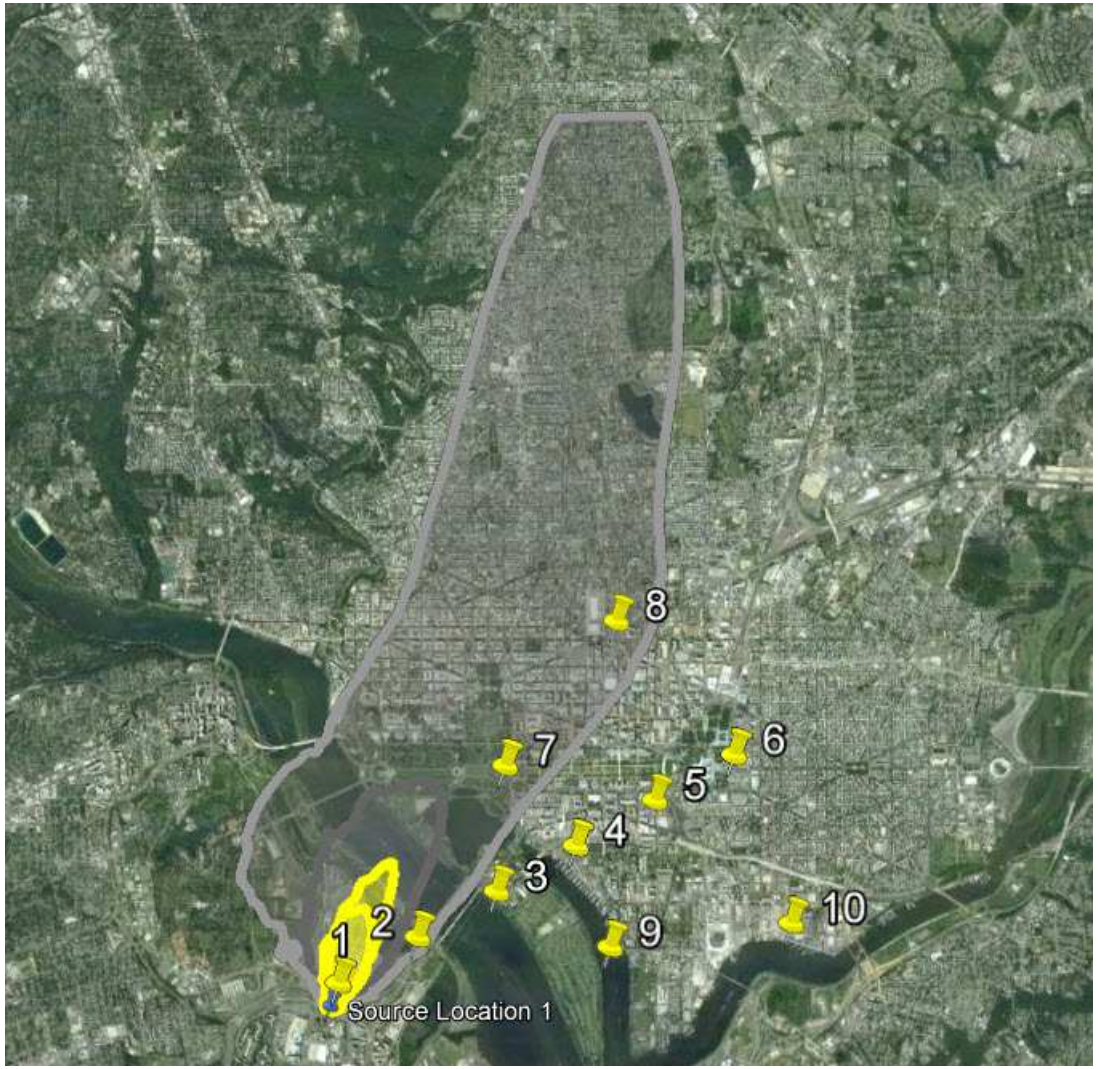
10 Points Selected CloseUp (Correct Wind Input)

Washington (cont)



10 Points Overlay on Map

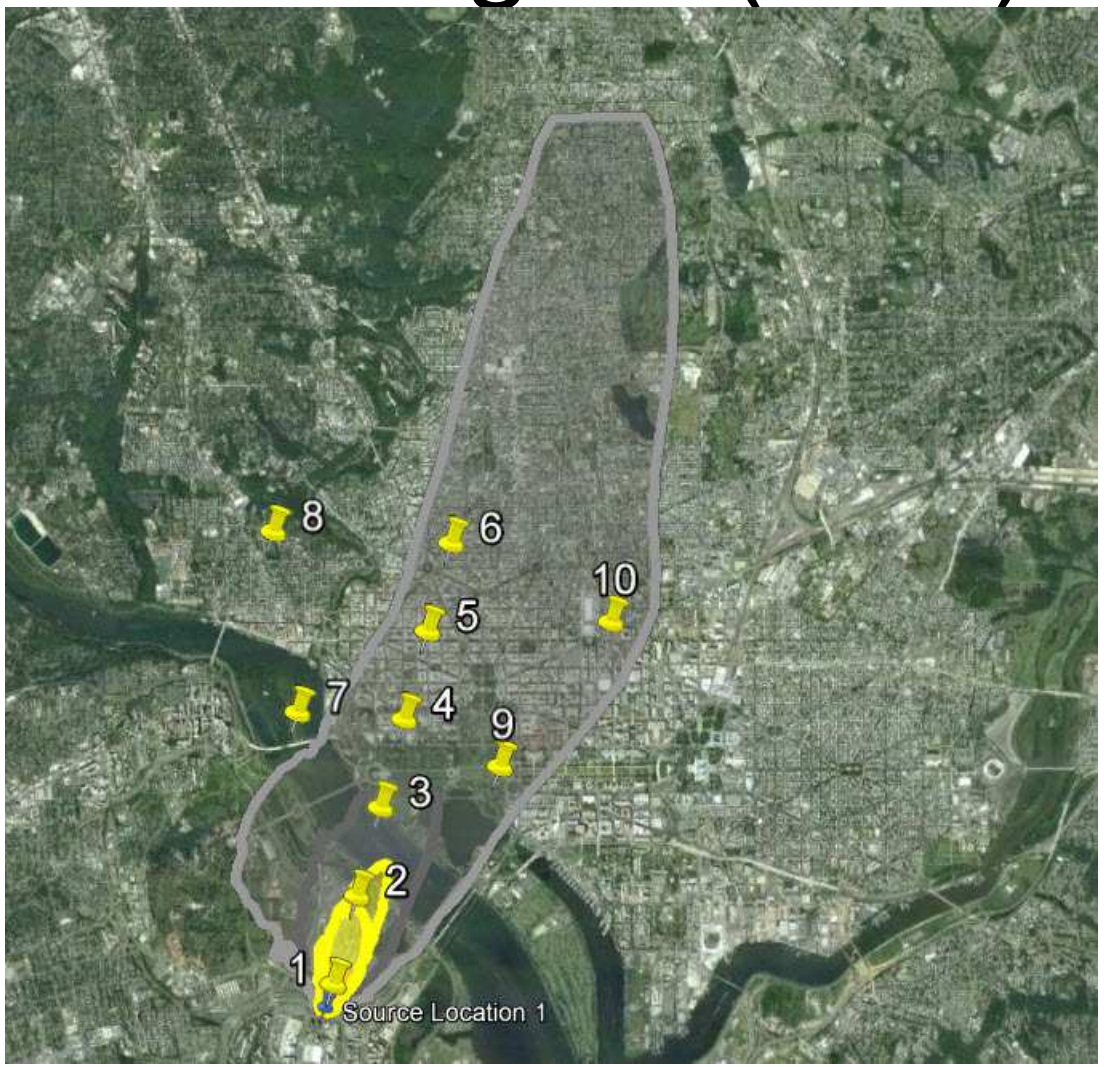
Washington (cont)



10 Point with Wind “Guessed”

Initial “Guess” of wind direction will affect monitoring point selection.

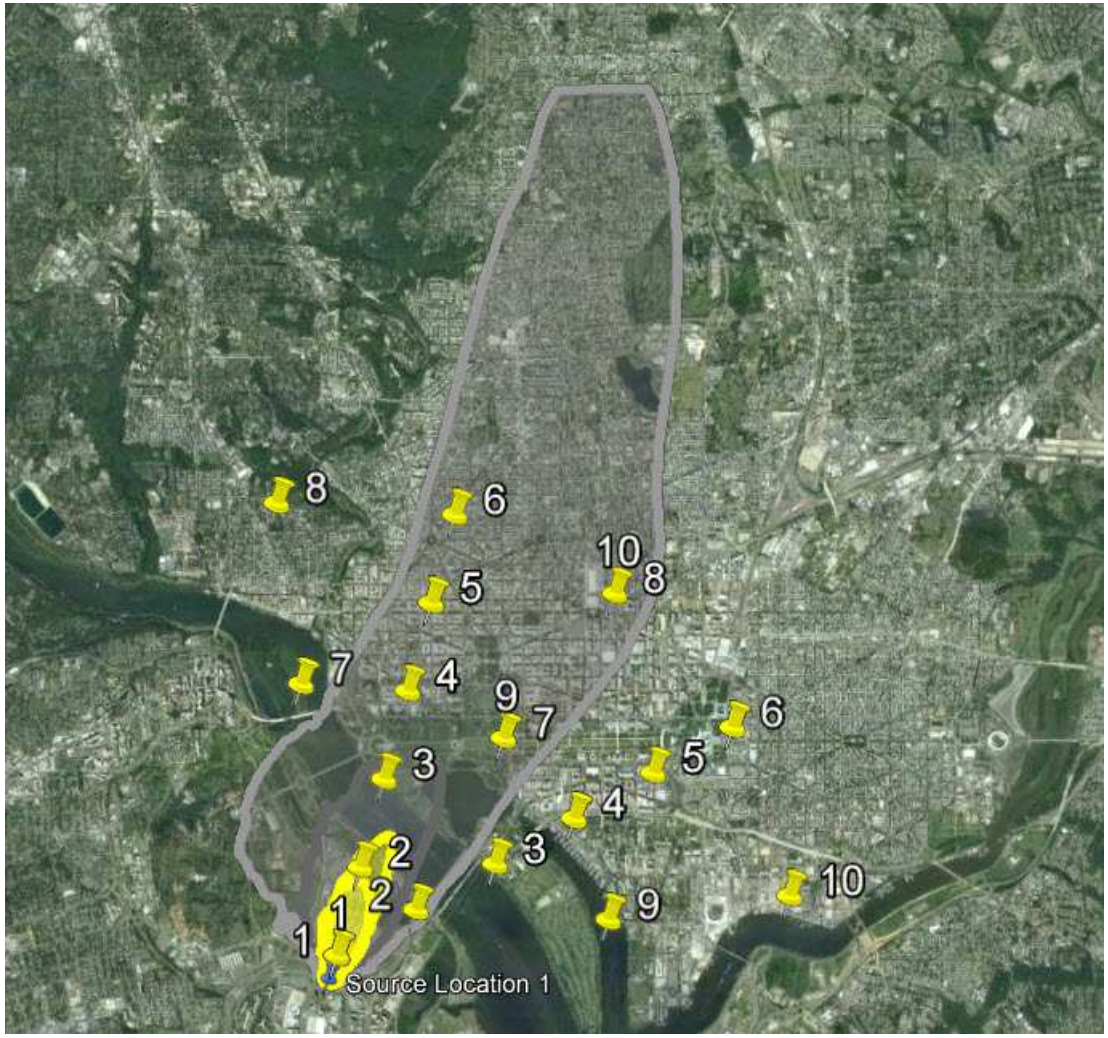
Washington (cont)



If data analysis Indicates, move locations 45 degrees
and monitor new 10 points.

10 Point with Wind “Guessed” and then Points moved 45 degrees

Washington (cont)



10 Point with Wind “Guessed” and then Points moved 45 degrees
(Both templates shown)

Washington (cont)

- Note that most of the points are readily accessible by road.
- Use of those points would quickly verify the initial plume projections and allow the plume projection to be “normalized” to actual readings.

San Francisco

San Francisco (cont)

10 Points Selected

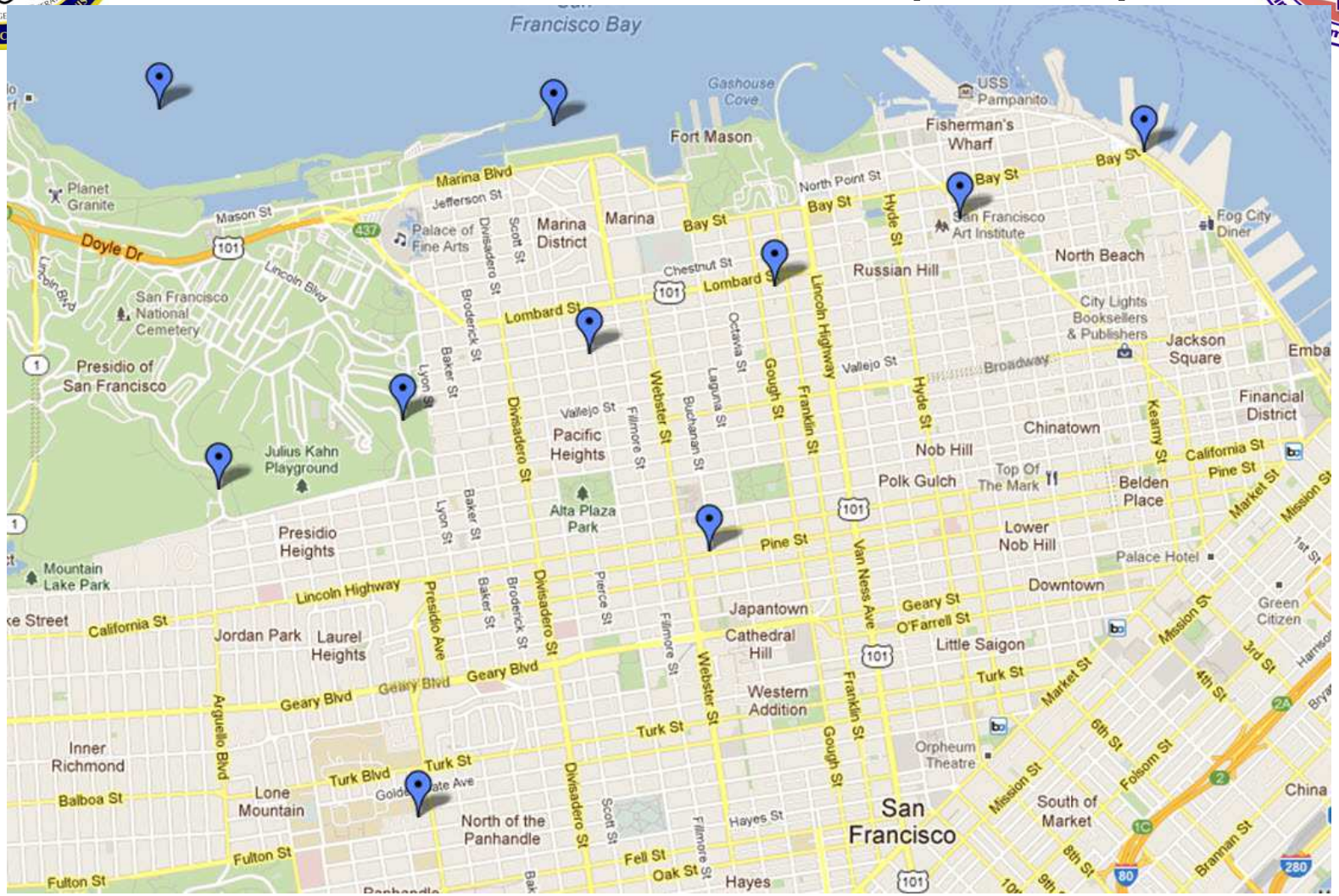
San Francisco (cont)

Plume Deposition

New Orleans (cont)

10 Points Overlay on Plume

San Francisco (cont)



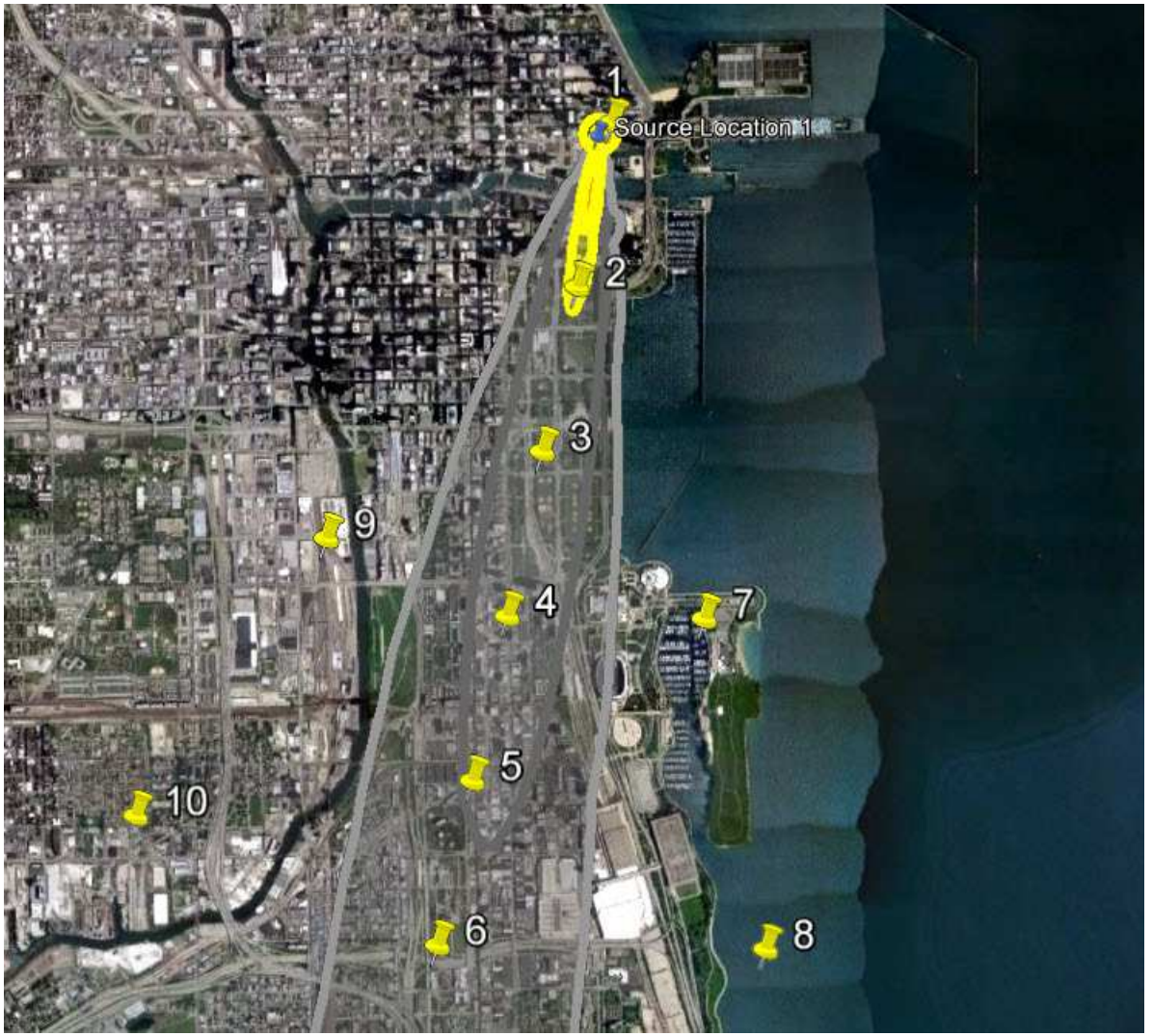
10 Points Overlay on Map

San Francisco (cont)

- Note that most of the points are readily accessible by road. However, some of the locations fall in the water. Those locations could either be skipped or monitored at a nearby location on land
- Use of those 10 points would quickly verify the initial plume projection and allow follow on detailed monitoring to be performed

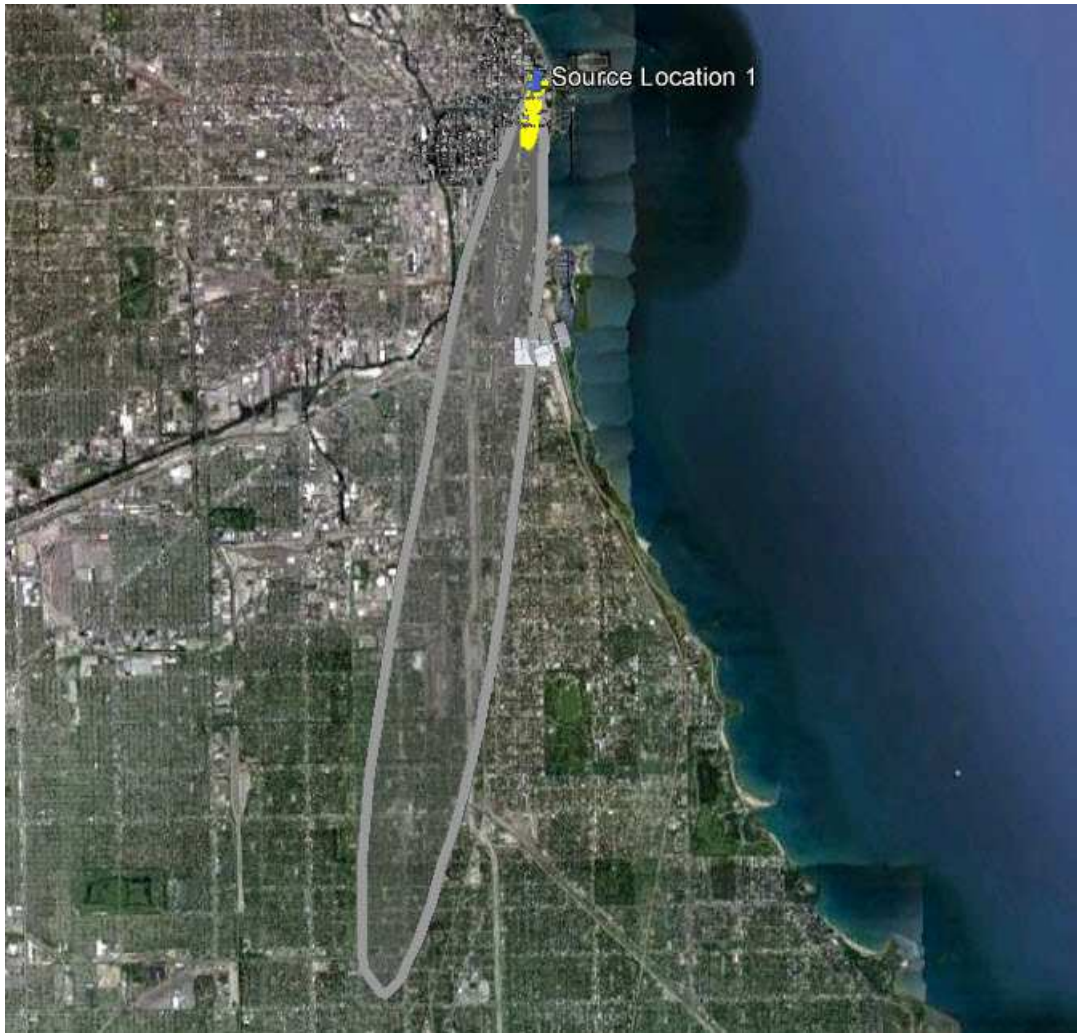
Chicago

Chicago (cont)



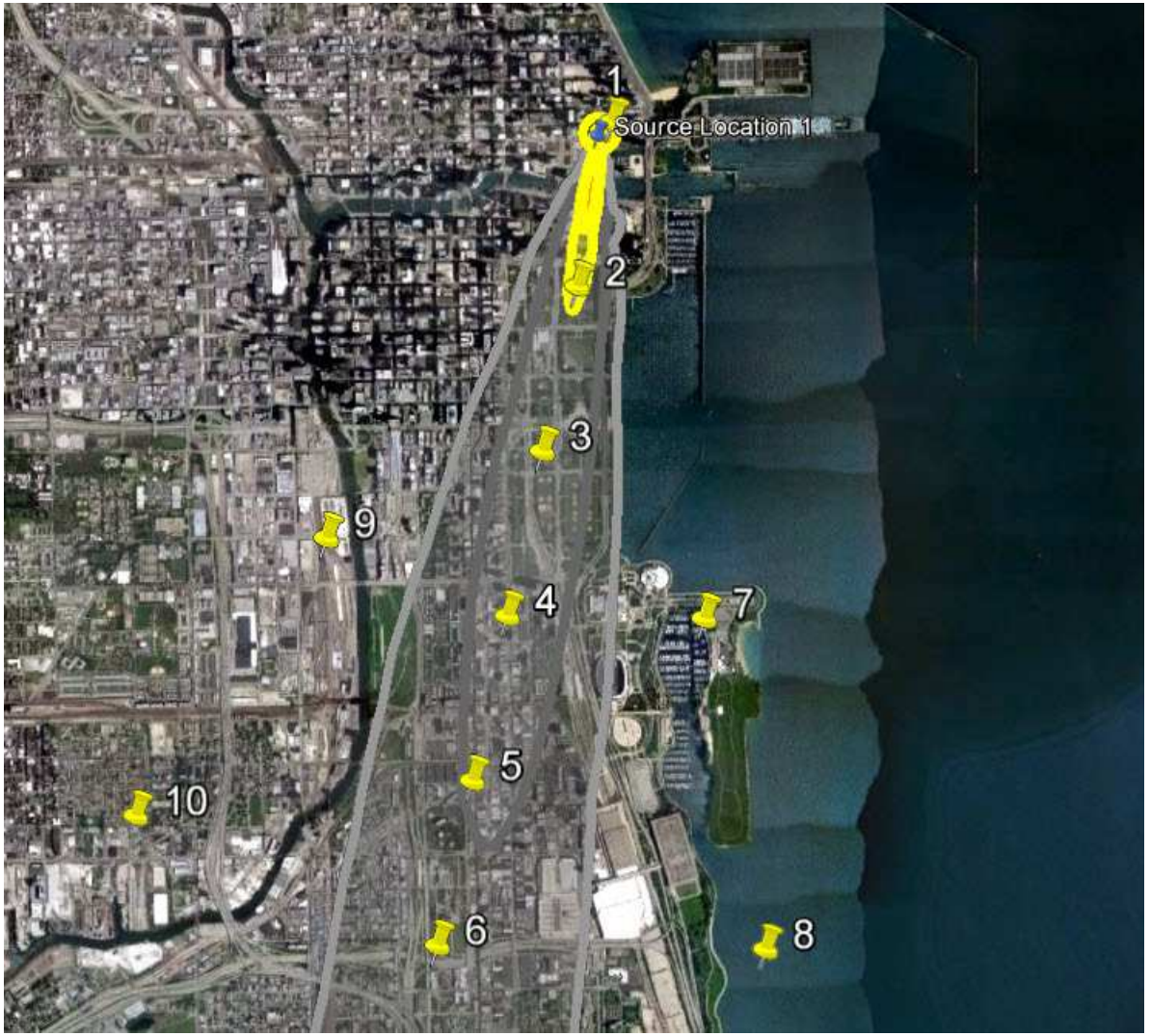
10 Points Selected

Chicago (cont)



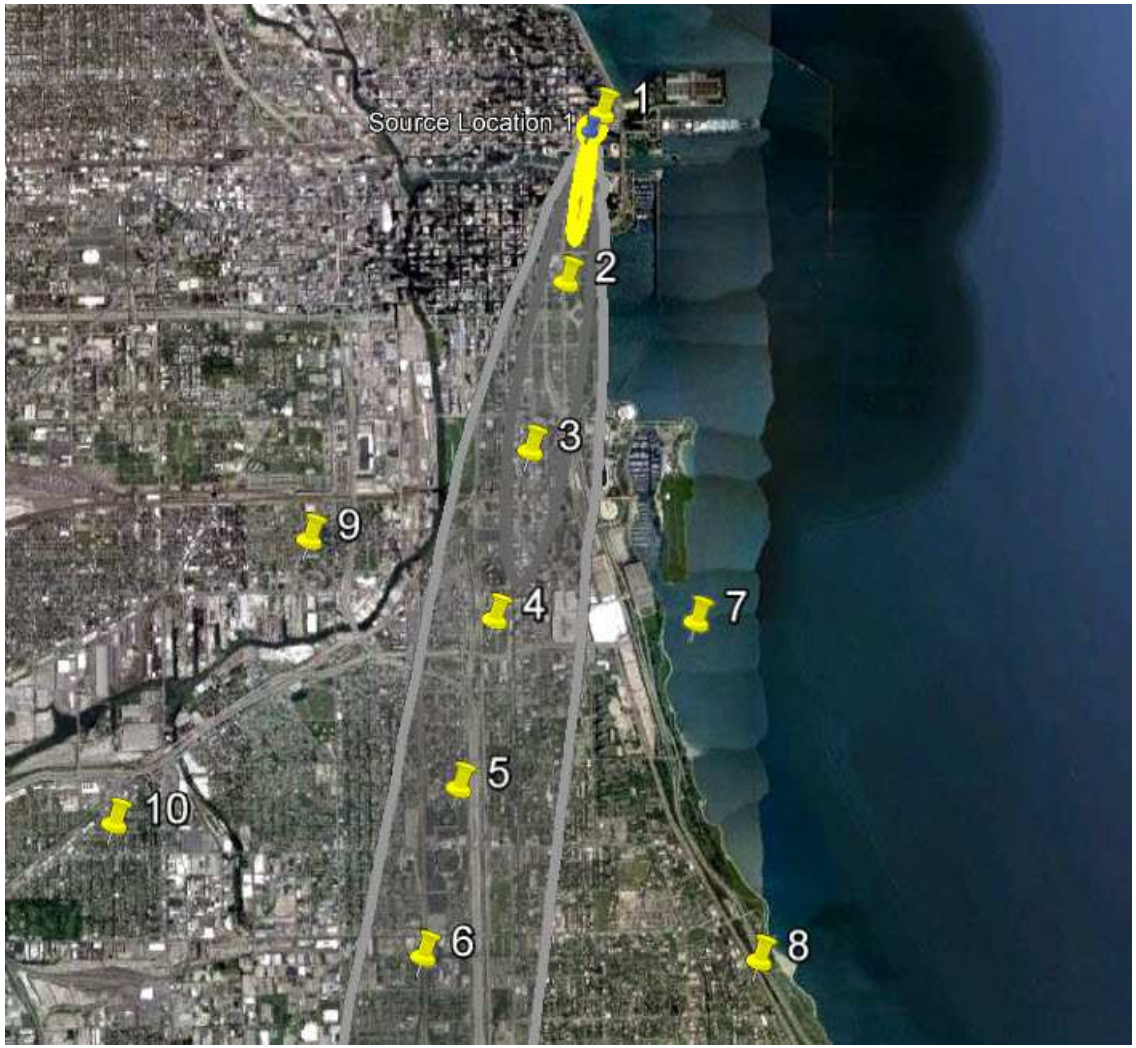
Plume Deposition

Chicago (cont)



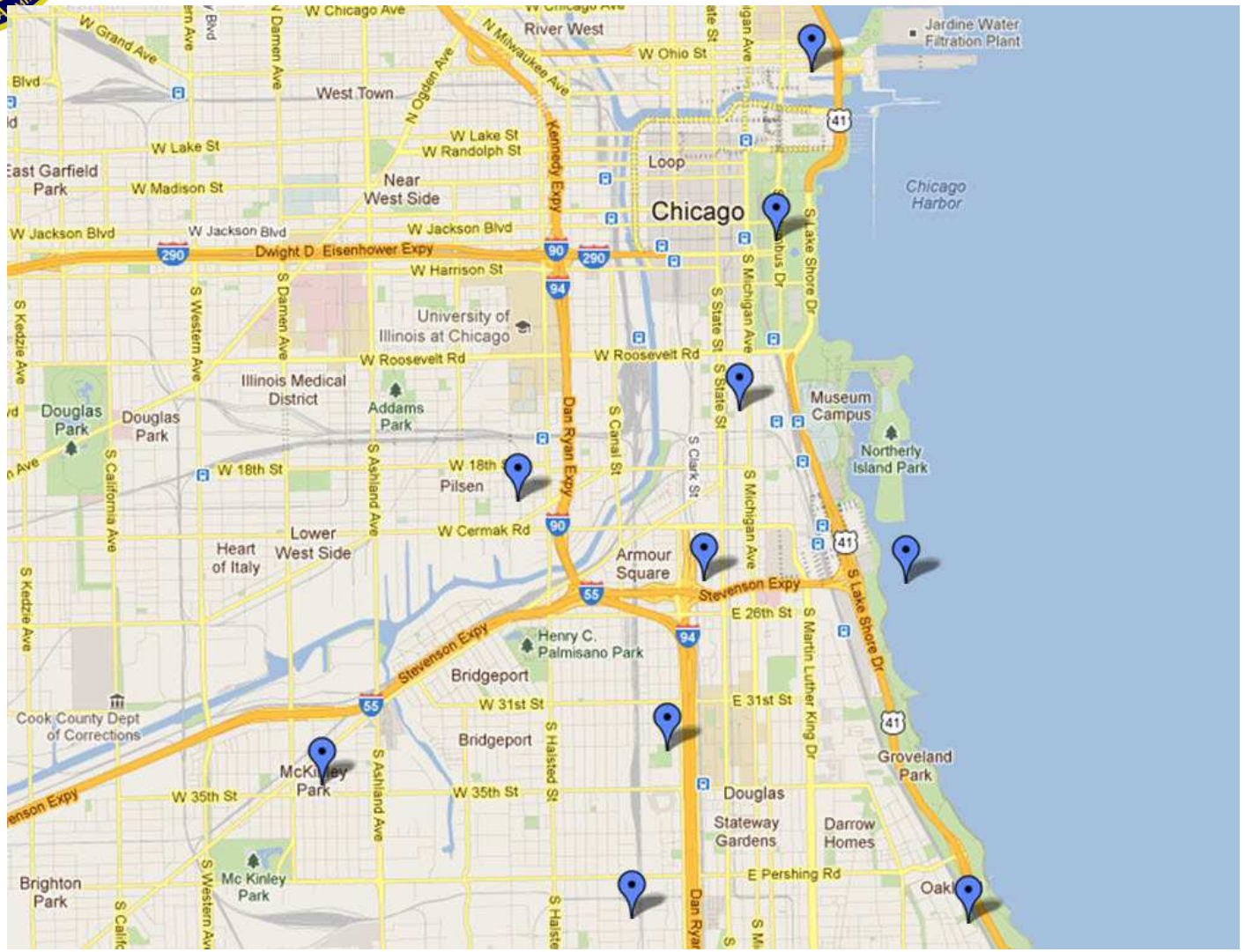
10 Points Overlay on Plume

Chicago (cont)



10 Points Overlay on Plume (Miles instead of kilometers)

Chicago (cont)

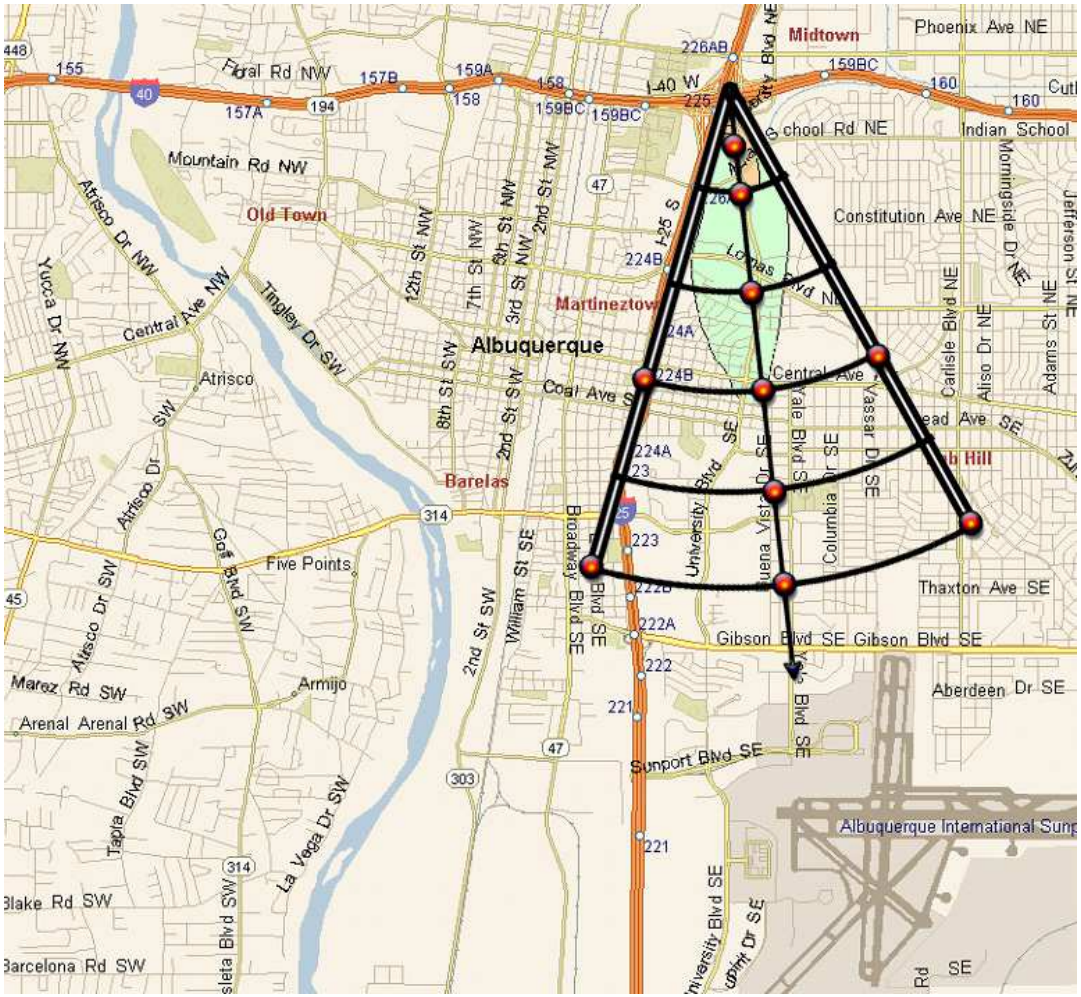


10 Points Overlay on Map

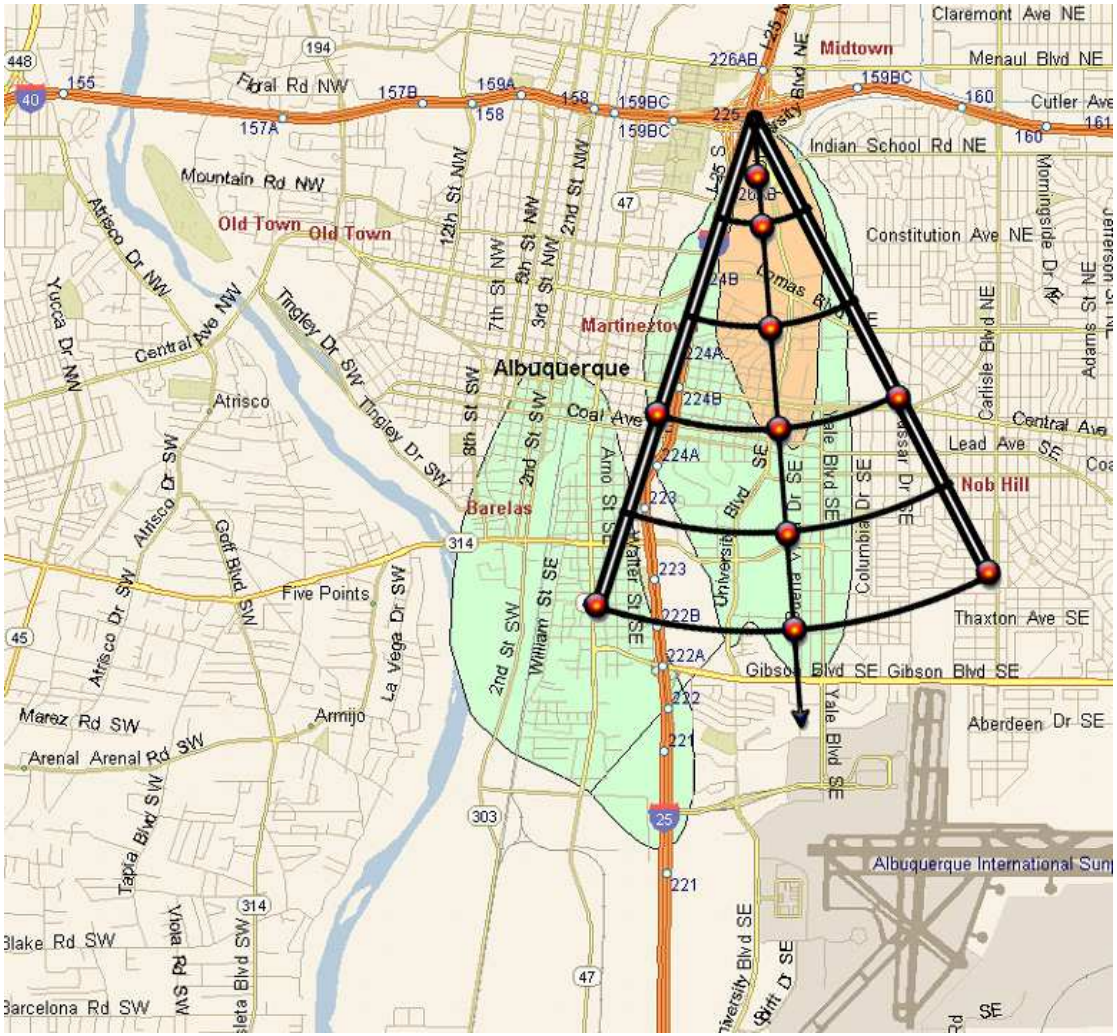
Chicago (cont)

- Note that most of the points are readily accessible by road. However, one of the points is in the water and should be monitored at a nearby location on land
- Use of those 10 points would quickly verify the initial plume projection and allow follow on detailed monitoring to be performed

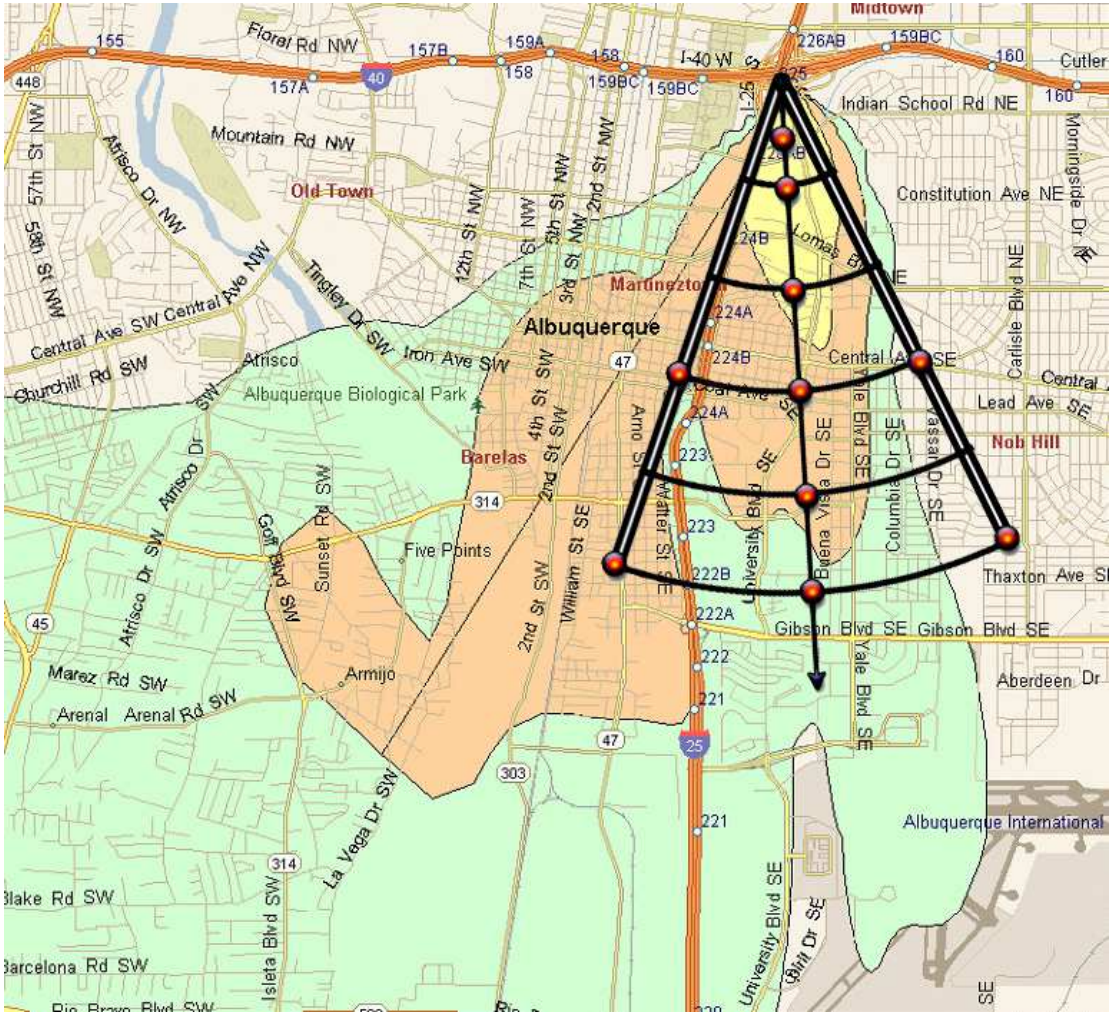
Albuquerque Example
1 lb explosive – Generic Release



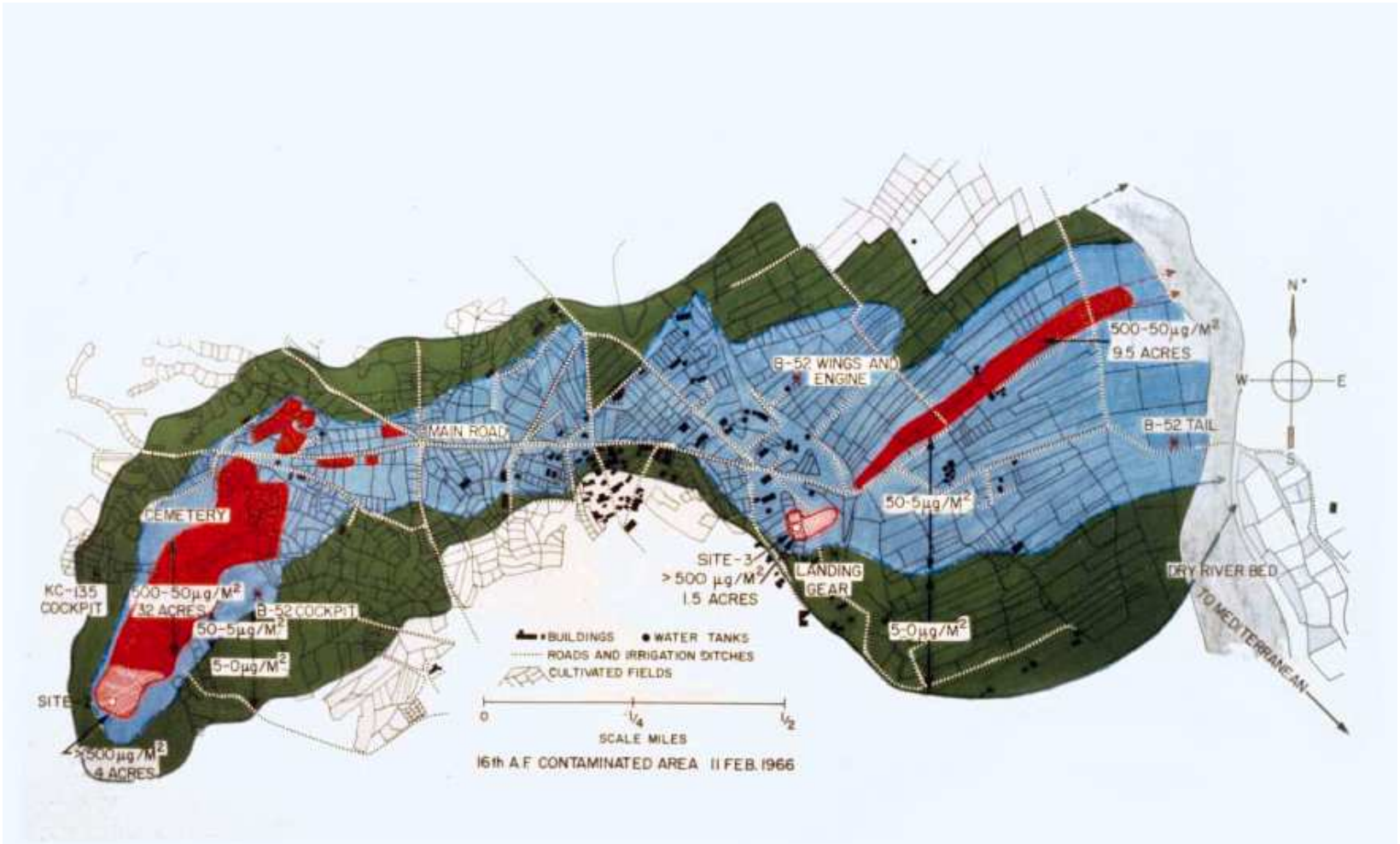
Albuquerque Example
10 lb explosive – Generic Release



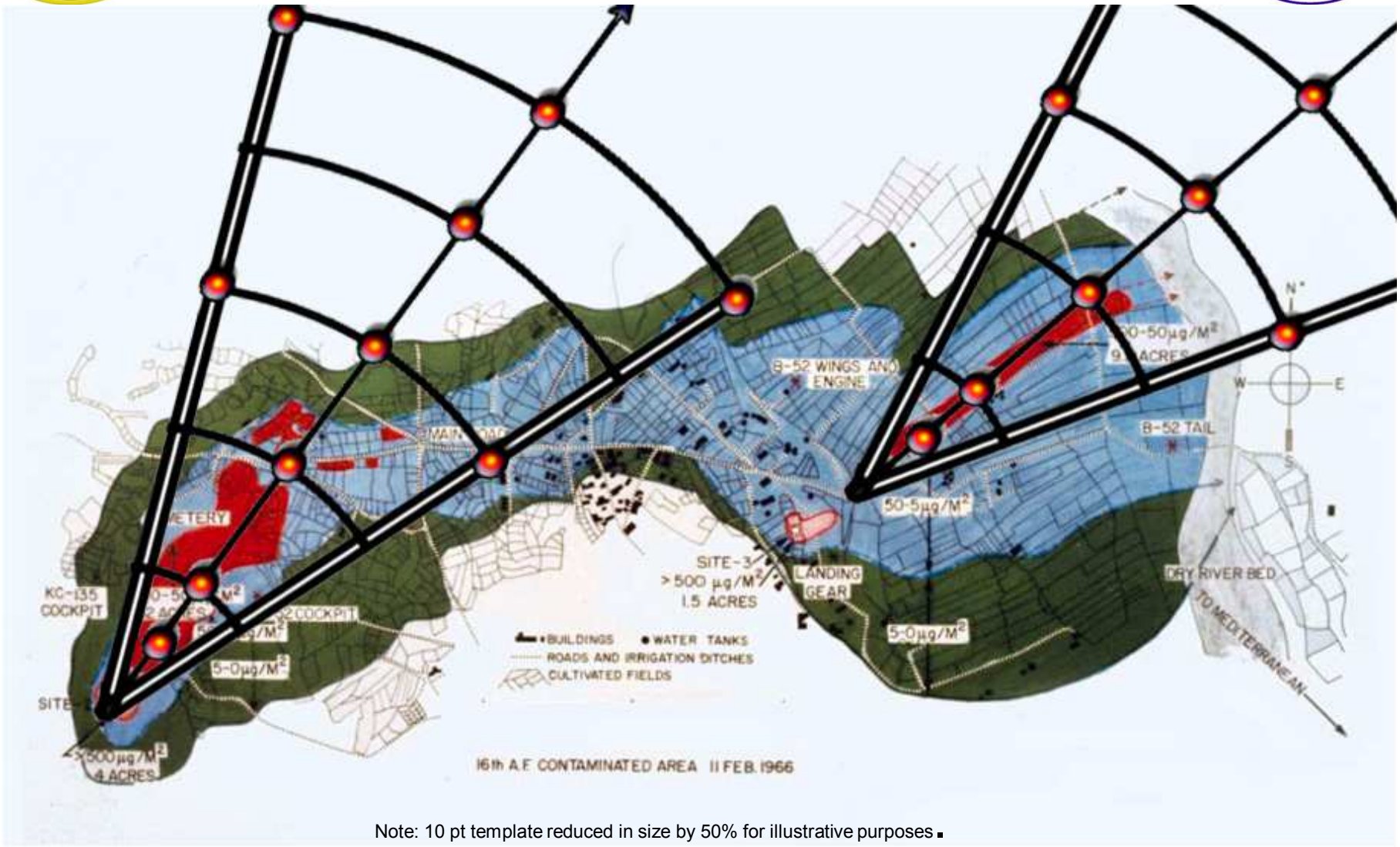
Albuquerque Example
100 lb explosive – Generic Release



Palomares Contamination



Palomares Contamination
10 Point Monitoring on Each Release Point



Note: 10 pt template reduced in size by 50% for illustrative purposes.

Additional Info

- Not all 10 points are “required” for plot normalization. For example part of the template could fall over a lake or river.
- As needed, the points may be modified to fit local conditions.
- Based on the initial 10 point data, the template may be rotated either clockwise or counter clockwise as needed and additional monitoring performed.
- Instrument type used for the monitoring should be appropriate to the type of material released.
- Use of the strategy does not imply that other measurements (such as ensuring the command post is in a safe area) are not needed.
- The 10 point strategy does not affect the need for a long term monitoring and sampling strategy!

Summary

- Development of a Standardized Initial Monitoring Strategy across all U.S. response assets could result in enhanced early assessment of the impact of incident and result in improved response.
- Development of standard strategy will require interagency cooperation.
- Training for first responders could easily be included along with other radiological training.

Questions?