



# GPS-COUPLED GAMMA (GPS/GAMMA) SURVEY SYSTEM: DON'T LEAVE HOME[LAND] SECURITY WITHOUT IT!

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Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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The potential for public hysteria following the dispersal of radioactive contamination by terrorists, either by explosion of a "dirty bomb" or a nuclear device is considerable. In today's "sound byte" and instant-information world, the public demands immediate information concerning the threat posed by any terrorist action. The use of a GPS/gamma system will enable prompt, precise determination of the nature and extent of radioactive contamination, which can immediately be used to inform the public. To this end, all emergency responder kits should include GPS/gamma survey equipment, and key emergency responders should be trained in its use.

# **NCRP #138, “Management of Terrorist Events Involving Radioactive Material” Describes the Potential Scope of Responses Needed**

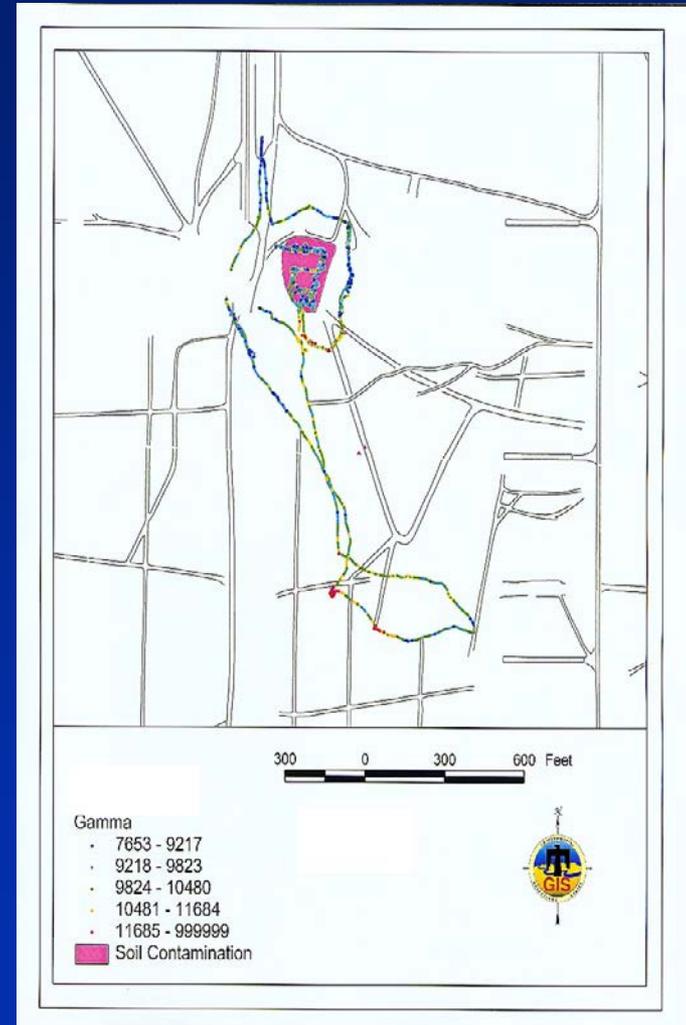
- **GPS/Gamma Equipment its Output Should be Available in all Emergency Response Kits**
- **GPS/Gamma Equipment is Only Part of the Consequence Evaluation “Toolkit”**

# **GPS/Gamma Survey Instruments Can Be Used in Many Ways:**

- Aircraft**
- Unmanned Drones**
- Robotics**
- Automobile**
- ATV**
- Backpack/Handheld**

# QUICK Determination of the Extent of Contamination is ESSENTIAL

- The first pass should be **QUALITATIVE**,
- Follow-up **QUANTITATIVE**, as appropriate

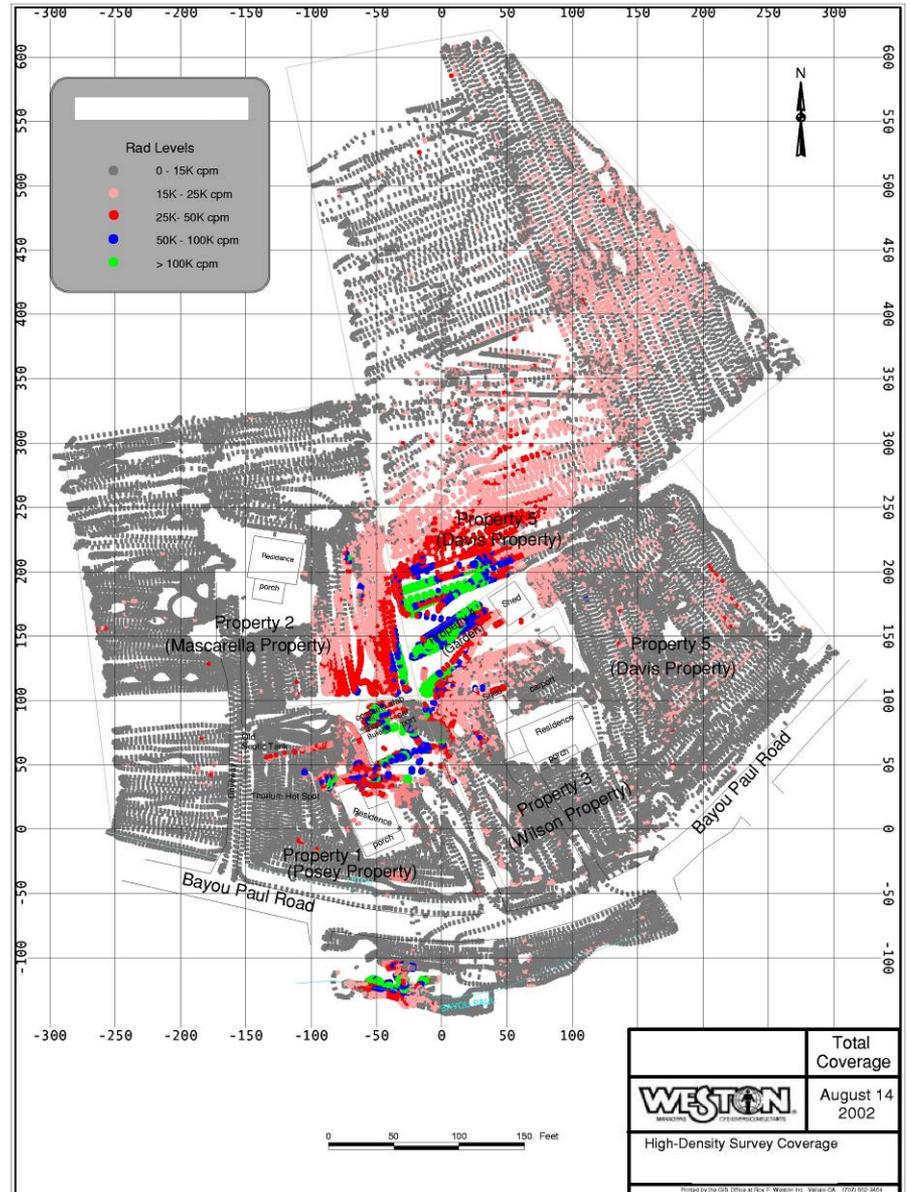


# More accurate Determination can be Performed Later, as Needed

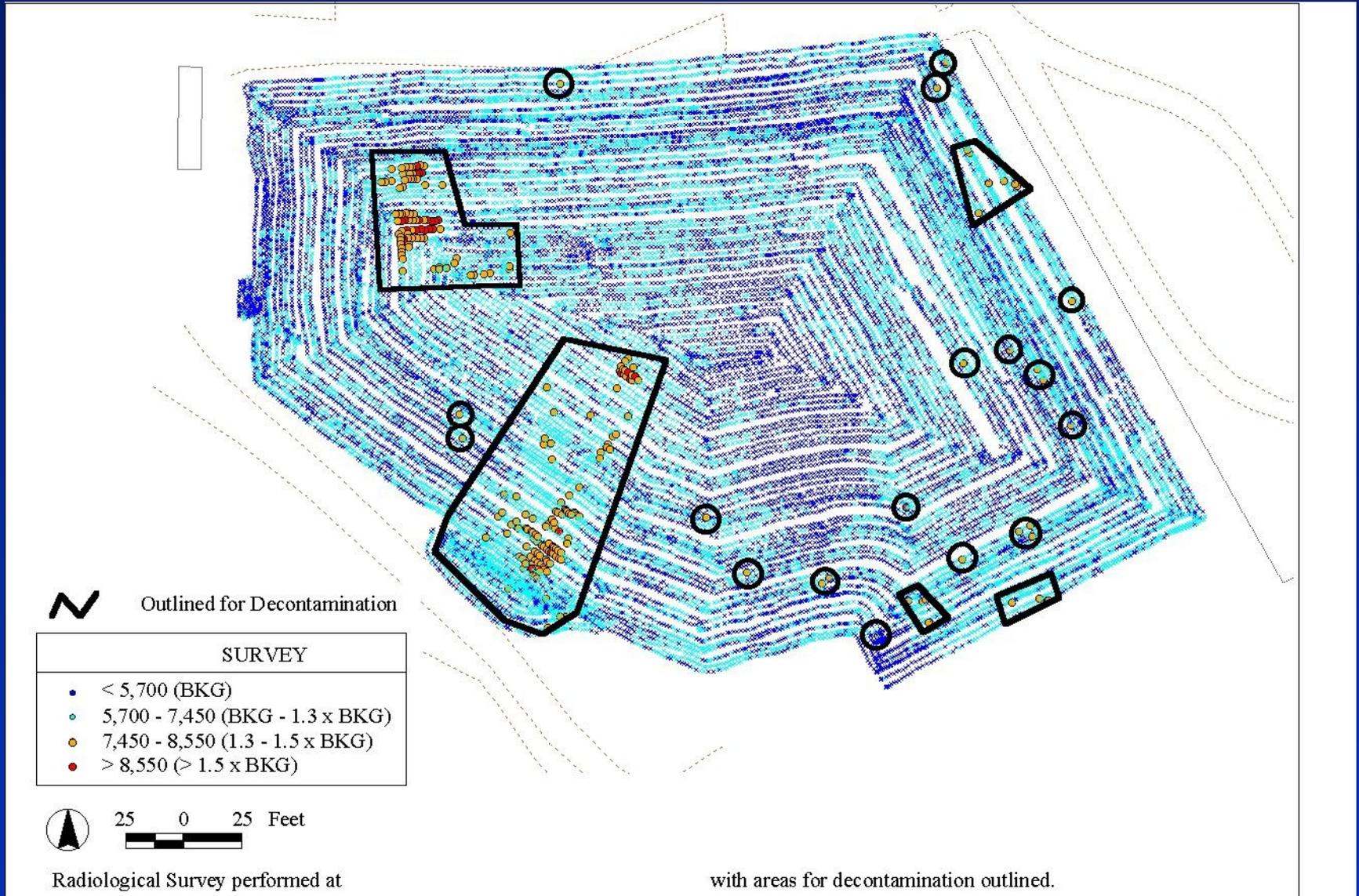
- **Specific areas of interest can be surveyed and logged effectively, efficiently and QUICKLY !**



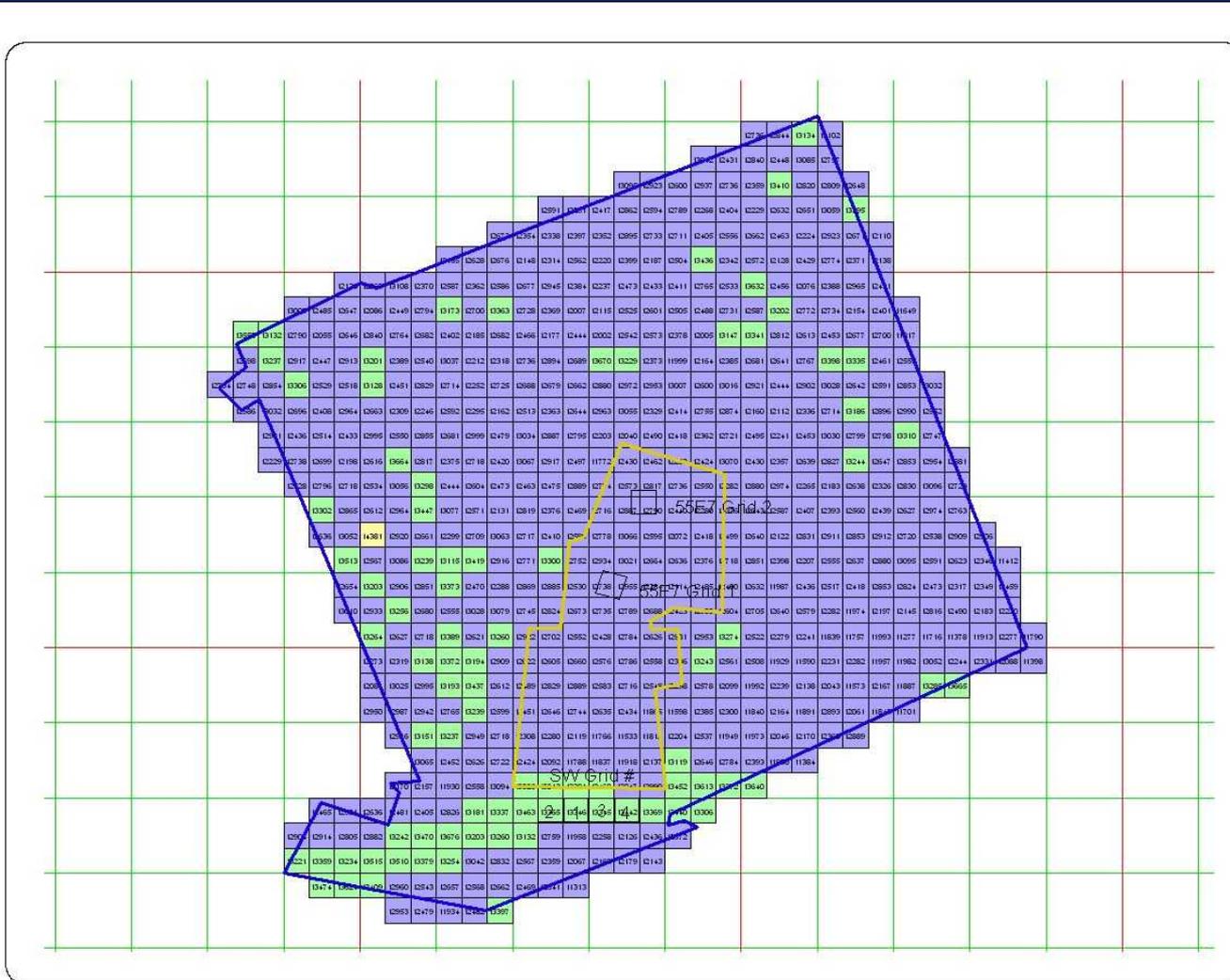
# Sample Survey



# Sample Survey



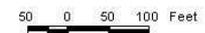
# Sample Survey



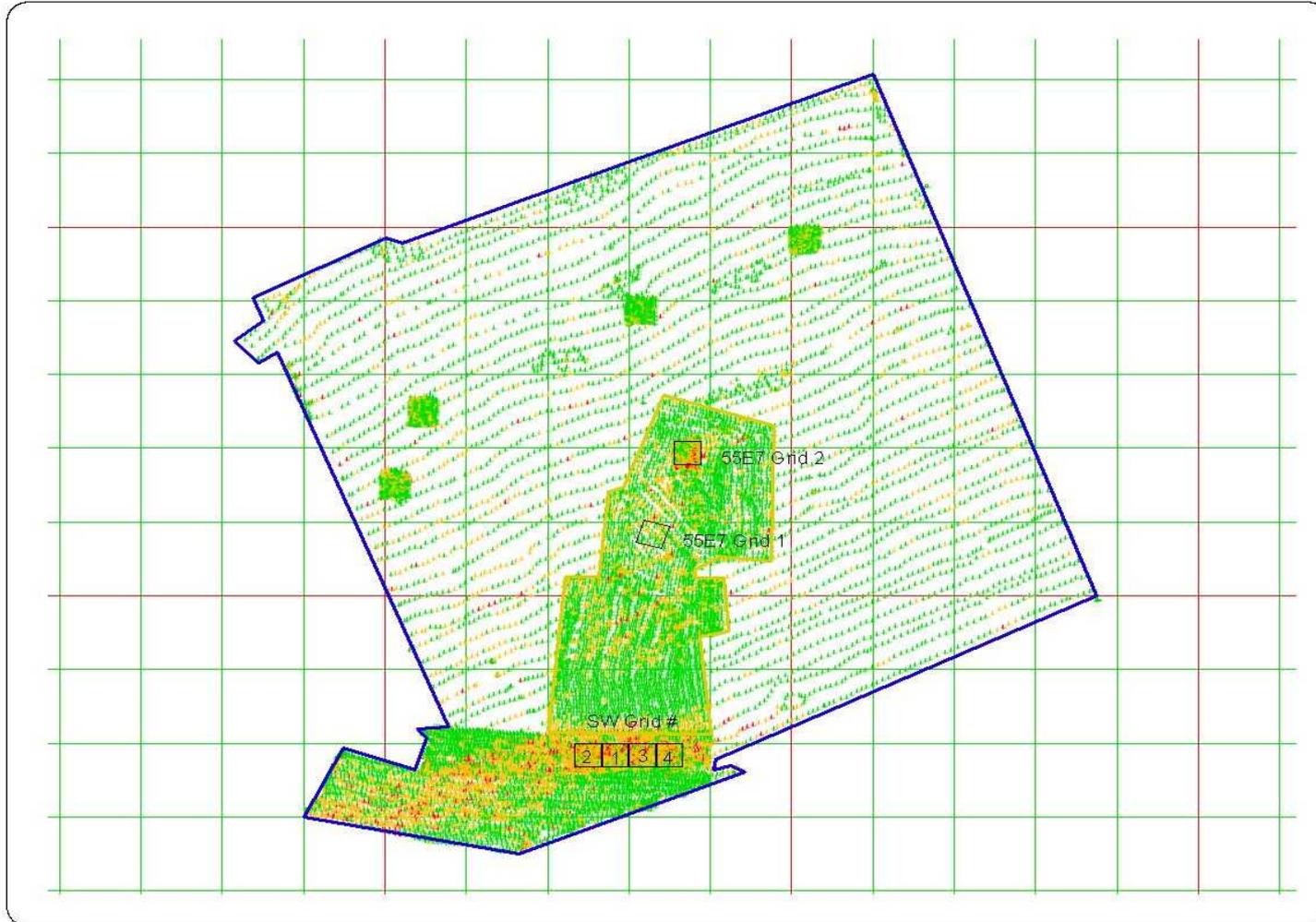
-  55E7-SA Boundary
-  Survey Boundary
-  500' Grid
-  100' Grid
-  33' Grid

33' Grid Block Averages	
	> BKG + 3 Std. Dev. (14,134 CPM)
	13,112 - 14,134 CPM
	< BKG + 1 Std. Dev. (13,112 CPM)

Gamma Survey  
 Surveyed 5/26-27/98 & 7/31/98



# Sample Survey



-  55E7-SA Boundary
-  Survey Boundary
-  500' Grid
-  100' Grid
-  33' Grid

Gamma Survey Readings	
	> BKG + 3 Std. Dev. (14,134 CPM)
	13,112 - 14,134 CPM
	< BKG + 1 Std. Dev. (13,112 CPM)

Red Tower Gamma Survey  
 Surveyed 5/26-27/98 & 7/31/98



# Use “”Screening Instruments” Initially

- **MicroR meters with Handheld GPS units**
- **2 X 2 NaI with Differential GPS**
- **GIS Display Software on Laptops**
- **Live-time Data Feed to Control Point**
- **Ready for the 6 PM Edition of the News!**

# **Iterative Approach May Be Best**

- **Make preliminary assessment first**
- **Make progressively more accurate assessments as needed**
- **Immediate in-situ readings, later supplemented by laboratory samples**

# Coastal Radiation Cleanup

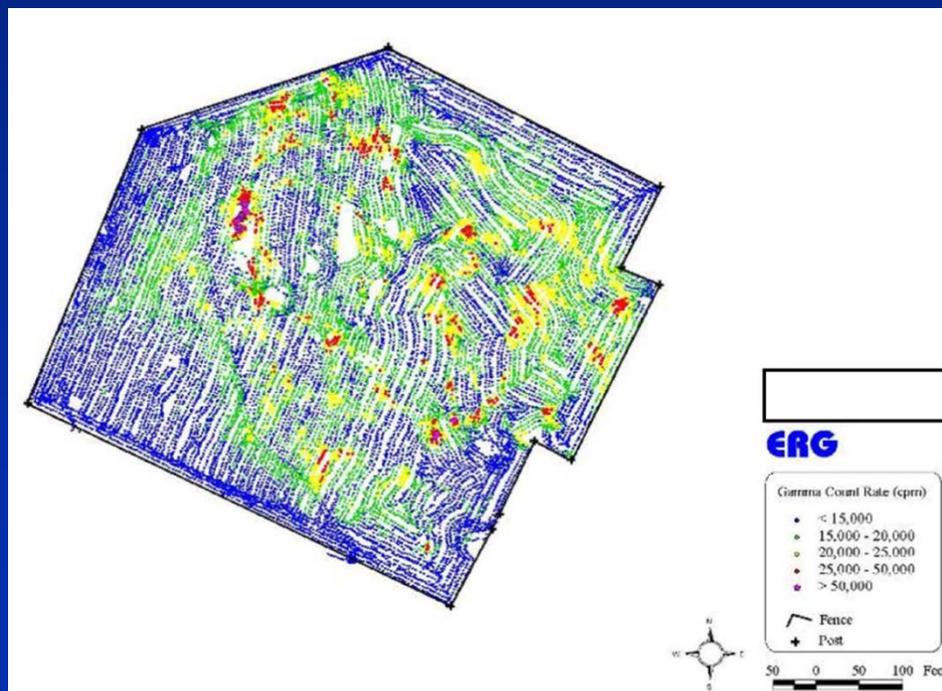
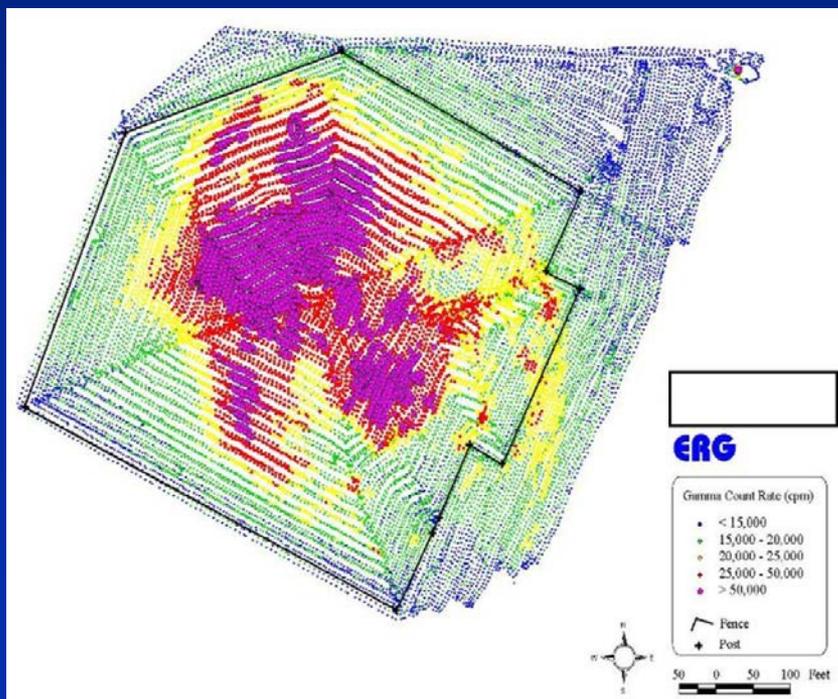
Baton Rouge, LA



# Another example...

Before Cleanup

After Cleanup



# Contractual Arrangements Considerations

- **The Capital Cost of the Equipment is Considerable** (NYC purchased ~500 radiation detectors, 9/2007 @ \$1500 (\$0.75M)– no GPS though)
- **Evolving Technology Quickly Makes “New” Equipment Obsolete**
- **Inactive Equipment in Emergency Response Kits May Not Work When Needed**

# **Contractual Arrangements Considerations (cont'd)**

- **Complex Workings of Component Equipment Requires Experienced Practitioners**
- **“Retainer Contracts” Will Ensure Readiness**
- **The Contracts Must Require First Priority for Response**
- **Contracts With Active Practitioners Will Ensure Field Readiness**

# Conclusions

- **GPS/Gamma Surveys Are the Most Comprehensive and Cost-Effective to Quickly Determine the Extent of Contamination (if gamma emitters are present).**
- **The Appropriate Survey Method and Instrumentation Depends on the Radionuclide(s) Present. Any or all of the Methods Should be Considered for any Given Site, as Appropriate**

# Conclusions (cont'd)

- **Hand-held in-situ gamma spec should be included for field identification**
- **DU, Co-60, Cs-137, I-131, Tc-99m, Tl-201, Nuclear Detonations, Other**
- **Contracted Organizations May Be Better Suited to Perform GPS/Gamma Surveys**
- **Quick Presentation of information to Public is CRITICAL to Psychosocial Impact Management**