SAND2011-4983C

Overview of the Interagency Biological Restoration Demonstration (IBRD) Project

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Sandia National Laboratories

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.

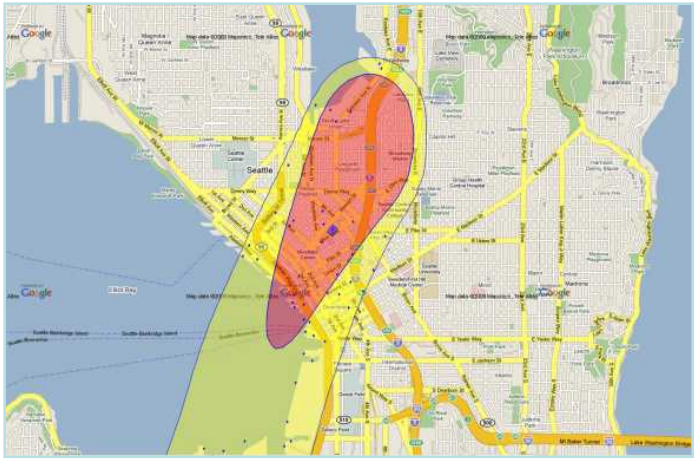
National response to the 2001 anthrax incidents was costly and time consuming

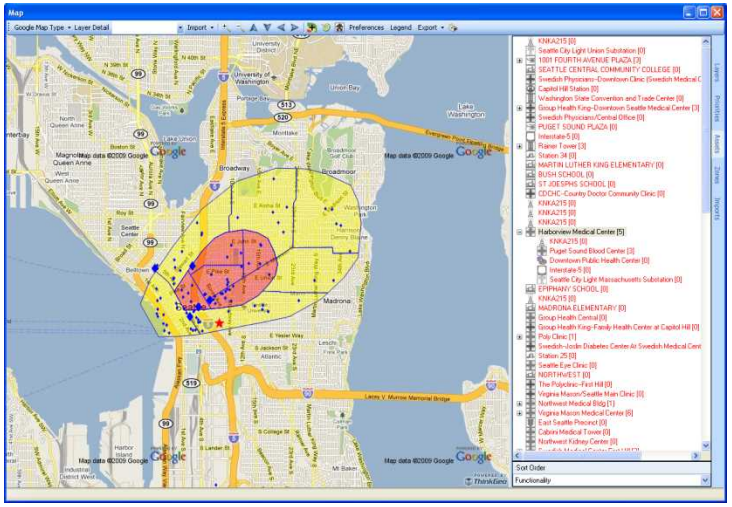
- Postal facilities, Senate buildings, and news organizations were contaminated
- Very little experience decontaminating large indoor facilities
- CDC reports that over 125,000 samples were tested at LRN laboratories costing $25-30M
- Many facilities were closed for years and restored at great cost
  - Capitol Hill (4 mo, $42M)
  - Brentwood (26 mo, $130M)
  - US Postal Facilities (3+ yr, $800M)

Sandia has worked to improve the facility remediation process since 2002

Recovery from a wide area biothreat agent release will be orders of magnitude more complex

National Planning Scenario 2 deals with one or more aerosol releases of anthrax in one or more large metropolitan areas. There may be 10's of thousands of people affected, thousands of buildings impacted, 10's of square kilometers contaminated, and billions of dollars in economic consequences.





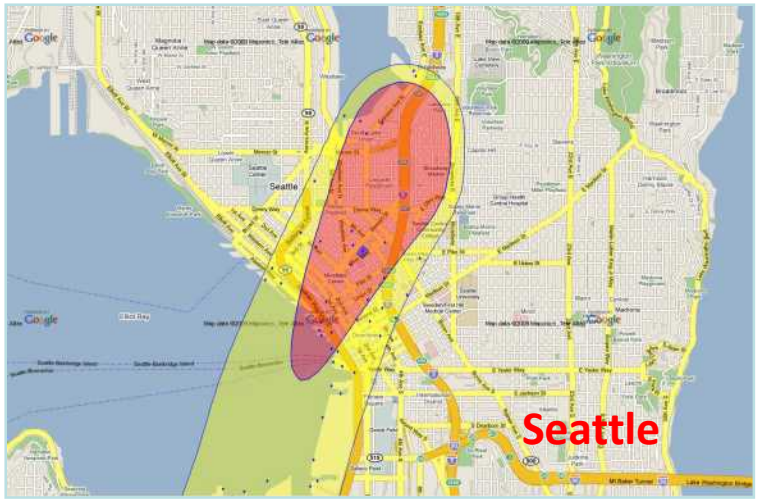
Remediation and recovery will be a significant challenge.

The IBRD project was initiated to address this scenario

IBRD Objectives/Performers

IBRD project objectives:

- Develop comprehensive guidance for restoration and recovery following a National Planning Scenario 2 attack, considering civilian/military cooperation
- Evaluate the technology gaps that exist today
- Develop technology, where appropriate, to fill these gaps, with an emphasis on saving time and money in the restoration process
- Exercise/demonstrate the remediation process



IBRD Program Managers:

- Chris Russell, DHS-S&T
- Ryan Madden, DoD-DTRA

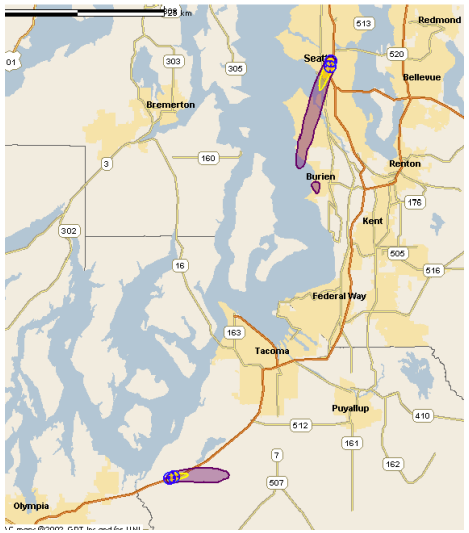
National Laboratory Participants:

- Sandia National Laboratories
- Lawrence Livermore National Laboratory
- Pacific Northwest National Laboratory
- Los Alamos National Laboratory

Project funded by the Department of Homeland Security - Science & Technology Directorate and the Department of Defense - Defense Threat Reduction Agency

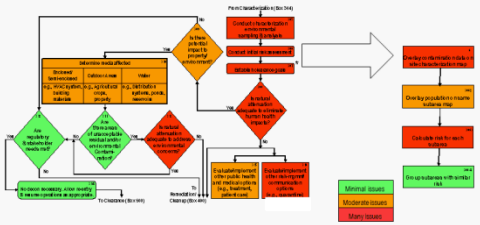
Sandia contributed to the four focus areas of IBRD

- Systems Study
  - Comprehensive systems study to identify policy, data, technology, and capability gaps
  - Prioritization of gaps to guide IBRD investment
- Consequence Management Planning
  - Comprehensive guidance document (in collaboration with locals)
  - Analysis and simulation tools for detailed planning and analysis
- Technology Development
  - Decision support tool development
  - Agent fate studies
  - Owner performed decon protocol development
  - Sample collection efficiency studies
- Workshops/Exercises
  - Participation in numerous workshops/exercises
  - SIMEX



Systems study methodology

Qualitative Analysis

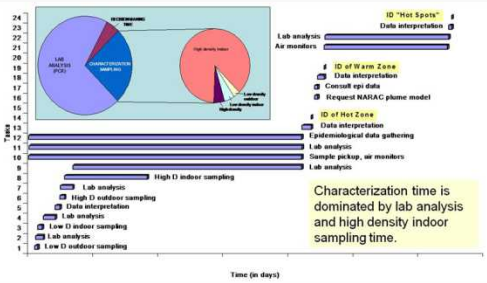


Interagency Bio Decision Framework was expanded and color-coded to help analyze problem

Actions and Decisions from expanded decision framework were analyzed to identify and prioritize gaps

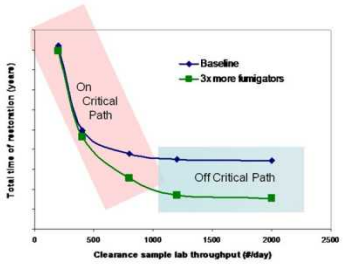
No.	Action	Decision	Who is involved	What tools used	Information required
100			CB, emergency management cooperators, EPA/T		
101					
102			CB, emergency management cooperators		
200			EPA		
201			CB, emergency management cooperators, HAZMAT, local EPA		
202			CB, emergency management cooperators, HAZMAT		
203					
204					
205					
206					
207					

Quantitative Analysis



The AWARE tool was run to quantify and prioritize gaps

Example results from the gap prioritization quantitative analysis: (calculated using Analyzer for Wide Area Restoration Effectiveness (AWARE) Tool):



Policy, data, technology and capability gaps were identified through a qualitative and quantitative analysis process

High priority technical gaps were identified through the systems study

(not in order of priority; represents a subset of a longer list of gaps)

Area	Technical gap
Health risk	1. Data to inform acceptable risk levels
Agent fate and transport	2. Understanding of natural attenuation of spores 3. Understanding of spore re-aerosolization and tracking
Characterization	4. Strategy for setting hot zone boundaries 5. Throughput for sample analysis
Indoor decontamination	6. Throughput for indoor decon 7. Guidance and policy on self-decon
Outdoor decontamination	8. Validated methods for outdoor decon
Clearance	9. Risk-based clearance policies suitable for wide area 10. Clearance strategies suitable for wide area
Prioritization	11. Methodology for prioritizing critical infrastructure for restoration
Solid waste disposal	12. Methods and policy for treating, transporting and disposing of contaminated solid waste
Planning	13. Planning tools for wide area restoration 14. Community resiliency planning

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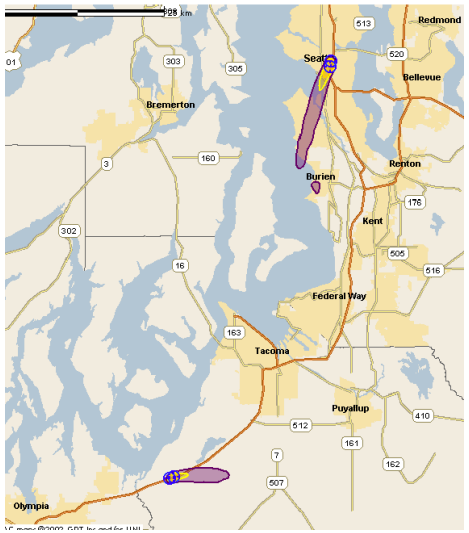
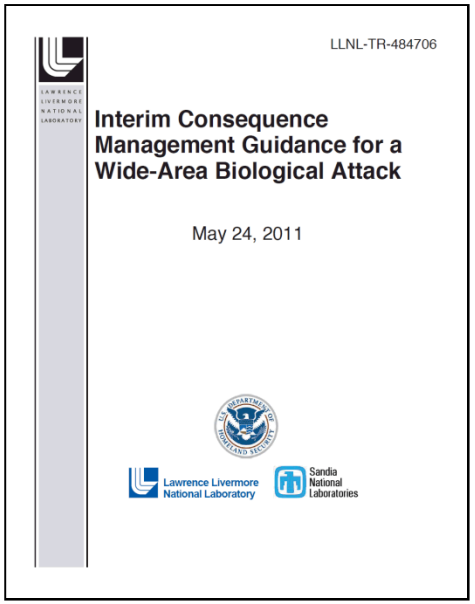


A method is needed to effectively plan for remediation incidents

What?


LLNL-TR-484706

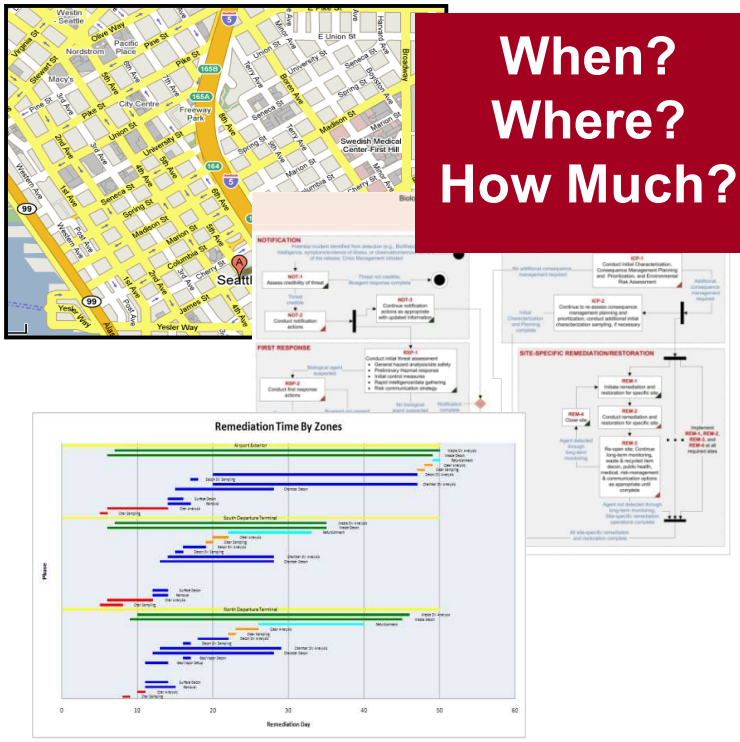
Interim Consequence Management Guidance for a Wide-Area Biological Attack

May 24, 2011

Lawrence Livermore National Laboratory

Sandia National Laboratories

When? Where? How Much?

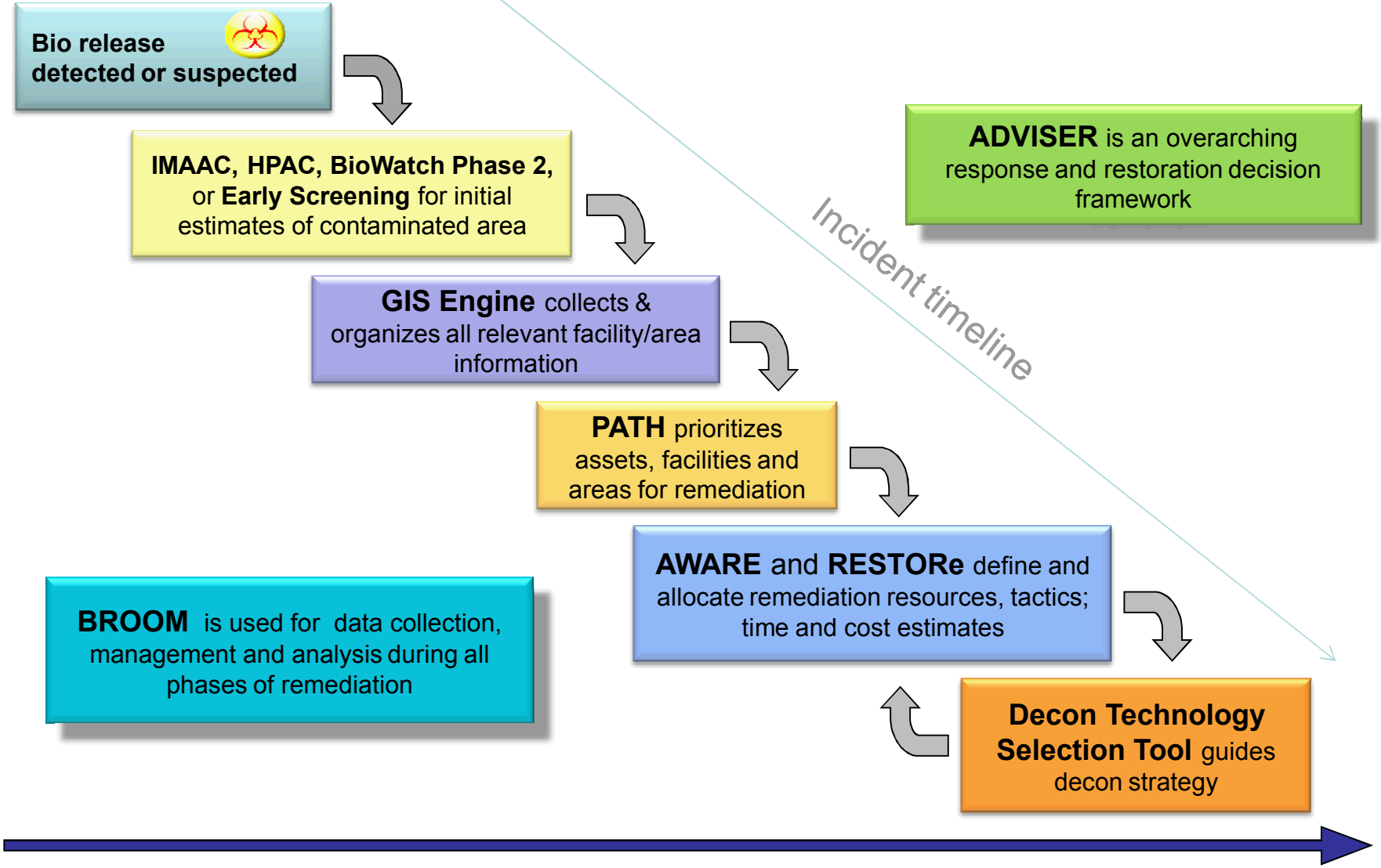


Guidance documents provide general information to plan remediation incidents

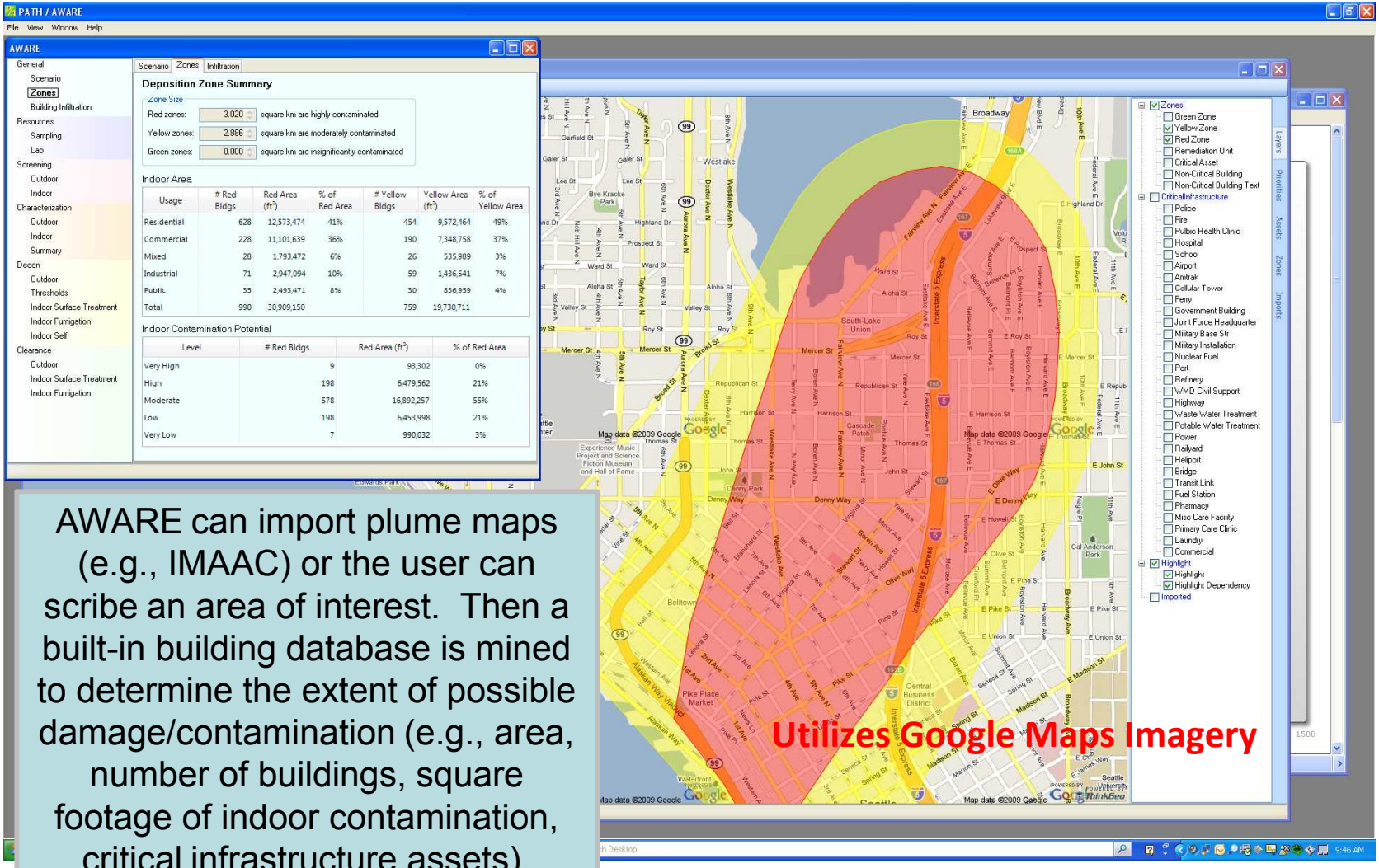
Decision support systems and/or simulation tools can be used for detailed planning for remediation incidents

Recovery planning will involve complex technical issues as well as traditional project management issues

A suite of decision support tools were developed to aid in restoration/recovery planning and analysis



PATH and AWARE enable detailed planning and analysis of the complex wide area recovery process



AWARE can import plume maps (e.g., IMAAC) or the user can scribe an area of interest. Then a built-in building database is mined to determine the extent of possible damage/contamination (e.g., area, number of buildings, square footage of indoor contamination, critical infrastructure assets).

PATH/AWARE output enables better decision-making

PATH / AWARE - [PATH (Beta-Release -- Not for public distribution)]

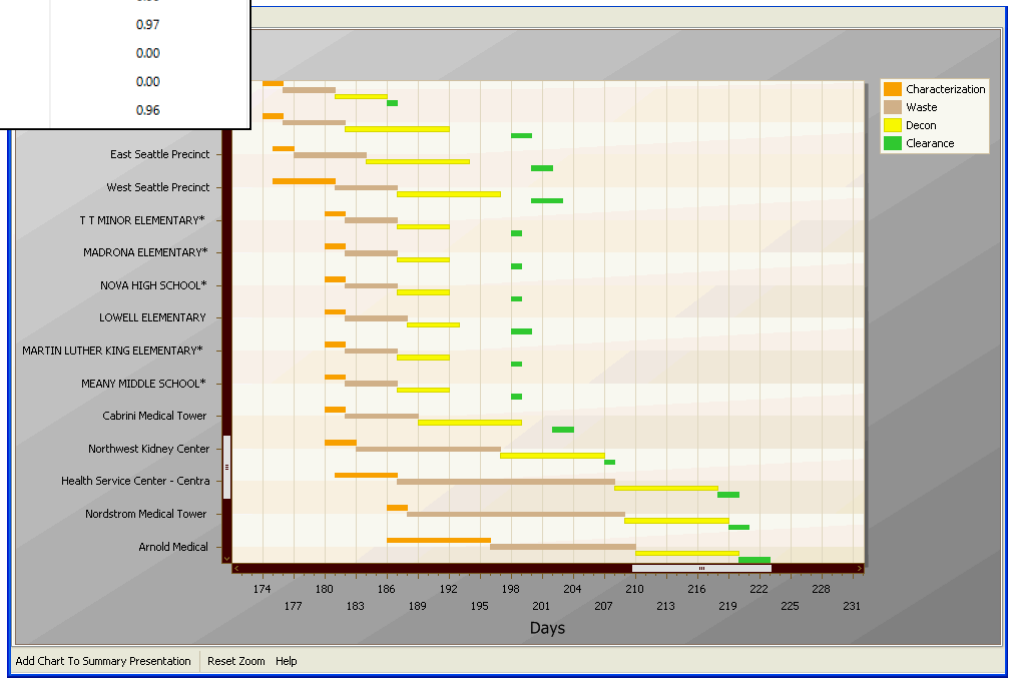
File View Window Help

Prioritization Objectives | Critical Infrastructure Asset List | Prioritization Objective Asset Contribution | Asset Prioritization | Asset Dependency Viewer

Drag a column

Pri	Name	Category	SpecialI...	Overall...	Maintain Economy	Mini...	Maintain Public Safety	Maintain Public Health
1	Interstate B	Highways	EA	0.13	0.97	0.00	0.00	0.00
2	Blood Bank A	Hospital	EA	0.13	0.86	0.00	0.00	0.00
3	Hospital D	Hospital		0.13	0.00	0.00	0.00	0.99
4	Military asset	CellularTowers		0.14	0.96	0.00	0.97	0.00
5	Hospital B	Hospital		0.08	0.92	0.00	0.00	0.98
6	Fire Station 12 (EOC)	Fire		0.07	0.00	0.00	0.99	0.00
7	Police HQ	Police	EA	0.07	0.00	0.00	0.93	0.00
8	Police Station A	Police		0.07	0.00	0.00	0.98	0.00
9	Hospital C	Hospital		0.06	0.84	0.00	0.00	0.97
10	Port Railyards	Railyards	EA	0.04	0.00	0.00	0.00	0.00
11	Port Terminal A	Ports		0.04	0.99	0.00	0.00	0.00
12	Army Medical Center	Hospital		0.04	0.91	0.00	0.00	0.96

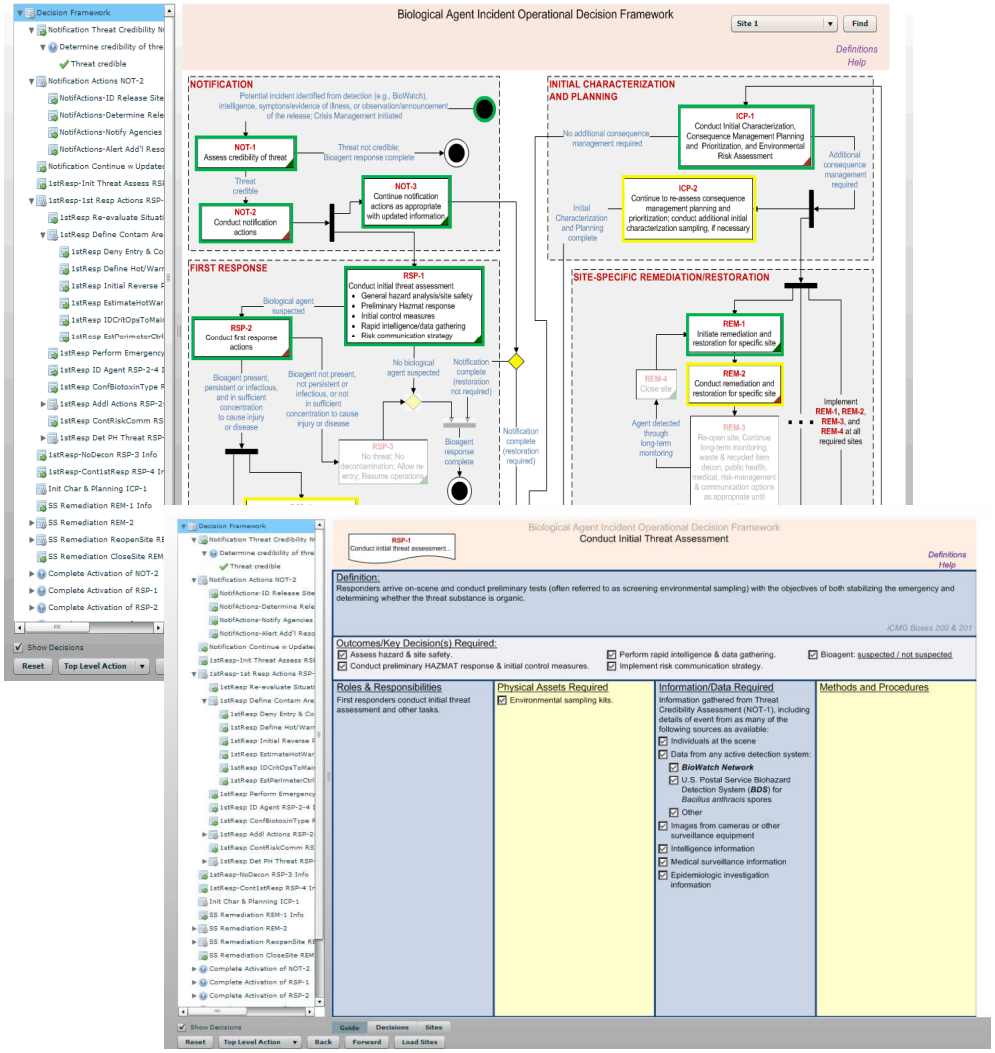
A logical, transparent, priority list provides a starting point for prioritization negotiation and decision making



Remediation timelines, cost, and resource estimates provides improved planning capabilities

ADVISER: Automated Decision Visualization and Information System for Emergency Response/Recovery

- Codifies complex process documentation into an easy to follow, interactive diagram
- Tracks and shares the decision making process between multiple users
- Users can quickly see how their task fits into the overall process
- Allows for the linking of tools and information sources needed to complete the process steps
- Allows for different “views” of the process (i.e., an EPA view, a sampling team view, etc.)



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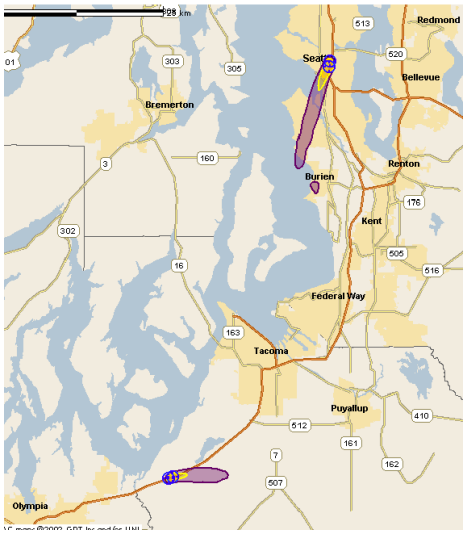
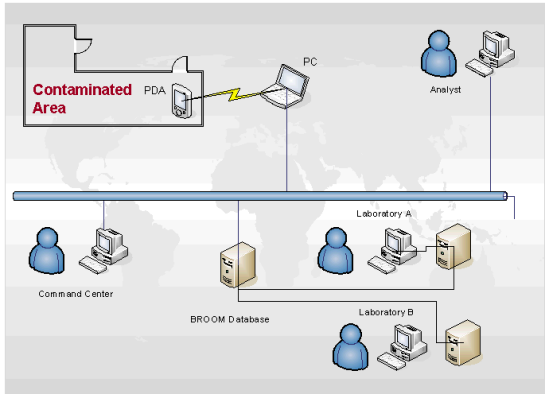


Sandia conducted several technology development efforts to improve restoration/recovery operations

BROOM



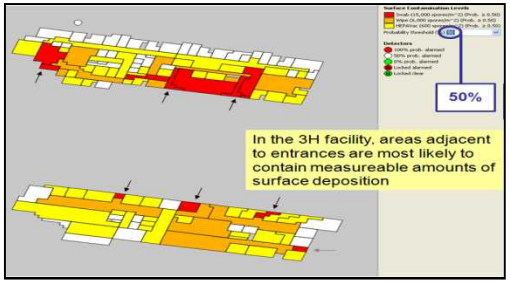
- Continued development
- Improved GIS
- Lab interface
- Deployments in exercises & demonstrations

Owner-performed decon protocol development

- Identify & develop decontaminants for owner-performed decon
- Tested protocols
- Worked closely with US EPA
- Used peroxide-based decontaminants

Agent Fate/Building Infiltration Studies

- Study infiltration of buildings
- Determine most likely infiltration pathways



- Develop sampling methods to determine if buildings have been contaminated
- Reduce restoration timelines by reducing number of required samples

Sample Collection Efficiency Studies

Collection Method	Surface	Mean Recovery Efficiency (n=24)	Median Recovery Efficiency (n=24)
Swab	Stainless Steel	0.461 ±0.154	0.455
	Painted Wallboard	0.483 ±0.224	0.442
Wipe	Stainless Steel	0.590 ±0.173	0.573
	Painted Wallboard	0.460 ±0.291	0.377
Vacuum	Stainless Steel	0.174 ±0.138	0.118
	Painted Wallboard	0.268 ±0.030	0.022
	Carpet	0.253 ±0.068	0.248
	Bare Concrete	0.181 ±0.072	0.173

- Identify best sampling methods
- Help determine number of required samples
- Led to new project with the VSP Working Group

The Sandia contributions to IBRD have had a significant impact

- **Impact on national policy**
  - Improved understanding of time, cost, resources required for wide area restoration
  - Emphasis on owner-performed decon by EPA
  - Greater understanding of sampling/agent fate issues
- **Impact at the local level**
  - Local emergency planners are using Sandia-developed tools for planning of real events
  - Local stakeholders have much improved understanding of wide area recovery
- **New work at Sandia**
  - WARRP (Wide Area Recovery & Resiliency Program – IBRD follow-on in Denver, CO)
  - TaCBRD (Trans-Atlantic Collaborative Biological Resiliency Program - International IBRD follow-on in Western Europe)
  - IBRD Tools Transition project (transition of Sandia-developed tools to web-based and use at the local level for planning)
  - Additional sample collection efficiency work (VSP)