

Overview of Briefing Products

Part 2: Chemical and Biological

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Kevin Foster and Gayle Sugiyama

 Lawrence Livermore
National Laboratory



LLNL-PRES-609133

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344. The Department of Homeland Security sponsored part of the production of this material.



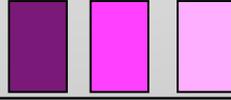
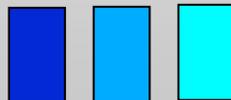
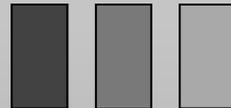
Standard Plots Are Derived From Interagency Input and Consensus

- Plot standards are developed with user input and agency consensus
 - Standard plot format and color schemes
 - Standard plot types and contamination/dose levels of concern
 - Consequence reports documenting model inputs and assumptions and providing interpretational guidance
 - Maps showing areas reaching health effect levels, and protective action guides from DHS/EPA, if available
- Default plots produced automatically when a model request is made
 - Web users may directly initiate a modeling request
 - NARAC Operations can produce and share results with designated users
- NARAC Operations provides reach-back support to:
 - Develop additional event-specific plots
 - Refine predictions based on field data and event information
 - Provide subject matter expertise on plots and analyses

A Standard Default Plot Set is Provided For Each Type of Release Developed with Interagency Input

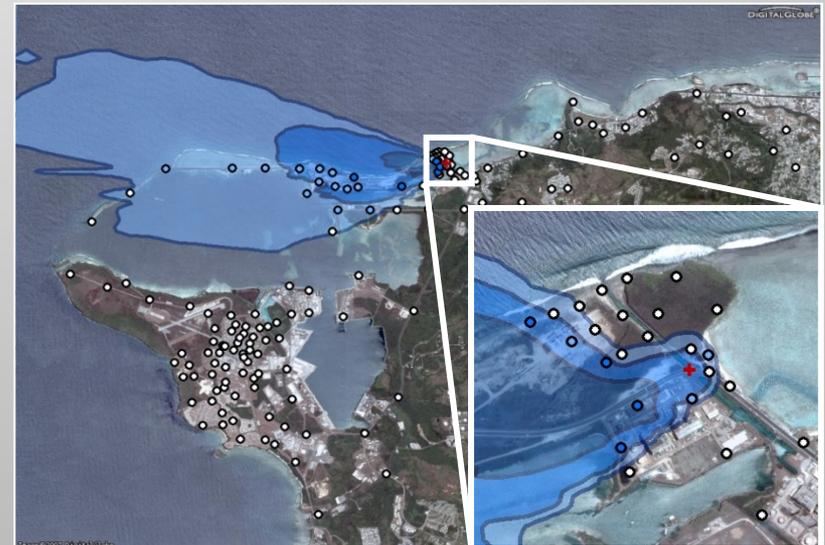
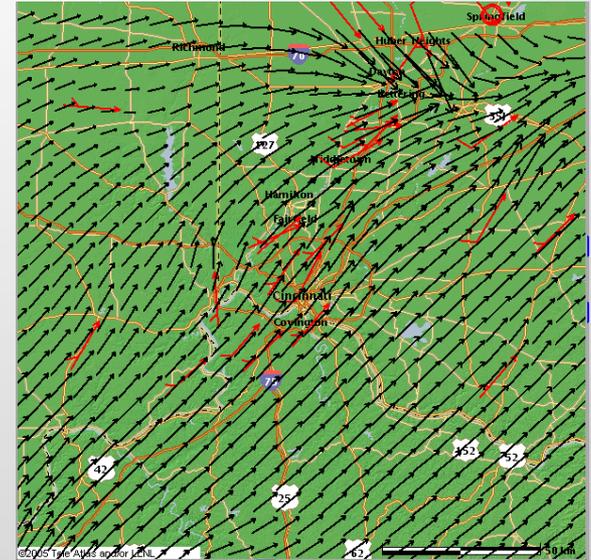
<i>Release Type</i>	<i>Default Plot Type</i>
Unknown source material	Hourly average air concentration Deposition if particulate is used
Industrial chemical	“Peak” average air concentration, deposition
Chemical agent	“Peak” average air concentration, deposition
Biological agent	Time-integrated air concentration, deposition
Explosive	Health effects from blast overpressure
Radiological	Dose, dose rate, deposition
Nuclear	Prompt effects, dose, dose rate

Standard Product Contour Level and Color Schemes are Used for Ease of Interpretation

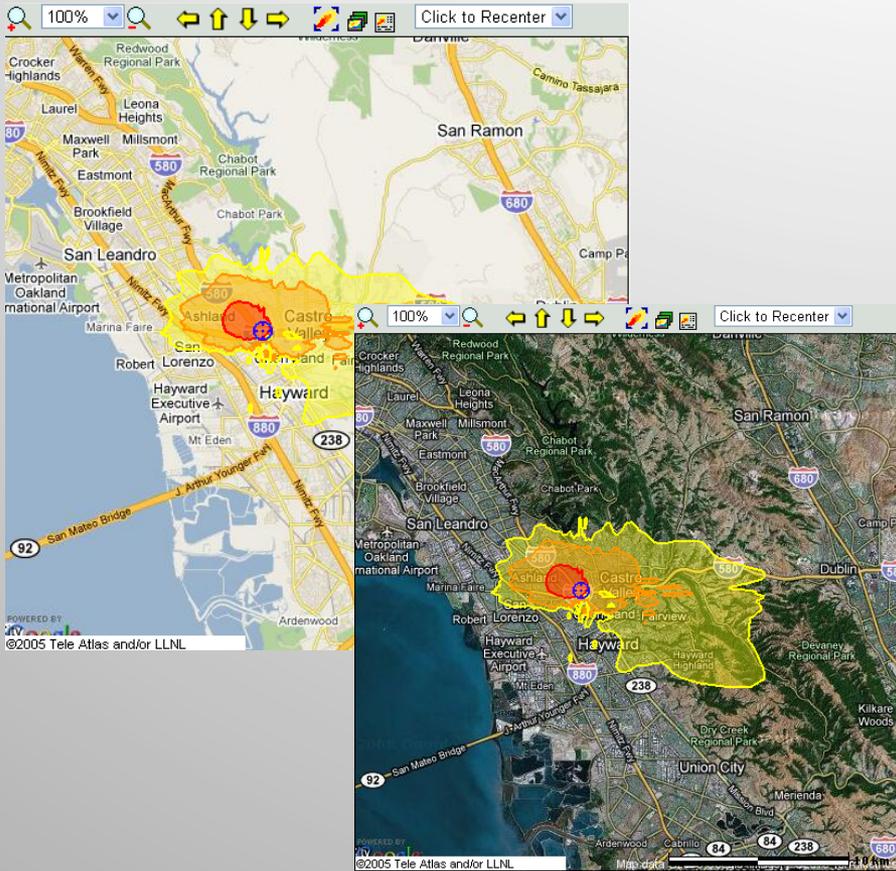
Model Contour Levels	Have levels been reached?	Contour Colors	Description Wording
Acute/Chronic exposure/dose or protective action guideline levels exist in the NARAC database (release amount assumed to be known)	Yes		Consistent with EPA, NRC, FDA or other guidance.
	No		Values below health effect or PAG levels. Possibly contaminated area. Confirm with monitoring surveys.
Customer specified levels	Yes		Customer specified levels.
	No		Values are below customer specified levels.
No levels exist in NARAC database (or no release amount known)			No guidelines specified. Possibly contaminated area.

Auxiliary Analyses Are Provided For Situational Awareness

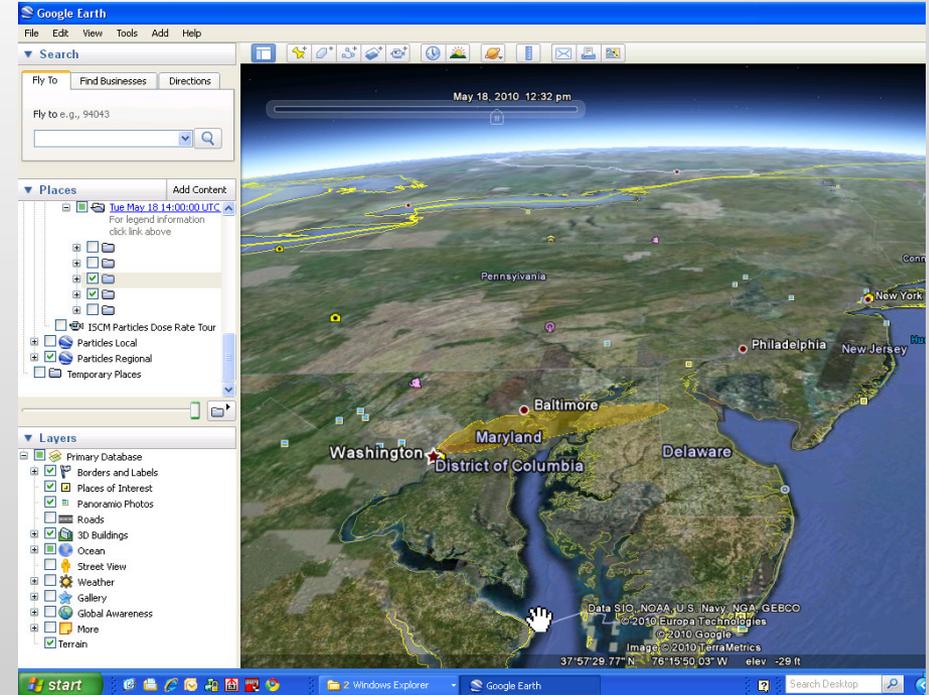
- Wind observations and fields
- Numerical weather prediction forecasts
- Field measurement data
- Deposition
- Time series, particle, or plume animations



Products and Map Layers are Provided in Multiple Formats (PDF, ESRI, Google)



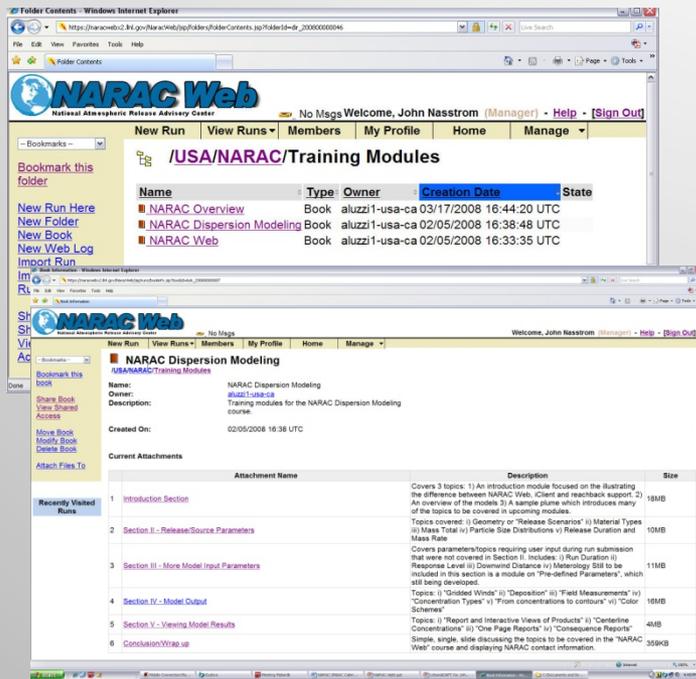
Worldwide Google Street and satellite displays



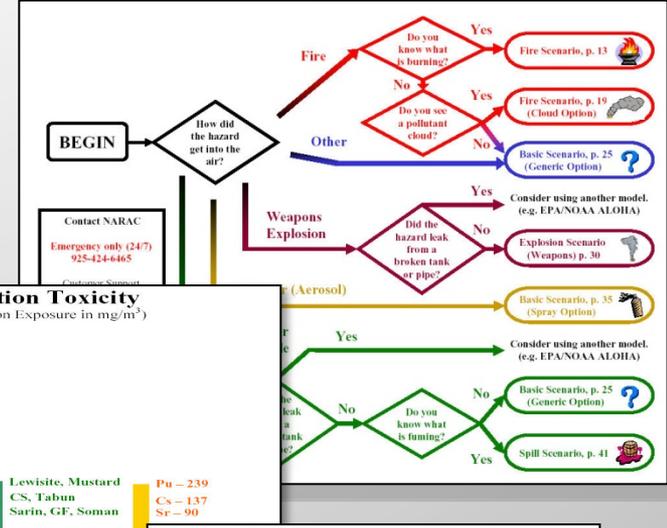
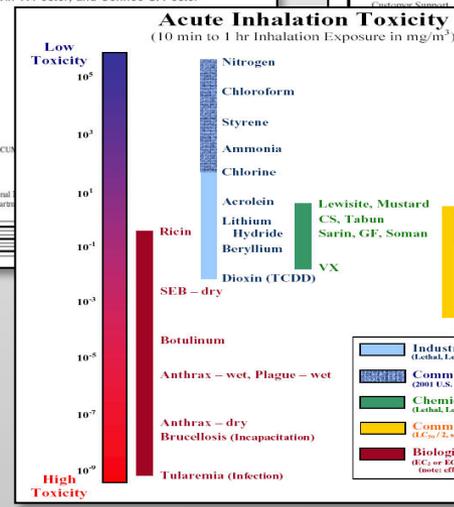
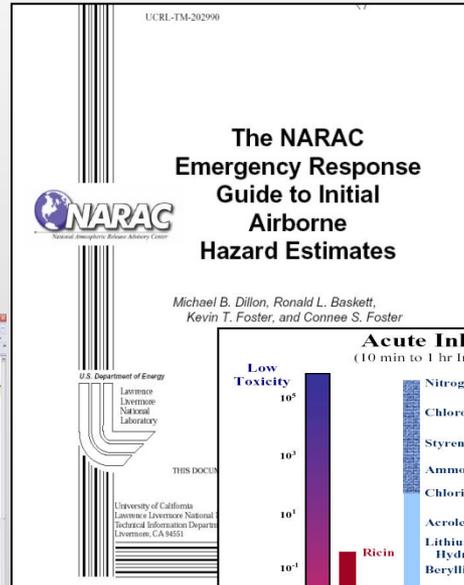
Export plumes to *Google Earth* (FEMA)

Available on NARAC/CM Web
PDF, PowerPoint, HTML/XML, JPG/PNG graphics,
ESRI Shape and Google Earth KMZ GIS files with
plume areas

Extensive User Documentation Includes User Guides and Web-Based Training



- Technical manuals
- Web-based training
- Step-by-step guide to software use
- Guide books for determining model inputs from known information



The 'Explosion Scenario (Weapons)' section provides instructions for running the software. It includes a list of steps: 1. Run iClient to open the Session Manager Window. 2. Select "Explosive Dispersal" from the Scenarios Menu. A screenshot of the software interface shows the 'Explosive Dispersal' scenario selected. A text box explains that NARAC uses explosion information only to describe how hazards are distributed in the atmosphere, unless explicitly specified. Another text box notes that if a small explosion has put a hole in a container, use either a Basic (p. 25) or Spill (p. 41) Scenario or another model (EPA/NOAA ALOHA, www.epa.gov/osqp/canoe/about.htm). A 'SOBCE MODEL INFO' section provides further details on explosion-dispersal hazards in NARAC models.

Summary of NARAC/IMAAC Briefing Products

 Lawrence Livermore
National Laboratory

 National Atmospheric Release Advisory Center
NARAC

LLNL-PRES-609133

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344. The Department of Homeland Security sponsored part of the production of this material.



Interagency Briefing Products Are Used to Communicate Key Information to Decision Makers

- Homeland Security Council tasked DOE / DHS to produce hazard area graphics targeted at officials, decision makers, and public affairs officers
 - Present information on effects in plain, non-technical language
 - Explain actions that need to be considered and why (e.g., sheltering, evacuation, relocation, worker protection, agricultural embargoes)
 - List assumptions and limitations
- Based on existing pertinent agency-published documents for guidance
- Developed with extensive interagency input with on-going updates based on interagency feedback and recommendations
- Designed for Subject Matter Experts to use in briefing officials and responders (not intended for direct briefing of the general public)

The development of Briefing Products has been sponsored by DOE/NNSA and DHS, and involved a collaboration of LLNL, RSL, Sandia, EPA, DHS, NRC, and HHS/CDC

Briefing Products Use a Standard Three Slide Format With Information Developed Via Interagency Consensus

Example for Demonstration Only

Automated Report: Testing
 (36: 7136: 121 2623)
 RDD Explosion at 30 Jun 2011 06:00 PDT

Predicted Evacuation and Sheltering Areas Based on EPA/DHS Guides
 Applicable within first hours while radioactive cloud is present
 (Based on thyroid dose from a 4-day exposure beginning at 30 Jun 2011 06:00 PDT)

Evacuation of entire population warranted, unless additional unusually hazardous circumstances exist (exceeds 25 rem). Estimated Population: 26800 Area: 8.9 km2 Extent: 6.2 km
Evacuation or sheltering normally inhaled (5 to 25 rem). Estimated Population: 47400 Area: 34.5 km2 Extent: 11.0 km

Notes:
 • Prompt evacuation and/or sheltering reduces radiation dose and cancer risk.
 • Sheltering-in-place can be more protective than evacuation while radioactive cloud is present.
 • Radiation doses predicted for maximally exposed individuals and includes dose from inhalation of contaminated air during plume passage and of resuspended contaminated dust over four days.
 • Protective actions are only based on dose that can be avoided. Prediction does not include dose received before 30 Jun 2011 06:00 PDT.
 • Refer to Predicted Areas for Considering Potassium Iodide (KI) Administration product for guidance on possible mitigating action.

Assumptions:
 • Areas shown are model predictions based on an estimated source term but no measurements.
 • Plume Phase - Radioactive cloud may still be present or imminent.
 • Four days exposure to only airborne contamination.

Technical Details: CMHT 702-794-1665
 Advice & Recommendations: A-Team 770-488-7100

Briefing Product for Public Officials
 Current: 18 Dec 2012 11:47 PST
 Check for updates

Example for Demonstration Only page 1 of 3

Example for Demonstration Only

Automated Report: Testing
 (36: 7136: 121 2623)
 RDD Explosion at 30 Jun 2011 06:00 PDT

Predicted Evacuation and Sheltering Areas Based on EPA/DHS Guides
 Applicable within first hours while radioactive cloud is present

Key Points

- Protective actions are based on dose that can be avoided.
- Areas shown do not include dose received before 30 Jun 2011 06:00 PDT.
- Greatest hazard is due to exposure to the radioactive cloud. Evacuation before radioactive cloud is present is best, but avoid evacuation in the radioactive cloud.
- Radioactive cloud is expected to clear the contoured areas by 30 Jun 2011 15:30 PDT.
- Sheltering-in-place may be preferable to evacuation in some situations
 - If radioactive cloud is present or its arrival is imminent,
 - For certain populations needing special consideration (hospitals/nursing homes, prisoners, elderly, etc.),
 - Other hazards are present which complicate or impede evacuation (severe weather, competing disasters, etc.).
- Sheltering followed by delayed evacuation may be best if radioactive decay is very rapid.
- Predicted dose is accumulated over 4 days (30 Jun 2011 06:00 PDT to 04 Jul 2011 06:00 PDT).
- Predicted dose assumes individuals are unsheltered and unprotected.
- Use the "Radioactive Cloud has Passed" map after radioactive cloud passes.

Technical Details: CMHT 702-794-1665
 Advice & Recommendations: A-Team 770-488-7100

Briefing Product for Public Officials
 Current: 18 Dec 2012 11:47 PST
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Example for Demonstration Only page 2 of 3

Example for Demonstration Only

Automated Report: Testing
 (36: 7136: 121 2623)
 RDD Explosion at 30 Jun 2011 06:00 PDT

Predicted Evacuation and Sheltering Areas Based on EPA/DHS Guides
 Applicable within first hours while radioactive cloud is present

Presenter Notes - Additional Information

- PAD - Protective Action Guidelines, projected dose at which a specific protective action to reduce or avoid that dose is warranted.
- Protective actions are based only on dose that can be avoided, not dose acquired prior to implementation of the protective action.
- Areas shown do not include dose received before 30 Jun 2011 06:00 PDT.
- Areas shown are model predictions based on an estimated source term but no measurements.
- Reduce radiation exposure to minimize long-term cancer risk. Evacuation and sheltering reduce radiation exposure to the greatest hazard, because total dose to the body results from radiation by the cloud, inhalation of radioactivity, dose reduction from contamination on the ground.
- Completion of evacuation before plume arrival is best. Evacuation in radioactive cloud may result in more dose than sheltering until 3 passes. Evacuees in cloud should cover mouth & nose with available filter materials.
- Evacuation and shelter guidance based on EPA/DHS Early Phase guidelines.
- Evacuation (or, for some situations, sheltering) should normally be initiated at a thyroid dose of 1 rem.
- Sheltering may be the preferred protective action when it will provide protection equal to or greater than evacuation, based on consideration of factors such as source term characteristics, and temporal or other site-specific conditions.
- Because of the higher risk associated with evacuation of some special groups in the population (e.g. those who are not readily mobile), sheltering may be the preferred alternative for such groups as a protective action at projected thyroid doses up to 25 rem.
- Under unusually hazardous environmental conditions use of sheltering at projected thyroid doses up to 25 rem to the general population may become justified.
- Sheltering followed by delayed evacuation may be best if radioactive decay is very rapid (e.g. radioiodine or nuclear deflation).
- Radioactive cloud expected to clear contoured areas by 30 Jun 2011 15:30 PDT.
- Different maps, based only on the radioactivity deposited and excluding the radioactive cloud, must be used after the radioactive cloud has passed.

Presenter Notes - Technical Background

- Guidance based on EPA and DHS FRPCC, as given in:
 - Manual of Protective Action Guides and Protective Actions for Nuclear Incidents" (EPA 600/R-92-01, May 1992).
 - "Planning Guidance for Protection and Recovery Following Technological Disaster Events (RDD) and Improved Nuclear Device (IND) Incidents", (Federal Register, Vol. 73, No. 149, Aug. 1, 2008, pg 8522).
- The FRPCC for evacuation (or, as an alternative in certain cases, sheltering) is expressed in terms of the projected committed dose equivalent to the thyroid from inhalation of radioactive materials from exposure and intake during the early phase.
- Predicted dose is known as the Committed Dose Equivalent (CDE) to the thyroid, which in this case includes:
 - Dose to the thyroid from inhalation of the contaminated air as it passes, and
 - Dose to the thyroid due to radioactivity taken into the body by inhalation of contaminated dust (resuspension).
- Predicted dose is accumulated over 4 days (30 Jun 2011 06:00 PDT to 04 Jul 2011 06:00 PDT).
- Predicted dose assumes maximum possible exposure, but only considers dose that can be avoided by protective actions. Doses received prior to this point in time are not considered.
- Radioactive contamination is expected outside the contoured areas, but not at levels expected to exceed federal guidelines for evacuation and sheltering based on current information.
- Additional background and background information is provided in the Consequence Report containing the detailed, technical version of this calculation.
- Briefing Products are intended for presenting a common operating picture to key leaders and decision makers. Other more technical products are available (Standard Products).
- Contact the FRPCC Subcommittee for Environment, Food and Health (Advisory Team) for advice and recommendations. Available by calling the ODO Emergency Operations Center (EOC) at 770-488-7100.

Technical Details: CMHT 702-794-1665
 Advice & Recommendations: A-Team 770-488-7100

Briefing Product for Public Officials
 Current: 18 Dec 2012 11:47 PST
 Check for updates

Example for Demonstration Only page 3 of 3

- ## Slide 1. Plot
- Map of the areas of concern
 - Plot legend (associated with actionable guidance)
 - Important notes, assumptions, and limitations

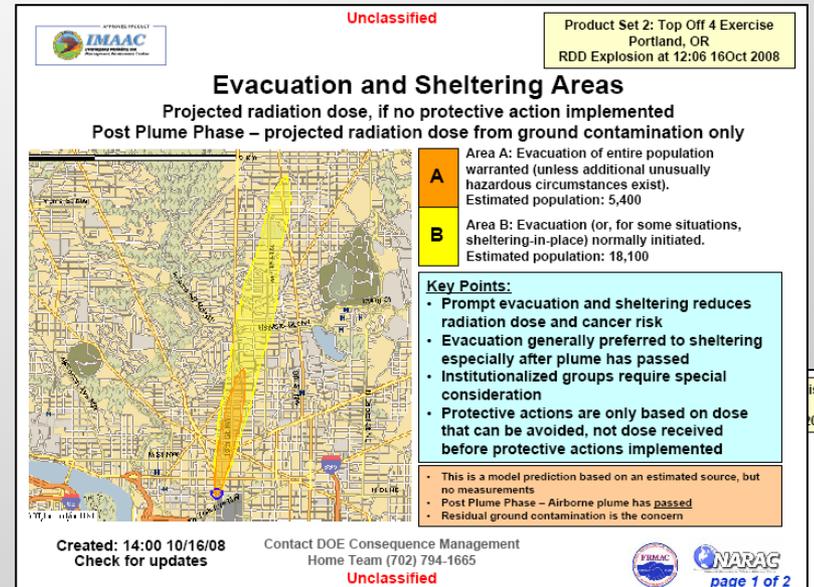
- ## Slide 2. Key Points
- Expanded list of key information concerning relevant actions for consideration (evacuation, relocation, worker protection)
 - Highlights key points to present

- ## Slide 3. Presenter Notes
- Background and technical
 - Intended for use by the presenter (not for display)

All slides include product titles and sub-titles, short scenario description, product creation date/time, and contact phone numbers for technical details and advice (e.g., NARAC/IMAAC, CMHT/FRMAC or Federal Advisory Team for Environment, Food and Health for radiological advice, EPA for chemical advice)

NARAC Automated Software Allows Users to Quickly Generate Briefing Products

- NARAC software can generate Briefing Products for these scenarios:
 - Nuclear detonations (e.g., Improvised Nuclear Device [IND])
 - Radiological Dispersion Device (RDD)
 - Nuclear Power Plant (NPP) accidents (under development, scheduled for release December, 2012)
 - Chemicals (toxic industrial materials/chemicals and chemical agents)
 - Biological agents
- LLNL NARAC software can quickly produce briefing products for distribution on CMweb/NARAC Web, HSIN, ECN or email
- Briefing Products available in two formats
 - PowerPoint
 - PDF



information.

- Sheltering-in-place may be preferable to evacuation in some situations
 - Institutionalized populations (invalids, prisoners...)
 - Severe weather, competing disasters, impediments to evacuation
 - Very rapid radioactive decay
- Initial airborne plume has cleared the area, leaving only ground contamination
- Protective actions are based only on dose that can be avoided, not dose acquired prior to protective action
- Dose does not include doses acquired before 14:00 10/16/08 (presumed end of plume passage)
- Projected dose is accumulated over 4 days (14:00 10/16/08 to 14:00 10/20/08)
- Projected dose assumes individuals are unsheltered and unprotected
- Map may be updated, if implementation of protective actions has been delayed and/or new information obtained

Technical Background.

- Shelter and evacuation guidance based on EPA/DHS guidelines for the Early Phase (assumes 4 day duration)
- Projected dose is known as Total Effective Dose Equivalent (TEDE), which is only due to external irradiation by ground contamination, plus dose due to radioactivity taken into the body by inhalation of contaminated dust (resuspension)
- Map contours correspond to minimum and maximum evacuation/sheltering thresholds of 1 and 5 rem respectively

Created: 14:00 10/16/08
Check for updates

Contact DOE Consequence Management Home Team (702) 794-1665

Unclassified

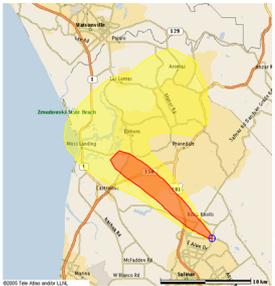
page 2 of 2

Comparison of Technical and Briefing Products

Characteristic	Technical Products	Briefing Products
<i>User and purpose</i>	For use by subject matter experts to support the decision-making process	To assist subject matter experts in the communication of consequences and guidance to decision-making officials
<i>Language</i>	Technical terminology	Plain language
<i>Content</i>	Complex: Includes data used to develop products such as source term, meteorology, measurements	Streamlined: Includes only essential details and focuses on explaining results
<i>Protective action criteria and guidelines</i>	Use established agency guidelines for standard default products, but may have information specified by subject matter experts for a special purpose	Use established agency guidelines to focus user's attention on potential actions for consideration
<i>Training needed to use products</i>	Requires a technical background and training before using	Each product includes two pages of key notes and background information, but training is still strongly suggested.

Neither type of product is intended for distribution or presentation to the general public

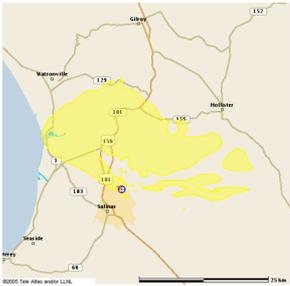
Chemical Briefing Products: Summary (1)

Chemical Product	Sample	Purpose	Uses
<p>Predicted Isolation and Protective Action Areas</p>	<p>For Example Only</p> <p>Set 2: Demonstration 36 7155-121 623 Chemical Release at 14 Jan 2012 19:00 UTC</p> <p>Predicted Isolation and Protective Action Areas Areas to consider for restricted entry, evacuation, or sheltering SARIN near-surface cloud present - Inhalation hazard</p>  <p>Initial Isolation Zone. Evacuation and restricted entry warranted unless protected and involved in emergency response. Estimated population: 8580</p> <p>Protective Action Zone. Evacuation or sheltering should be considered due to increased risk of harmful exposure. Estimated population: 79800.</p> <p>Notes:</p> <ul style="list-style-type: none"> Exposed individuals risk immediate or delayed serious health effects in these areas, with possible fatalities in or near isolation zone. Unprotected emergency workers should not enter isolation zone or evacuation/sheltering areas. Establish isolation zone first to control area of operations. Prompt evacuation and/or sheltering reduces health risks, including exposures to subsequent evaporation. Employ shelter-in-place if evacuating the public would cause greater risk. Areas shown do not consider potential skin contact risk. <p>Assumptions:</p> <ul style="list-style-type: none"> This is a model prediction based on an estimated source; confirm with measurements or medical diagnosis. Plume Phase - Chemical cloud may be present or imminent. <p>Briefing Product for Public Officials Current: 09 Feb 2012 16:15 UTC Check for updates</p> <p>Technical Details: IMAAC 925-424-6465 Federal POC for Advice: EPA/OSC</p> <p>For Example Only page 1 of 3</p>	<p>Guidance for decisions on actions to be taken to reduce potential health effects from inhalation for exposed population (sheltering or evacuation)</p>	<ul style="list-style-type: none"> Estimate locations at which access control areas should be considered Inform response operations of potential geographic extent of response
<p>Predicted Public Health Protective Action Criteria (PAC) Areas</p>	<p>For Example Only</p> <p>Set 2: Demonstration 36 7155-121 623 Chemical Release at 14 Jan 2012 19:00 UTC</p> <p>Predicted Emergency Worker Protection Based on 30 min Exposure Use of personal protective equipment (PPE) by emergency workers is recommended SARIN near-surface cloud present - Inhalation hazard</p>  <p>Area where maximum respiratory PPE (Level A/B) is NIOSH-recommended for emergency workers, along with careful supervision and monitoring. (Level B affords less skin protection.) Exceeds 30 min AEGL-2 (0.009 ppm)</p> <p>Area where reduced (Level C) PPE is NIOSH-recommended for workers, with careful supervision and monitoring. Exceeds 30 min AEGL-1 (0.0007 ppm). Use Level A PPE if concentrations are not confirmed!</p> <p>Notes:</p> <ul style="list-style-type: none"> Unprotected emergency response or medical personnel should not approach these areas without appropriate PPE. Severe or potentially fatal concentration levels may exist within these areas, especially close to the release. Unprotected individuals exposed for 30 min or more in these areas may develop mild, transient health effects to irreversible or serious effects that could impair ability to escape, and may also risk potentially fatal effects. Refer to NIOSH Emergency Response Safety and Health Database list of chemical properties and recommended PPE: http://www.cdc.gov/niosh/erandhs/index_name.html <p>Assumptions:</p> <ul style="list-style-type: none"> This is a model prediction based on an estimated source; confirm with measurements. Plume Phase - Chemical cloud may be present or imminent. <p>Briefing Product for Public Officials Current: 09 Feb 2012 16:15 UTC Check for updates</p> <p>Technical Details: IMAAC 925-424-6465 Federal POC for Advice: EPA/OSC</p> <p>For Example Only page 1 of 3</p>	<p>Show potential health effects to the exposed general population from inhalation of the chemical</p>	<ul style="list-style-type: none"> Inform and prioritize emergency response operations

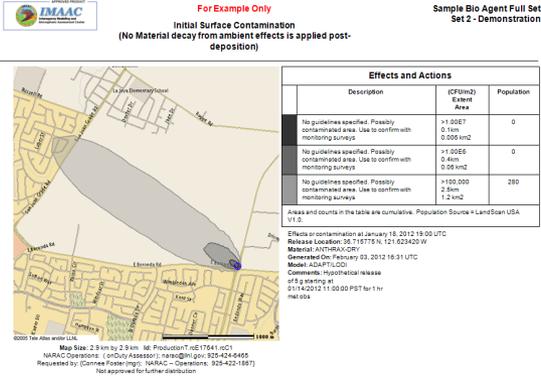
Chemical Briefing Products: Summary (2)

Chemical Product	Sample	Purpose	Uses															
<p>Predicted Emergency Worker Protection Based on XX min Exposure</p>	<p style="text-align: center;">For Example Only</p>  <p style="text-align: right;">Set 2 - Demonstration (30 7158 - 121 625) Chemical Release at 14 Jan 2012 19:00 UTC</p> <p style="text-align: center;">Predicted Public Health Protective Action Criteria (PAC) Areas Areas exceeding harmful vapor air concentration exposure limits SARIN near-surface cloud present - Inhalation hazard</p> <p>PAC-3 (exceeds 0.02 ppm). Life-threatening health effects. Estimated population: 6580 PAC-2 (exceeds 0.006 ppm). Irreversible or serious health effects that could impair ability to take protective action. Estimated population: 11900 PAC-1 (exceeds 0.0005 ppm). Mild, transient health effects. Estimated population: 33900</p> <p>Notes: • Refer to accompanying Predicted Isolation and Protective Action Areas product for warranted protective actions. • Refer to Emergency Worker Protection Areas product for NIOSH-recommended personal protective equipment. • Prompt evacuation and/or sheltering reduces health risks, including exposures to subsequent evaporation. • Unshielded effects are for unprotected, unsheltered general population from initial plume passage. • Based on threshold concentrations for stated health effects. Effects are not universal across all populations. • Areas shown do not consider potential skin contact risk.</p> <p>Assumptions: • This is a model prediction based on an estimated source; confirm with measurements or medical diagnosis. • Plume Phase - Chemical cloud may be present or imminent</p> <p>0000 Top Airs water LSL Briefing Product for Public Officials Current: 09 Feb 2012 16:15 UTC Check for updates</p> <p style="text-align: right;">Technical Details: IMAAC 925-424-6465 Federal POC for Advice: EPA/OISC</p> <p style="text-align: center;">For Example Only page 1 of 3</p>	<p>Guidance for the use of personal protective equipment (PPE) by workers entering areas of concern</p>	<ul style="list-style-type: none"> Estimate areas where different PPE levels should be considered for rescue workers, <u>once concentrations have been confirmed</u> Estimate PPE requirements for emergency response 															
<p>Predicted Liquid-Skin Contact Effects (Technical Product Only)</p>	<p style="text-align: center;">For Example Only</p>  <p style="text-align: right;">Sample Chem Agent Full Set Set 2 - Demonstration</p> <p style="text-align: center;">Predicted Liquid-Skin Contact Effects (Areas exceeding harmful liquid droplet deposition thresholds)</p> <table border="1"> <thead> <tr> <th colspan="3">Effects and Actions</th> </tr> <tr> <th>Description</th> <th>Impd. Exposed Area</th> <th>Population</th> </tr> </thead> <tbody> <tr> <td>Greater than 50% fatalities expected in exposed general population.</td> <td>>750 78.5m² 1,939 m²</td> <td>0</td> </tr> <tr> <td>Greater than 50% of exposed general population expected to develop severe health effects.</td> <td>>440 110m² 3,892 m²</td> <td>0</td> </tr> <tr> <td>Greater than 20% of exposed general population expected to develop severe health effects.</td> <td>>41 433m² 20,547 m²</td> <td>0</td> </tr> </tbody> </table> <p>Areas and counts in the table are cumulative. Population Source = LandScan USA V1.0.</p> <p>Effects at contamination at January 14, 2012 20:00 UTC Release Location: SR 1787716, TS 628420 W Material: SARIN Generated On: February 02, 2012 18:26 UTC Model: CACTUS Comments: Hypothetical Release 0112:18:30:00 0114:20:12:11:00:00 PST for 35 min @ 5 sec met 0.0</p> <p>0000 Top Airs water LSL Map Size: 600 m by 800 m. Alt. Projection: NAD 83 UTM IMAAC Classification: (In)Conf. Assessment: Approved. IMAAC: 925-424-6465 Requested by: (Conf)ing. IMAAC - Operations: 925-422-1897 Not approved for further distribution</p> <p style="text-align: center;">For Example Only</p>	Effects and Actions			Description	Impd. Exposed Area	Population	Greater than 50% fatalities expected in exposed general population.	>750 78.5m ² 1,939 m ²	0	Greater than 50% of exposed general population expected to develop severe health effects.	>440 110m ² 3,892 m ²	0	Greater than 20% of exposed general population expected to develop severe health effects.	>41 433m ² 20,547 m ²	0	<p>Show potential health effects to the exposed general population from absorption of the liquid chemical through the skin</p>	<ul style="list-style-type: none"> Inform and prioritize emergency response operations based on additional potential skin contact hazard posed by chemical weapons agents
Effects and Actions																		
Description	Impd. Exposed Area	Population																
Greater than 50% fatalities expected in exposed general population.	>750 78.5m ² 1,939 m ²	0																
Greater than 50% of exposed general population expected to develop severe health effects.	>440 110m ² 3,892 m ²	0																
Greater than 20% of exposed general population expected to develop severe health effects.	>41 433m ² 20,547 m ²	0																

Biological Briefing Products: Summary (1)

Biological Product	Sample	Purpose	Uses
<p>Predicted Bio-Agent Infection Areas Due to Airborne Plume</p>	<p style="text-align: center;">For Example Only</p> <div style="text-align: right; font-size: small;"> Set 2: Demonstration (05:15:00 - 05:16:00) Biological Agent Release at 14 Jan 2012 19:00 UTC </div> <p style="text-align: center;">Predicted Bio-Agent Infection Areas Due To Airborne Plume Areas exceeding potentially infectious air concentrations ANTHRAX-DRY near-surface cloud present - Continuing inhalation hazard</p>  <p>Notes: •Populations in areas shown may be exposed to infection from inhalation of an aerosolized biological agent. •Agent is not contagious. •Establishment of access control of an area at least 25 m (75 ft) from release site is warranted. •Nearly all untreated inhalation pathway infections may result in fatalities. •Prompt medical care may greatly reduce health risks. •Sheltering-in-place during plume passage may reduce infection rate from airborne plume. •Predicted health effects are for an unprotected/unsheltered population from initial plume passage. •Prediction includes environmental degradation effects on agent viability.</p> <p>Assumptions: •This is a model prediction based on an estimated source; confirm with measurements. •Plume Phase - Biological agent cloud poses inhalation risk.</p> <p style="font-size: x-small;">©2005 The Ohio State Univ. LRS. Briefing Product for Public Officials Current: 09 Feb 2012 16:44 UTC Check for updates</p> <p style="text-align: right; font-size: x-small;">Technical Details: IMAAC 926-424-6465 Federal POC for Advice: EPA/OSC For Example Only page 1 of 3</p>		

Biological Briefing Products: Summary (2)

Biological Product	Sample	Purpose	Uses
<p>Predicted Initial Surface Contamination (Technical Product Only)</p>	<p style="text-align: center;">For Example Only</p> <p style="text-align: center;">Initial Surface Contamination (No Material decay from ambient effects is applied post-deposition)</p> <p style="text-align: right;">Sample Bio Agent Full Set Set 2 - Demonstration</p>  <p style="text-align: center;">For Example Only</p>	<p>Show areas of higher deposition concentrations of agent</p>	<ul style="list-style-type: none"> • Inform emergency response operations and decontamination efforts • Compare predicted contaminated areas with instrument detection or analysis thresholds (if available) to build confidence in predictions for unmonitored areas • Conduct model-data comparison for source term reconstruction

Layout of Briefing Products (1)

[Product Set #:] [Event Name]
 [Location Name and/or Coordinates]
 [Event Type] at [Date/Time]

Italicized text describes type of information that will appear here, and varies from product to product

Product Title
Product Sub-Title 1
Product Sub-Title 2

Blue text is substituted in the actual product with appropriate text based on response-, scenario- or material-dependent information

Non-Italicized text shows text as it is displayed in the actual product

Contour Legend Area: one or more color-coded areas with associated descriptive text applicable to the area covered by the contour. This text preferably reflects appropriate actions for consideration by the decision-maker.

One or more shaded contoured areas overlaid onto a geographic map of the affected area

Notes

- A list of bulleted key items of interest concerning this product, the area it covers, and/or relevant actions for consideration.

Assumptions:

- A statement of whether this product is based only on estimated source term, or if initial source term assumptions have been modified to better match available measurement data.
- A statement of whether the airborne plume is still expected to be present in the area, or if the initial plume has passed.

Product Title

Product Sub-Title 1

Product Sub-Title 2

Key Points

- *An expanded list of bulleted key items of interest concerning this product, the area it covers, and/or relevant actions for consideration. Some of these points may repeat Notes from slide one.*

*Product Title**Product Sub-Title 1**Product Sub-Title 2*Presenter Notes – Additional Information:

- *A bulleted list of background information items relevant to briefing this product. These items are meant to provide context and reference for the presenter, and not for display to the audience.*

Presenter Notes - Technical Background:

- *A bulleted list of more technically-oriented background information items relevant to briefing this product. These items are meant to provide context and optional reference for the presenter, and not for display to the audience.*

Briefing Products For Chemical and Biological Releases

Kevin Foster and Gayle Sugiyama

 Lawrence Livermore
National Laboratory



IMAAC

Interagency Modeling and
Atmospheric Assessment Center



National Atmospheric Release Advisory Center

NARAC

LLNL-PRES-609133

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Derived from LLNL-PRES-541974



Chemical and Biological (CB) Briefing Products Were Developed Under DHS Auspices

- Interagency content surveys and design of CB Briefing Products
 - Toxic Industrial Chemicals / Materials (TICs/TIMs)
 - Chemical Warfare Agents (CWA)
 - Biological agents
- Approach
 - Expanded set of CB technical products
 - Addition of newly designed Briefing Products
 - Input and feedback from OSHA/NIOSH, CDC, ECBC, EPA, USACHPPM, CSAC, etc.
 - IMAAC Interagency Working Group reviews
 - DHS S&T funded content design FY09-FY10; DHS OPS funded implementation in FY11-FY12
- Limited actionable federal guidance available for CB Briefing Products

CB Briefing Products are available on the NARAC Web for testing and feedback purposes

Chemical Briefing and Technical Products

- Chemical Briefing Products
 - Protective Action/Isolation Zone
 - Worker Personal Protective Equipment (PPE)
 - Protective Action Criteria
- Existing Chemical Technical Product
 - Protective Action Criteria (PAC)
- New Chemical Technical Products
 - Protective Action/Isolation Zone
 - Worker Personal Protective Equipment (PPE)
 - Liquid/Skin Contact (chemical warfare agents)

Biological Briefing and Technical Products

- Biological Briefing Products
 - Agent Infection Areas
 - Toxin Life-Threatening Areas
- Existing Biological Technical Product
 - Predicted Short-Term Human Health Effects (used for both bio-agents and bio-toxin)
- New Biological Technical Product
 - Surface Contamination

Chemical Briefing Product: Predicted Isolation and Protective Action Areas

- Defines two areas of concern
 - Protective Action Zone (PAZ)
 - Sheltering or evacuation
 - Rectangular area based on maximum extent of Protective Action Criteria 2, PAC-2 (AEGL, ERPG, or TEEL), if available, else 1% of animal-based median or threshold lethality level
 - Initial Isolation Zone (IIZ) (evacuate and for access control)
 - Circular area based on median or animal lethality data
 - Adjusted to include at least 15% of PAZ extent for gases or 7.5% of PAZ extent for non-gases
- Based on U.S. DOT Emergency Response Guidebook (ERG)
- Based on model-calculated 15-minute running peak average air concentrations
- Only generated for fixed, near-point (non-line) sources

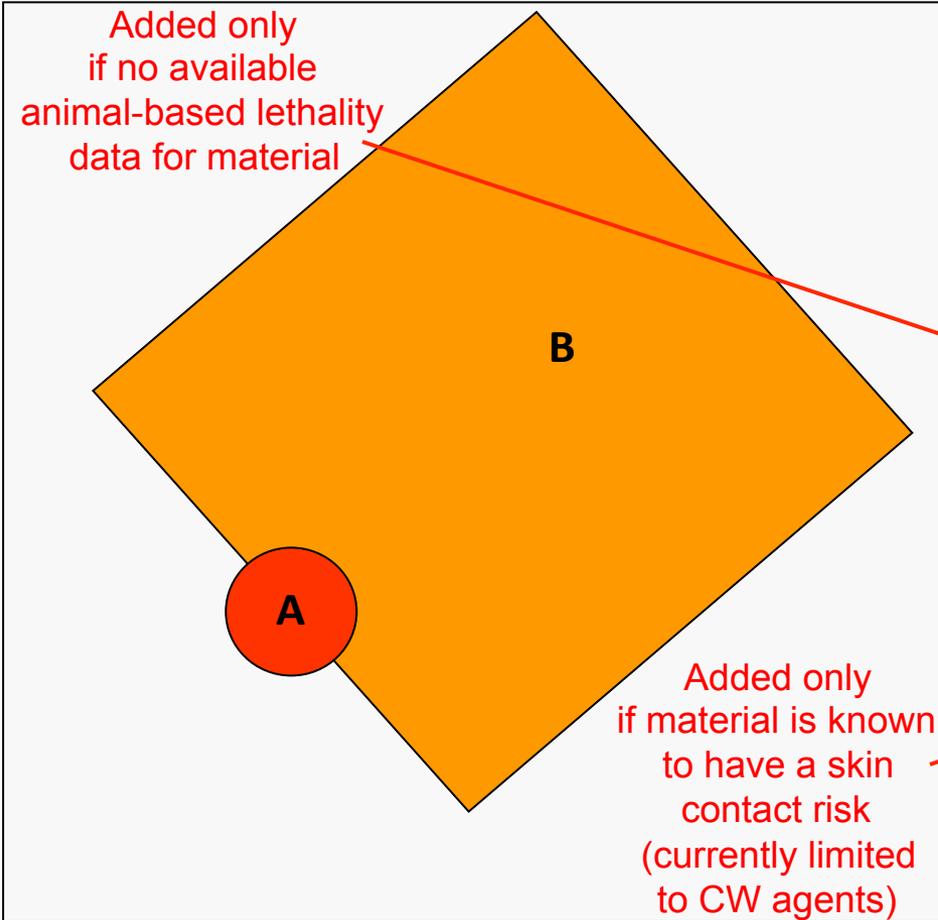


[Product Set #:] [Event Category]
[Location Name and/or Coordinates]
[Event Type] at [Date/Time]

Predicted Isolation and Protective Action Areas

Areas to consider for restricted entry, evacuation, or sheltering
[Material name] near-surface cloud present – Inhalation hazard

Based only on inhalation effects



- A** Initial Isolation Zone. Evacuation and restricted entry warranted unless protected and involved in emergency response. Estimated population: [pop count]
- B** Protective Action Zone. Evacuation or sheltering should be considered due to increased risk of harmful exposure. Estimated population: [pop count]

Notes

- Due to a lack of required health effect data for this specific material, the Initial Isolation Zone radius has been set to a standard minimum of 15% of the Protective Action Zone extent.
- Exposed individuals risk immediate or delayed serious health effects in these areas, with possible fatalities in or near isolation zone.
- Unprotected emergency workers should not enter isolation zone or evacuation/sheltering areas.
- Establish isolation zone first to control area of operations.
- Prompt evacuation and/or sheltering reduces health risks, including exposures to subsequent evaporation.
- Employ shelter-in-place if evacuating the public would cause greater risk.

Areas shown do not consider potential skin contact risk.

Assumptions:

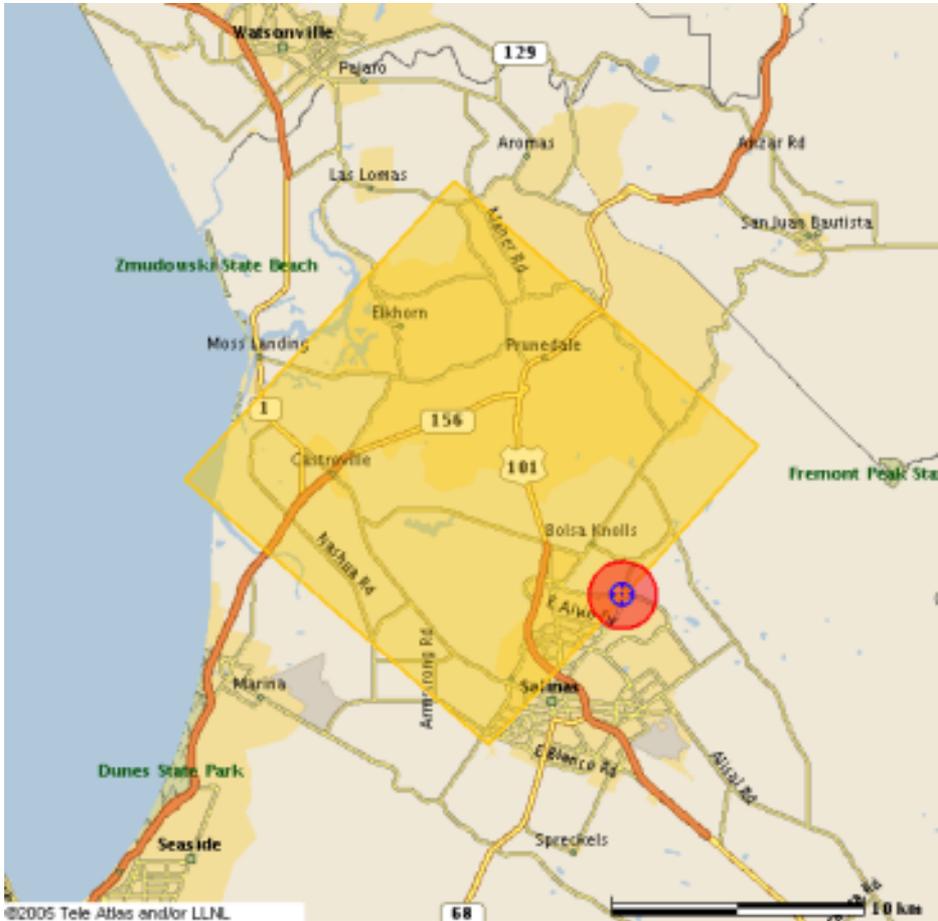
- This is a model prediction based on an estimated source; confirm with measurements or medical diagnosis
- Plume Phase - Chemical cloud may be present or imminent



Set 2: Demonstration
(36.7158,-121.623)
Chemical Release at 14 Jan 2012 19:00 UTC

Predicted Isolation and Protective Action Areas

Areas to consider for restricted entry, evacuation, or sheltering
SARIN near-surface cloud present - Inhalation hazard



-  Initial Isolation Zone. Evacuation and restricted entry warranted unless protected and involved in emergency response. Estimated population: 8580
-  Protective Action Zone. Evacuation or sheltering should be considered due to increased risk of harmful exposure. Estimated population: 79800.

- Notes:**
- Exposed individuals risk immediate or delayed serious health effects in these areas, with possible fatalities in or near isolation zone.
 - Unprotected emergency workers should not enter isolation zone or evacuation/sheltering areas.
 - Establish isolation zone first to control area of operations.
 - Prompt evacuation and/or sheltering reduces health risks, including exposures to subsequent evaporation.
 - Employ shelter-in-place if evacuating the public would cause greater risk.
 - Areas shown do not consider potential skin contact risk.

- Assumptions:**
- This is a model prediction based on an estimated source; confirm with measurements or medical diagnosis.
 - Plume Phase - Chemical cloud may be present or imminent.

Briefing Product for Public Officials
Current: 09 Feb 2012 16:15 UTC
Check for updates

Technical Details: IMAAC 925-424-6465
Federal POC for Advice: EPA/OSC



Predicted Isolation and Protective Action Areas

Areas to consider for restricted entry, evacuation, or sheltering

[Material name] near-surface cloud present – Inhalation hazard

Key Points

- Evacuate or shelter as soon as possible to minimize potentially severe to fatal effects.
- Evacuation before start of potential release affords the greatest protection.
- Sheltering-in-place in Protective Action Zone (PAZ) may be preferable to evacuation if
 - Anticipated release and subsequent evaporation period is shorter than time required to prepare and execute evacuation
 - Populations need special consideration (hospitals/nursing homes)
 - Wind or source conditions are variable, leading to shifting PAZ size and shape
 - **There is a potential significant skin contact health risk.**
- However sheltering-in-place protection may not be the best option under other circumstances
 - When chemical vapors are flammable (**refer to Presenter Notes section**)
 - The vapors are expected to persist for an extended period
 - Buildings (while possibly affording some protection) cannot be tightly closed
- If sheltering, direct those inside to close and stay away from doors/windows, and shut off ventilating/heating/cooling systems. Maintain communications with those sheltered.
- If evacuating, start with those outdoors and nearest to the scene.
- Exposed population outside of these zones may experience notable discomfort. The effects are expected to be reversible upon cessation of exposure.



Predicted Isolation and Protective Action Areas

Areas to consider for restricted entry, evacuation, or sheltering [Material name] near-surface cloud present – Inhalation hazard

Presenter Notes – Additional Information:

- Definitions of the Initial Isolation Zone (IIZ) and the Protective Action Zone (PAZ), and associated actions, are taken from the U.S. Department of Transportation's Emergency Response Guidebook (ERG).
- The PAZ may be modified from the ERG definition when significant wind direction changes occur during the release. Under these conditions the current pattern may appear significantly different than those previously produced.
- The PAZ threshold concentration is based on a [exp. duration] exposure duration, which may produce a predicted Zone area which is too large [small] if actual exposures are for shorter [longer] time periods.
- Approach the scene from upwind, if possible, with emergency workers wearing appropriate protective gear.
- Establish the IIZ first to permit access control to the area of operations.
- When establishing the IIZ, direct persons to move, in a crosswind direction, away from release location and then out of the PAZ.
- When initiating protective actions in the PAZ, begin with those closest to the release location and work away from the site in the downwind direction.
- Contamination exists outside the plotted area, and may exceed the Level 1 Protective Action Criteria (PAC) air concentration (shown on Predicted Public Health PAC Area product) which correlates to areas in which exposed individuals may experience notable, but non-disabling, discomfort and irritation.
- Chemical-specific details (this material's ERG Guide Number and Title are currently unavailable): ERG Guide Number [insert 2008 ERG Guide Number and Name] (see //phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/erg2008_eng.pdf)
 - Flammability Concern. [if known, insert NFPA Fire Hazard Classification and associated wording]
 - This gas is heavier than air and could pool in holes or depressions, causing local increased air concentrations near the surface. This effect is not reflected in these calculations.
- Refer to the accompanying Emergency Worker Protection Areas product for additional worker response information, with levels of Personal Protective Equipment recommendations from the Centers for Disease Control and Prevention (CDC) National Institute for Occupational Safety and Health (NIOSH).

Presenter Notes - Technical Background:

- Air concentration levels used to define the Initial Isolation Zone (IIZ) and the Protective Action Zone (PAZ), and associated suggested actions, are based on the general methodology given in the U.S. Department of Transportation's Emergency Response Guidebook (ERG).
- For these calculations however, downwind air concentrations are always calculated as the maximum concentration of 15-minute averages at the location, which may in some cases provide additional conservatism.
- The IIZ and PAZ extents found in the ERG are based on modeling of pre-calculated scenarios. The extents depicted here are based on modeling using event-specific release and meteorological parameters.
- The IIZ is defined by the downwind extent of the experimentally-determined animal median fatal air concentration (LC50) in animal studies for a 1-hour exposure period for this chemical (if available), but in all cases is modified to be not less than 15% of the Protective Action Zone extent for gases, or not less than 7.5% of the Protective Action Zone extent for liquids.
- The IIZ is based solely on inhalation toxicity and does not account for the possible explosive or flammable nature of the material. In some cases this may result in smaller IIZ distances than corresponding evacuation distance guidelines given in the Orange Guide pages found in the ERG.
- The PAZ extent (evacuation or sheltering area) is defined by using a hierarchy of the EPA AEGL-2 for 1-hr exposure (preferred), the AIHA ERPG-2 air concentration level, or the SCAPA TEEL-2 value. If none of these are available then 1% of the animal-based lethal air concentration level is used. (Note, the ERG protocol does not include TEEL values in this hierarchy.) In this case the [name of threshold used] value was used.
- Additional chemical-specific information (e.g. physical properties, personal protection, respirator recommendations, first aid, etc.) may be found in the Centers for Disease Control and Prevention (CDC) National Institute for Occupational Safety and Health (NIOSH) Emergency Response Safety and Health Database at http://www.cdc.gov/NIOSH/ershdb/index_name.html
- Auxiliary detailed information for toxic industrial chemicals with links to the Department of Transportation's Emergency Response Guidebook chemical-specific guides (http://hazmat.dot.gov/pubs/erg/erg2008_eng.pdf) can be found in the NIOSH Pocket Guide to Chemical Hazards (<http://www.cdc.gov/niosh/npg/default.html>). Fact Sheets for chemical weapon agents, and other chemicals, designed for non-technical audiences are found at <http://emergency.cdc.gov/chemical>.

Briefing Product for Public Officials

Current: [insert time and date]

Check for updates

Technical Details: IMAAC 925-424-6465

Federal POC for Advice: EPA/OSC XXX-XXX-XXXX

Chemical Briefing Product: Predicted Public Health Protective Action Criteria (PAC) Areas

- Based on pre-existing technical product generated for either toxic industrial chemicals or chemical agents
- Shows areas for each of the three the following Protective Action Criteria air concentration levels:
 - PAC-3 – Life-threatening health effects
 - PAC-2 – Irreversible or serious health effects
 - PAC-1 – Mild, transient health effects
- PAC level values are chosen from one of following guidelines (in order of priority):
 - 60-minute AEGL (Acute Exposure Guideline Level from US EPA)
 - ERPG (Emergency Response Planning Guideline from American Industrial Hygiene Association)
 - TEEL (Temporary Emergency Exposure Limit from US DOE)
- Not directly associated protective action guidance, only related health effects
 - PAC-2 level serves as the basis for the Protective Action Zone (PAZ)
 - PAC-1 level is related to the outer Personal Protective Equipment level but may use a different exposure period
- Available for any material that has PAC values (currently using DOE PAC Revision 27, March 2012)
- Based on model-calculated 15-minute running peak average air concentrations



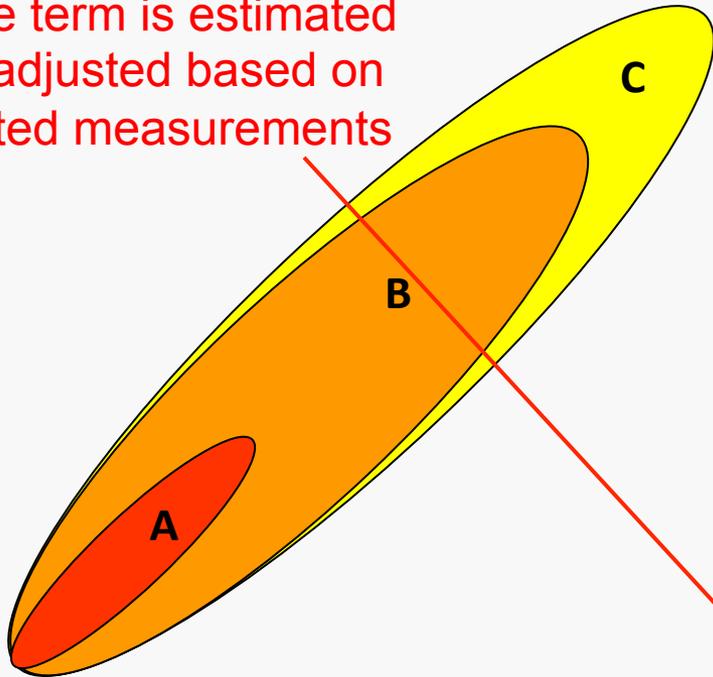
[Product Set #:] [Event Category]
 [Location Name and/or Coordinates]
 [Event Type] at [Date/Time]

Predicted Public Health Protective Action Criteria (PAC) Areas

Areas exceeding harmful vapor air concentration exposure limits

[Material name] near-surface cloud present – Inhalation hazard

All products have a statement indicating if the source term is estimated or is adjusted based on reported measurements



A	PAC-3 (exceeds [conc level] ppm). Life-threatening health effects. Estimated population: [pop count]
B	PAC-2 (exceeds [conc level] ppm). Irreversible or serious health effects that could impair ability to take protective action. Estimated population: [pop]
C	PAC-1 (exceeds [conc level] ppm). Mild, transient health effects. Estimated population: [pop count]

Notes:

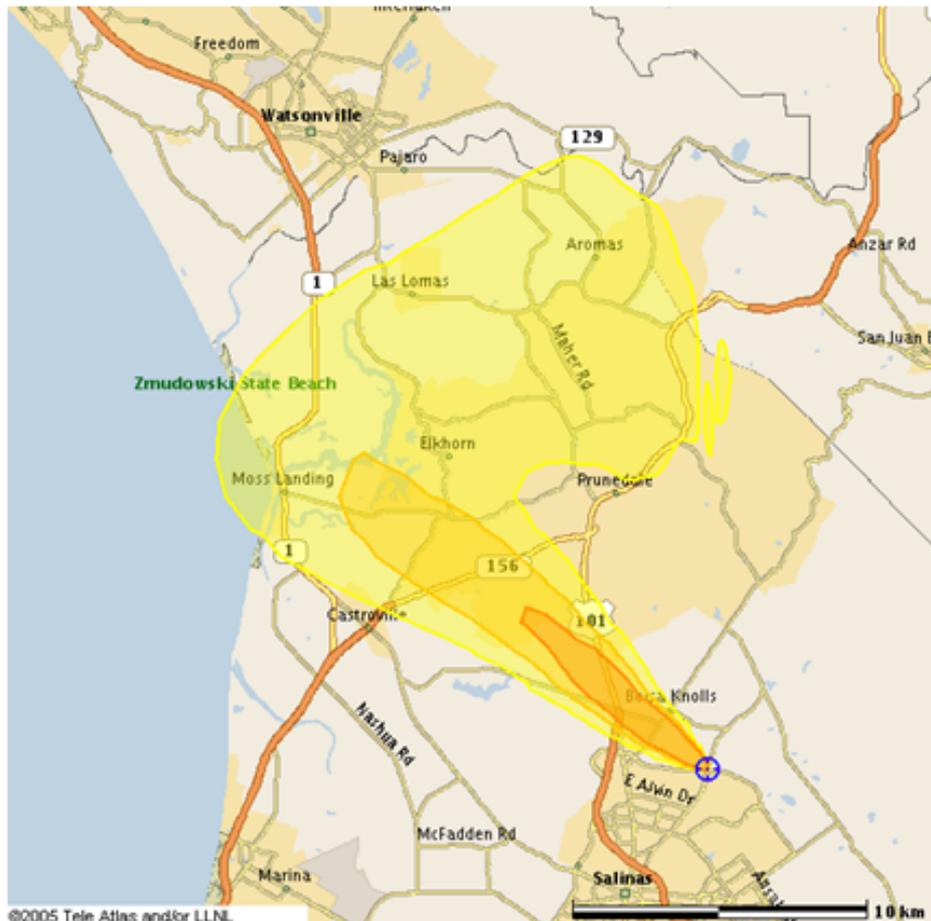
- Refer to accompanying Predicted Isolation and Protective Action Areas product for warranted protective actions.
- Refer to Emergency Worker Protection Areas product for NIOSH-recommended personal protective equipment.
- Prompt evacuation and/or sheltering reduces health risks, including exposures to subsequent evaporation.
- Predicted effects are for an unprotected, unsheltered general population from initial plume passage
- Based on threshold concentrations for stated health effects. Effects are not universal across all populations.
- **Areas shown do not consider potential skin contact risk.**

Assumptions:

- This is a model prediction based on an estimated source; confirm with measurements or medical diagnosis
- Plume Phase - Chemical cloud may be present or imminent

Predicted Public Health Protective Action Criteria (PAC) Areas

Areas exceeding harmful vapor air concentration exposure limits
SARIN near-surface cloud present - Inhalation hazard



	PAC-3 (exceeds 0.02 ppm). Life-threatening health effects. Estimated population: 6580
	PAC-2 (exceeds 0.006 ppm). Irreversible or serious health effects that could impair ability to take protective action. Estimated population: 11900
	PAC-1 (exceeds 0.0005 ppm). Mild, transient health effects. Estimated population: 33900

Notes:

- Refer to accompanying Predicted Isolation and Protective Action Areas product for warranted protective actions.
- Refer to Emergency Worker Protection Areas product for NIOSH-recommended personal protective equipment.
- Prompt evacuation and/or sheltering reduces health risks, including exposures to subsequent evaporation.
- Predicted effects are for unprotected, unsheltered general population from initial plume passage
- Based on threshold concentrations for stated health effects. Effects are not universal across all populations.
- Areas shown do not consider potential skin contact risk.

Assumptions:

- This is a model prediction based on an estimated source; confirm with measurements or medical diagnosis
- Plume Phase - Chemical cloud may be present or imminent



Predicted Public Health Protective Action Criteria (PAC) Areas

Areas exceeding harmful vapor air concentration exposure limits

[Material name] near-surface cloud present – Inhalation hazard

Key Points

- Refer to accompanying Predicted Isolation and Protective Action Areas product for appropriate protective actions based on U.S. Dept. of Transportation Emergency Response Guide definitions and methodology, which uses the PAC-2 level to define a Protective Action Zone.
- Unprotected emergency response workers should not approach the hazard areas shown. Refer to accompanying Emergency Worker Protection Areas product which presents information on appropriate personal protective equipment.
- Due to uncertainties, individuals outside the hazard areas shown could be exposed to harmful vapor concentrations.
- **Initial plume is expected to pass through the contoured area by [insert time and date] however resuspension or evaporation of residual material may continue in these areas.**
- Effects are calculated based on initial plume passage and do not include subsequent effects due to evaporation or resuspension; confirm with measurements.
- Protective Action Criteria (PAC) threshold concentrations are based on published U. S. EPA AEGL, American Industrial Hygiene Association ERPG, or Department of Energy TEEL values.
- AEGL, ERPG, and TEEL PAC values serve the same general purpose...to assist those who are responsible for planning for and responding to chemical emergencies.



Predicted Public Health Protective Action Criteria (PAC) Areas

Areas exceeding harmful vapor air concentration exposure limits [Material name] near-surface cloud present – Inhalation hazard

Presenter Notes – Additional Information:

- Protective Action Criteria (PAC) levels typically define up to three areas of increasingly severe health-related effects.
- PAC include levels of interest defined by the U.S. Environmental Protection Agency (Acute Exposure Guideline Levels, AEGLs), the American Industrial Hygiene Association (Emergency Response Planning Guidelines, ERPGs), or the U.S. Department of Energy's Subcommittee on Consequence Assessment and Protective Actions (Temporary Emergency Exposure Limits, TEELs).
- [PAC type] are used to define the PAC shown in this product.
- Contamination exists outside the contoured areas, but is not predicted to reach the published Level 1 PAC threshold.
- One or more PAC thresholds may not be shown if predicted air concentrations do not reach these levels.
- Depiction of these effects levels provides assistance to emergency planners and responders in prioritizing resources and activities.
- Protective actions may be initiated over larger areas and at lower contamination/dose levels if advantageous, for example, in order to account for uncertainties in the predicted dose and mapped areas, and/or to use convenient boundaries, such as roads.

Presenter Notes - Technical Background:

- Air concentrations are calculated as the maximum concentration of 15-minute averages at the location.
- Using shorter time-averaged air concentrations with longer exposure period PACs is an accepted practice providing conservative estimates based on more accurate PACs.
- There are subtle differences in the definitions of the PAC thresholds (AEGLs, ERPGs, and TEELs). [ORISE]
 - AEGLs are developed by the U.S. Environmental Protection Agency and are the preferred PAC
 - Pertain to the general population, including susceptible individuals
 - Define levels above which certain health effects are expected
 - If available, AEGLs for exposure durations of 60 minutes are used
 - May use defined interim values, if not yet accepted as final
 - ERPGs are developed by the American Industrial Hygiene Association, and are used in the absence of AEGLs for the chemical of interest
 - Pertain to nearly all individuals
 - Define levels below which certain health effects are not expected
 - Normally refer to exposure durations of 60 minutes
 - TEELs are developed by the DOE Subcommittee on Consequence Assessment and Protective Actions, and are used in the absence of AEGLs and ERPGs
 - Pertain to nearly all individuals
 - Define levels below which certain health effects are not expected
 - Refer to peak 15-minute time-weighted average concentrations
- [ORISE] <http://orise.orau.gov/emi/scapa/teels.htm>, provides additional background PAC information

Chemical Briefing Product: Predicted Emergency Worker Protection

- Shows areas where worker use of Personal Protective Equipment (PPE) may be warranted based on CDC NIOSH (Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health) criteria:
 - Area where Level A/B PPE may be warranted based on (in order of preference) IDLH, 30-minute AEGL-2, other-exposure-period AEGL-2, ERPG-2, or TEEL-2 air concentration levels
 - Area where Level C PPE may be warranted based on (in order of preference) 30-minute AEGL-1, other-exposure-period AEGL-1, ERPG-1, or TEEL-1 air concentration levels
- If no IDLH (Immediately Dangerous to Life or Health) or PAC air concentration levels available, a blank product with text message is created indicating unavailability of effects levels
- Based on model-calculated 15-minute running peak average air concentrations



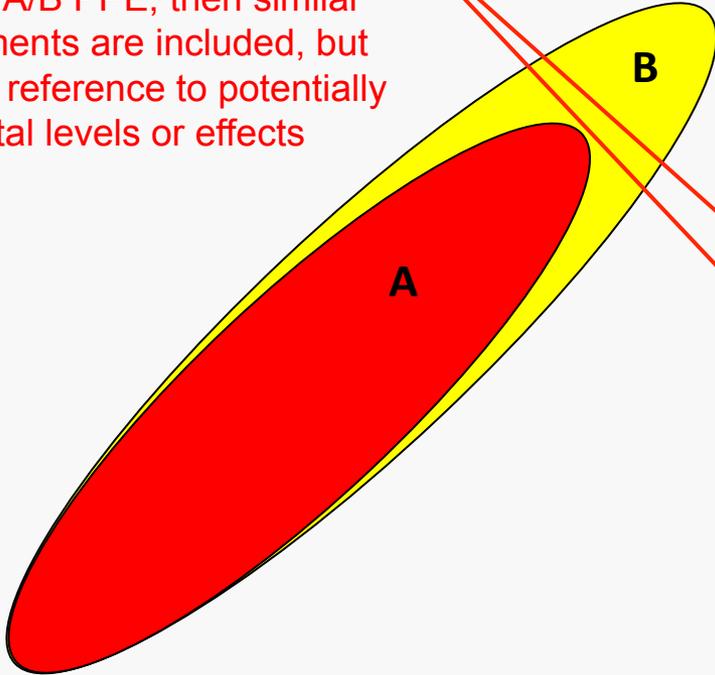
States exposure **Classification**
period corresponding
to IDLH or PAC levels used

[Product Set #:] [Event Category]
[Location Name and/or Coordinates]
[Event Type] at [Date/Time]

Predicted Emergency Worker Protection Based on **30-min** Exposure

Use of personal protective equipment (PPE) by emergency workers is recommended
[Material name] near-surface cloud present – Inhalation hazard

If predicted concentrations are not high enough to reach Level A/B PPE, then similar statements are included, but without reference to potentially fatal levels or effects



A	Area where maximum respiratory PPE (Level A/B) is NIOSH-recommended for emergency workers, along with careful supervision and monitoring. (Level B affords less skin protection.) Exceeds IDLH ([conc])
B	Area where reduced (Level C) PPE is NIOSH-recommended for workers, with careful supervision and monitoring. Exceeds AEGL-1 ([conc level]). <u>Use Level A PPE if concentrations are not confirmed!</u>

Notes:

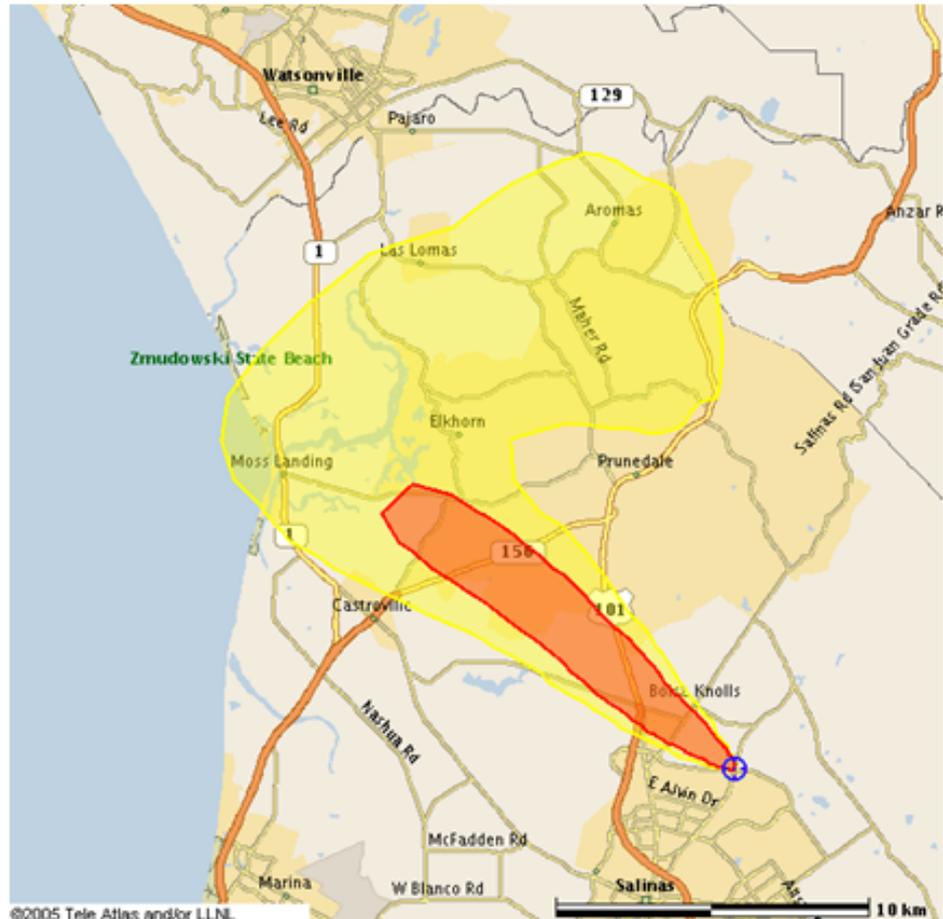
- Unprotected emergency response or medical personnel should not approach these areas without appropriate PPE.
- Severe or potentially fatal concentration levels may exist within these areas, especially close to the release.
- Unprotected individuals exposed for 30 minutes or more in these areas may develop mild, transient health effects to irreversible or serious effects that could impair ability to escape, and may also risk potentially fatal effects.
- Refer to NIOSH Emergency Response Safety and Health Database list of chemical properties and recommended PPE: http://www.cdc.gov/NIOSH/ershdb/index_name.html

Assumptions:

- This is a model prediction based on an estimated source; confirm with measurements
- Plume Phase - Chemical cloud may be present or imminent

Predicted Emergency Worker Protection Based on 30 min Exposure

Use of personal protective equipment (PPE) by emergency workers is recommended
SARIN near-surface cloud present - Inhalation hazard



Area where maximum respiratory PPE (Level A/B) is NIOSH-recommended for emergency workers, along with careful supervision and monitoring. (Level B affords less skin protection.) Exceeds 30 min AEGL-2 (0.009 ppm)

Area where reduced (Level C) PPE is NIOSH-recommended for workers, with careful supervision and monitoring. Exceeds 30 min AEGL-1 (0.0007 ppm). Use Level A PPE if concentrations are not confirmed!

Notes:

- Unprotected emergency response or medical personnel should not approach these areas without appropriate PPE.
- Severe or potentially fatal concentration levels may exist within these areas, especially close to the release.
- Unprotected individuals exposed for 30 min or more in these areas may develop mild, transient health effects to irreversible or serious effects that could impair ability to escape, and may also risk potentially fatal effects.
- Refer to NIOSH Emergency Response Safety and Health Database list of chemical properties and recommended PPE:
http://www.cdc.gov/NIOSH/ershdb/index_name.html

Assumptions:

- This is a model prediction based on an estimated source; confirm with measurements.
- Plume Phase - Chemical cloud may be present or imminent.



Predicted Emergency Worker Protection Based on 30-min Exposure

Use of personal protective equipment (PPE) by emergency workers is recommended

[Material name] near-surface cloud present – Inhalation hazard

Key Points

- Responders should use “Level A” NIOSH-approved Chemical, Biological, Radiological, Nuclear (CBRN) Self Contained Breathing Apparatus with Totally-Encapsulating suits if entering an area with unknown contaminant or unconfirmed contaminant concentration.
- “Level A” or “Level B” PPE should be used for planned entry for air concentrations at or above NIOSH Immediately Dangerous to Life and Health (IDLH) air concentration levels.
- Where monitored air concentration is below the IDLH, Level C PPE may be sufficient if certain respiratory criteria are met, and would be suitable for decontaminating victims.
- See <http://www.cdc.gov/niosh/npptl/default.html> respirator selection guidance.
- Consider extending use of Level A/B PPE to Protection Action Zone shown on the Predicted Isolation and Protective Action Areas slide.
- Emergency Worker Protection Areas are based on the NIOSH IDLH and EPA’s 30-min Acute Exposure Guideline Level (AEG1).
- Contamination exists outside the contoured areas, but is not predicted to reach the published 30-minute AEG1 threshold concentration; confirm with measurements.
- Calculations are based on initial plume passage and do not include any effects from subsequent resuspension, or evaporation of deposited material.
- Engage assistance of industrial hygienist professionals ASAP.



Predicted Emergency Worker Protection Based on 30-min Exposure

Use of personal protective equipment (PPE) by emergency workers is recommended

[Material name] near-surface cloud present – Inhalation hazard

Presenter Notes – Additional Information:

- Refer to NIOSH Emergency Response Safety and Health Database for detailed chemical-specific information tailored for the emergency response community (<http://www.cdc.gov/NIOSH/ershdb/about.html>)
- The Immediately Dangerous to Life or Health (IDLH) level (or alternate A/B PPE plotted level), based on no escape within 30 minutes, poses a threat of exposure to airborne contaminants that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment.
- The Occupational Safety and Health Administration (OSHA) respiratory protection standard [29 CFR 1910.134e] requires that only “planned” entries be made into IDLH conditions by trained personnel, and that a standby person be present with suitable rescue equipment when self-contained breathing apparatus or hose masks with blowers are used in IDLH conditions. Furthermore, persons using air-line respirators in conditions exceeding IDLH levels must be equipped with safety harnesses and safety lines for lifting or removing workers from hazardous conditions.
- “Level A protection is generally needed when the active release is still occurring, or the release has stopped but there is no information about the duration of the release or the airborne concentrations of CBRN agents.”*
- Predicted air concentrations do not reach levels high enough for NIOSH-recommended level A/B PPE.
- Contamination exists outside the contoured areas, but is not predicted to reach the published [insert contour level name] threshold.
- “Site control is an important part of managing any emergency response operation & the DOT Emergency Response Guidebook provides for an Initial Isolation Zone where dangerous or life threatening concentrations of a substance may exist or a Protective Action Zone where serious or irreversible health effects may be seen.”* (Refer to accompanying Predicted Isolation and Protective Action Areas product.
- “Other prudent work practices should include minimizing exposure time to that essential for lifesaving or initial monitoring, avoiding any unnecessary contact with surfaces or potentially contaminated material, use of natural ventilation flows to reduce exposure, mandatory decontamination and post exit evaluation for signs and symptoms of exposure.”*
- *Quoted from OSHA:
<http://www.osha.gov/SLTC/emergencypreparedness/cbrnmatrix/index.html>

Presenter Notes - Technical Background:

- A hierarchy of Protection Action Criteria (PAC) or Immediately Dangerous to Life and Health (IDLH) exposure thresholds are used to depict these Worker Protection Areas. In order of preference PACs are determined from:
 - NIOSH IDLH value
 - U.S. Environmental Protection Agency AEGLs (30-minute values preferred)
 - American Industrial Hygiene Association ERPGs
 - U.S. Department of Energy TEELs
- Details of PPE hazard levels, decontamination and mitigation methods, etc. are found in the National Fire Protection Association (NFPA) Recommended Practice for Responding to Hazardous Materials Incidents (NFPA Publication 471)
 - PPE is comprised of appropriate respiratory protective equipment, chemical-protective clothing, and thermal-protective suits. Levels referred to on this product pertain principally to respiratory protection.
 - Possible incident mitigation techniques are dependent on the type of hazardous material, its physical state, the release mechanism, and whether physical or chemical mitigation methods are most appropriate under the specific circumstances.
 - Personnel and equipment decontamination may be required. Decontamination methods and procedures should be established based on the hazards present prior to entry into the areas shown, unless rescue may be possible and emergency decontamination is available.
 - Response personnel should be medically monitored to 1) obtain baseline vital signs and physical assessment, 2) identify and preclude from participation individuals at increased risk as a result of on-scene activities, 3) provide early recognition and treatment of personnel with adverse physiological responses as a result of on-scene activities.
- NFPA Classes 1, 2, and 3 CBRN ensemble PPE are appropriate for use under conditions associated here with Levels A, B, and C PPE, respectively.
- Air concentrations are calculated as the maximum concentration of 15-minute averages at the location.
- Using shorter time-averaged air concentrations with longer exposure period PACs is an accepted practice providing conservative estimates based on more accurate PACs.

Technical Details: IMAAC 925-424-6465

Federal POC for Advice: EPA/OSC XXX-XXX-XXXX

Briefing Product for Public Officials

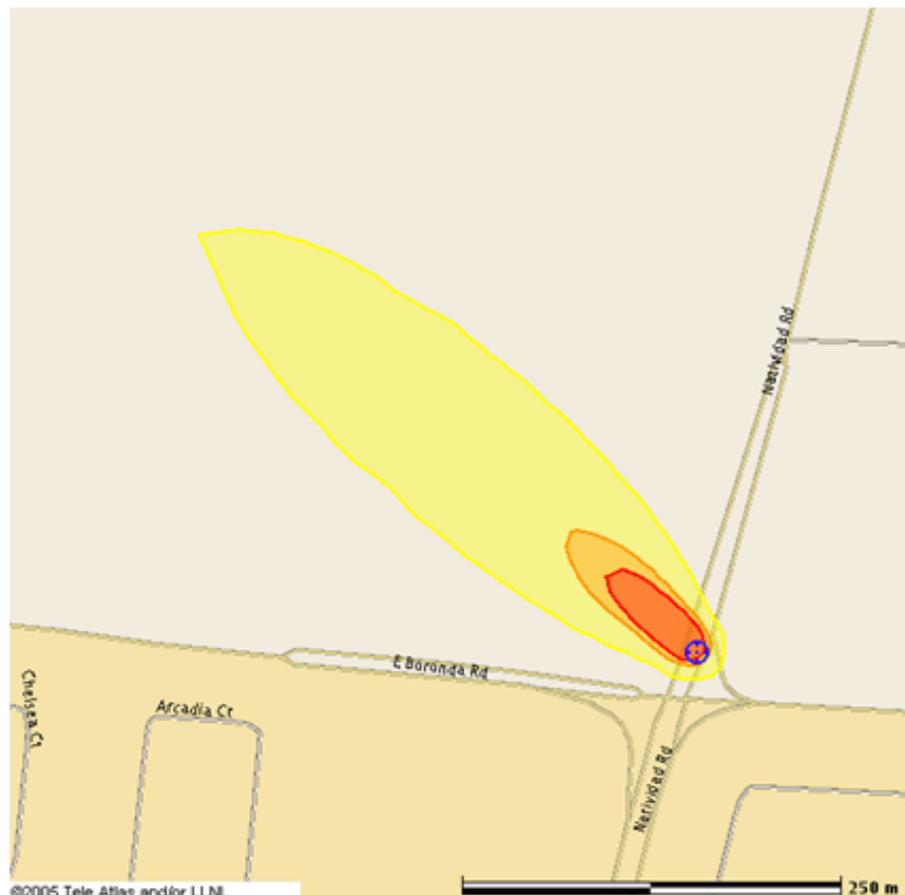
Current: [insert time and date]

Check for updates

New Chemical Warfare Agent Technical Product: Predicted Liquid-Skin Contact Effects

- Shows areas where dissemination of liquid droplets (e.g. sprayer release) could produce severe and fatal health effects through deposit on, and absorption by, exposed skin
- Uses a probit analysis to define three areas-of-concern:
 - Fatalities in more than 50% of exposed population
 - Severe health effects in more than 50% of population
 - Severe health effects in more than 2% of population
- Based on Edgewood Chemical Biological Center (ECBC) reports for Tabun, Sarin, Soman, Cyclosarin, VX and Sulfur Mustard
- Assumes exposed skin on head, neck, upper extremities, and half of the trunk using ICRP23 Reference Man estimates (equivalent to 0.9 m² per person)

Predicted Liquid-Skin Contact Effects
 (Areas exceeding harmful liquid droplet deposition thresholds)



Effects and Actions			
	Description	(mg) Extent Area	Population
	Greater than 50% fatalities expected in exposed general population.	>750 78.5m 1,999 m ²	0
	Greater than 50% of exposed general population expected to develop severe health effects.	>440 116m 3,898 m ²	0
	Greater than 2% of exposed general population expected to develop severe health effects.	>51 433m 39,527 m ²	0
Areas and counts in the table are cumulative. Population Source = LandScan USA V1.0.			

Effects or contamination at January 14, 2012 23:00 UTC
Release Location: 36.715775 N, 121.623420 W
Material: SARIN
Generated On: February 02, 2012 18:26 UTC
Model: ADAPT/LODI
Comments: Hypothetical release
 of 513.89 kg starting at
 01/14/2012 11:00:00 PST for 35 min 9 sec
 met obs

©2005 Tele Atlas and/or LLNL

Map Size: 600 m by 600 m **Id:** ProductionT.rcE17636.rc1
 NARAC Operations: (onDuty Assessor); narac@llnl.gov; 925-424-6465
 Requested by: (Connee Foster (mgr); NARAC – Operations; 925-422-1867)
 Not approved for further distribution

Biological Briefing Product: Predicted Biological Agent Infection Areas Due to Airborne Plume

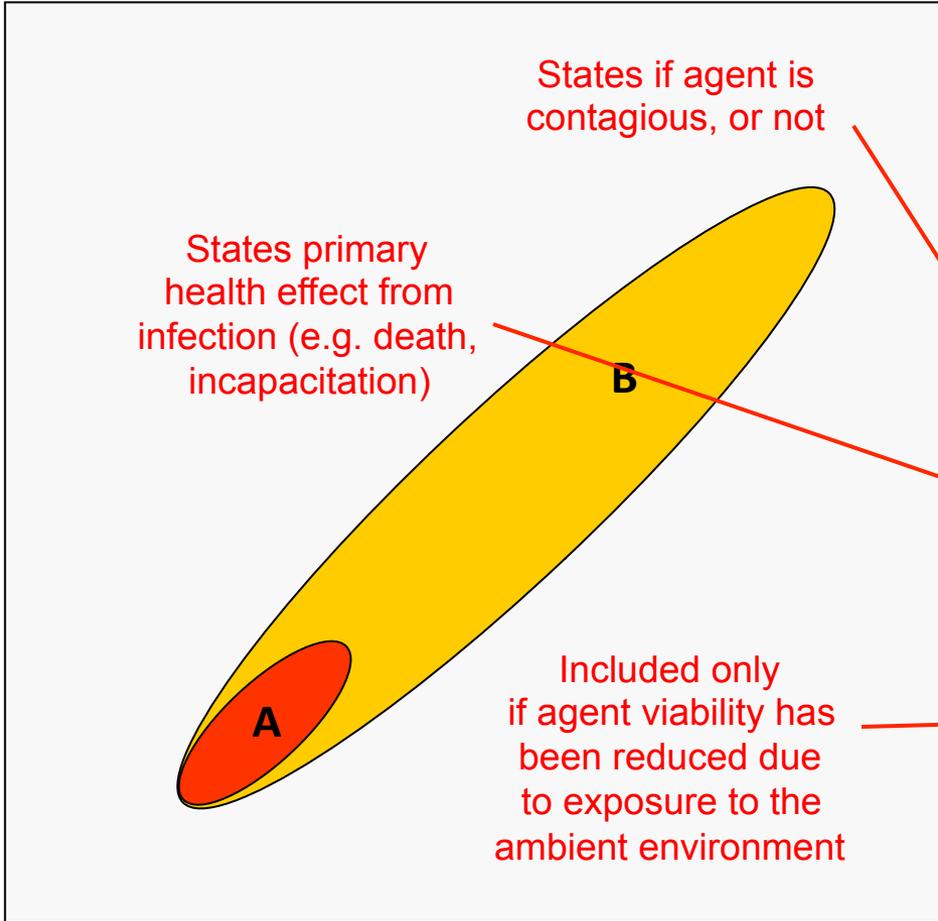
- Uses a probit analysis to define two areas-of-concern:
 - Infections in most (more than 50%) of exposed population
 - Approximate extent of infections (more than 2%) of exposed population
- Only accounts for direct inhalation during plume passage (does not model person-to-person transmission if contagious)
- General lack of published agency actionable guidance (contoured area in terms of health effects)
 - Guidance based on NSTC (National Science and Technology Council) and ECBC sources
 - Consistent with BioWatch reports
- Based on data from 1950's-1960's U.S. Weapons Programs
- Based on integrated air concentration and associated agent inhaled during entire plume passage



[Product Set #:] [Event Category]
 [Location Name and/or Coordinates]
 [Event Type] at [Date/Time]

Predicted Bio-Agent Infection Areas Due To Airborne Plume

Areas exceeding potentially infectious air concentrations
[Material name] near-surface cloud present – Continuing inhalation hazard



- | | |
|----------|--|
| A | Expect infections in most of the exposed, untreated population (exceeds [conc level] CFU-min/m ³). Estimated total population: [pop count] |
| B | Approximate extent where infectious levels of airborne organisms are likely (exceeds [conc level] CFU-min/m ³). Est. total population: [pop count] |

Notes

- Populations in areas shown may be exposed to infection from inhalation of an aerosolized biological agent.
- Agent is **not** contagious. Infections can be spread beyond these areas through human contact (effects not included).
- Establishment of access control of an area at least 25 m (75 ft) from release site is warranted.
- [insert primary health effect summary]
- Prompt medical care may greatly reduce health risks.
- Sheltering-in-place during plume passage may reduce infection rate from airborne plume.
- Predicted health effects are for an unprotected/unsheltered population from initial plume passage.
- Prediction includes environmental degradation effects on agent viability.

Assumptions:

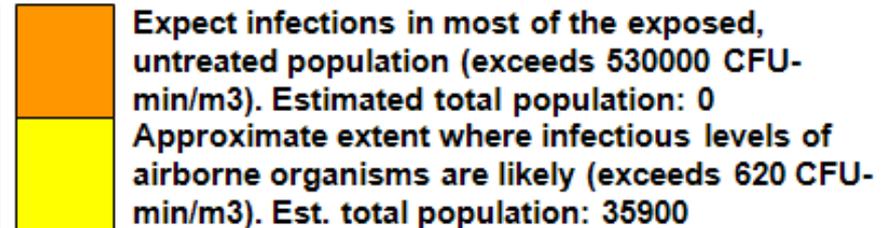
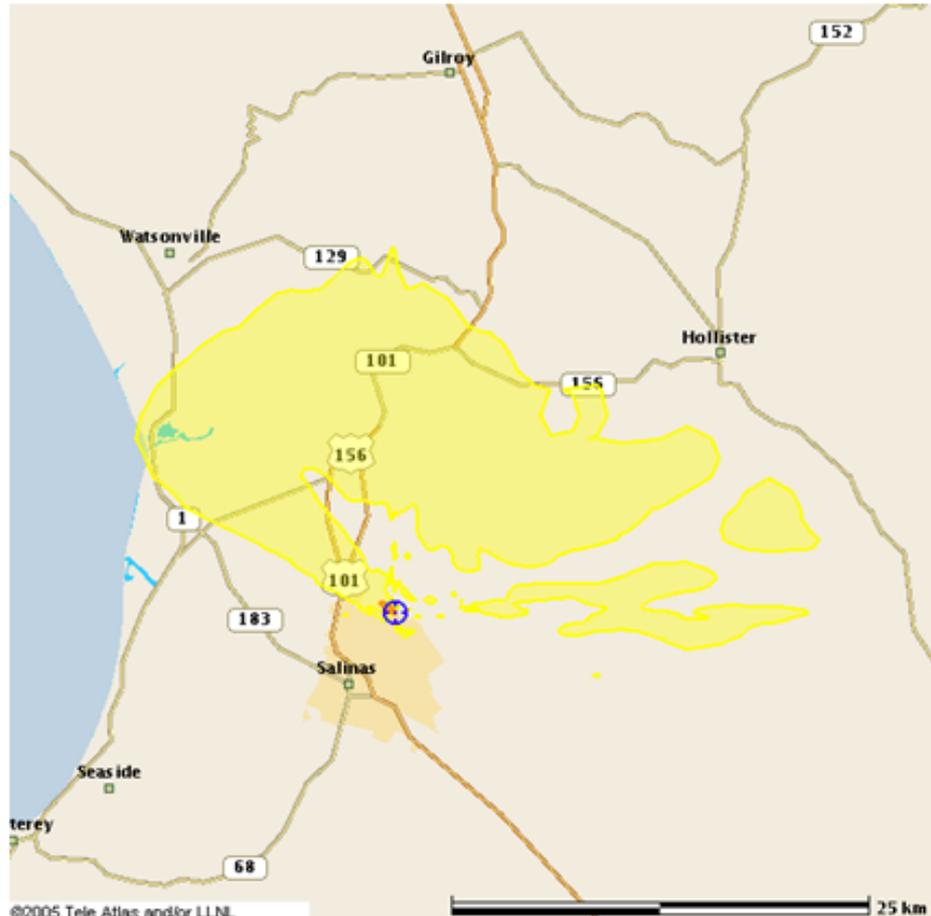
- This is a model prediction based on an estimated source; confirm with measurements or medical diagnosis.
- Plume Phase – Biological agent cloud poses inhalation risk



Set 2: Demonstration
 (36.7158,-121.623)
 Biological Agent Release at 14 Jan 2012 19:00 UTC

Predicted Bio-Agent Infection Areas Due To Airborne Plume

Areas exceeding potentially infectious air concentrations
ANTHRAX-DRY near-surface cloud present - Continuing inhalation hazard



Notes:

- Populations in areas shown may be exposed to infection from inhalation of an aerosolized biological agent.
- Agent is not contagious.
- Establishment of access control of an area at least 25 m (75 ft) from release site is warranted.
- Nearly all untreated inhalation pathway infections may result in fatalities.
- Prompt medical care may greatly reduce health risks.
- Sheltering-in-place during plume passage may reduce infection rate from airborne plume.
- Predicted health effects are for an unprotected/unsheltered population from initial plume passage.
- Prediction includes environmental degradation effects on agent viability.

Assumptions:

- This is a model prediction based on an estimated source; confirm with measurements.
- Plume Phase - Biological agent cloud poses inhalation risk.

Briefing Product for Public Officials
 Current: 09 Feb 2012 16:44 UTC
 Check for updates

Technical Details: IMAAC 925-424-6465
 Federal POC for Advice: EPA/OSC



Predicted Bio-Agent Infection Areas Due To Airborne Plume

Areas exceeding potentially infectious air concentrations

[Material name] near-surface cloud present – Continuing inhalation hazard

Key Points

- Infection should be confirmed by medical diagnosis
- Public health officials should consider initiating heightened disease surveillance.
- Use of prophylaxis **and isolation or quarantine** may be warranted; consult with public health officials ASAP.
- Air concentrations of agent in the respirable size range are sufficient to cause infections in the general population. Effects are calculated for outdoor populations.
- Each contoured area corresponds to a different infection rate level and is shown only if the corresponding air concentrations are reached.
- Due to uncertainties, individuals outside these hazard areas could become infected.
- Appropriate personal protective equipment (PPE) is needed for all emergency response personnel entering the hazard areas. Refer to <http://www.cdc.gov/niosh/docs/2009-132>.
- Agent is **not** contagious. **Infections can spread beyond these areas via human contact.**
- Percentage of infections due to airborne plume is expected to increase nearer the source location.
- Agent characteristics and employment will affect agent viability, environmental stability, and health consequence severity, beyond assumed levels.



Predicted Bio-Agent Infection Areas Due To Airborne Plume

Areas exceeding potentially infectious air concentrations

[Material name] near-surface cloud present – Continuing inhalation hazard

Presenter Notes – Additional Information:

- Use of prophylaxis (and isolation or quarantine, if contagious) may be warranted; consult with public health officials ASAP.
 - Agencies may recommend use of agent-specific prophylaxis for likely exposed persons, first responders, medical staff, and others having contact with exposed persons. Appropriate distribution and administration may be needed. * [BW-IRP]
 - Agencies may recommend that confirmed cases be isolated at home with prophylaxis administered. However, large outbreaks may require centralized neighborhood clinics to triage and advise the worried well and infected victims. * [BW-IRP]
- Other possible actions that may be taken by public health officials:
 - Assessment of the need to conduct environmental sampling of air, water, soil, exposed surfaces, animals, insects, and plants, as applicable. * [BW-IRP]
 - Assessment of the need to perform vector and animal control, as applicable. * [BW-IRP]
 - Consult with U.S. Food and Drug Administration officials on precautions to reduce potential contamination of food/feed.
- General guidance for accidental releases of infectious agents may be found in the U.S. Department of Transportation's 2008 Emergency Response Guidebook, Guide Number 158 (pages 262-263):
http://phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/erg2008_eng.pdf
- Protective actions may be initiated over larger areas and at lower contamination/dose levels if advantageous, for example, in order to account for uncertainties in the predicted dose and mapped areas, and/or to use boundaries, such as roads, that are convenient.
- Decrease in agent viability over time due to solar ultraviolet radiation exposure is included in these calculations, as appropriate for this agent and release scenario.

-
- * [BW-IRP] The Biological Weapon Improved Response Program Updated BW Response Decision Tree and BW Response Template (2001):
http://www.edgewood.army.mil/hld/bwirp/bwirp_updated_decision_tree_report_download.htm

Presenter Notes - Technical Background:

- Infectious areas based on predictions of total agent inhaled and retained during plume passage, using an assumed breathing rate of 15 liters/minute. Effects of agent resuspension, and contamination by tracking or surface contact are not included.
- Infectious dose rate can vary significantly by agent strain and different preparation and dissemination methods.
- Area where most individuals will be infected is based on 50% infection rate threshold for military populations. This area will not be shown if the maximum predicted air concentrations do not reach the 50% infection rate level.
- Approximate extent of area where infection is likely, if shown, is based on the military 2% infection rate threshold in the exposed population.
- The 2% probability level for likely infections is determined from probit-slope statistical calculations using the ICt50 (dose which causes infection in 50% of the exposed individuals). As such, the associated extent of this area should be treated as more approximate than those based directly on the ICt50. Some studies indicate infections are possible at much lower concentrations. Some individuals outside this area may become infected.
- Agent specific information
 - This is a CDC category [X] biological agent.
 - [insert health effects text]
 - [insert transmission text]
 - [insert environmental degradation text]
 - [insert treatment text]
- Additional background information on this agent can be found at these Centers for Disease Control and Prevention (CDC) web pages:
<http://emergency.cdc.gov/bioterrorism/factsheets.asp> or
<http://www.bt.cdc.gov/agent/agentlist.asp>

Briefing Product for Public Officials

Current: [insert time and date]

Check for updates

Technical Details: IMAAC 925-424-6465

Federal POC for Advice: EPA/OSC XXX-XXX-XXXX

Biological Briefing Product: Predicted Biological Toxin Life-Threatening Effects Areas

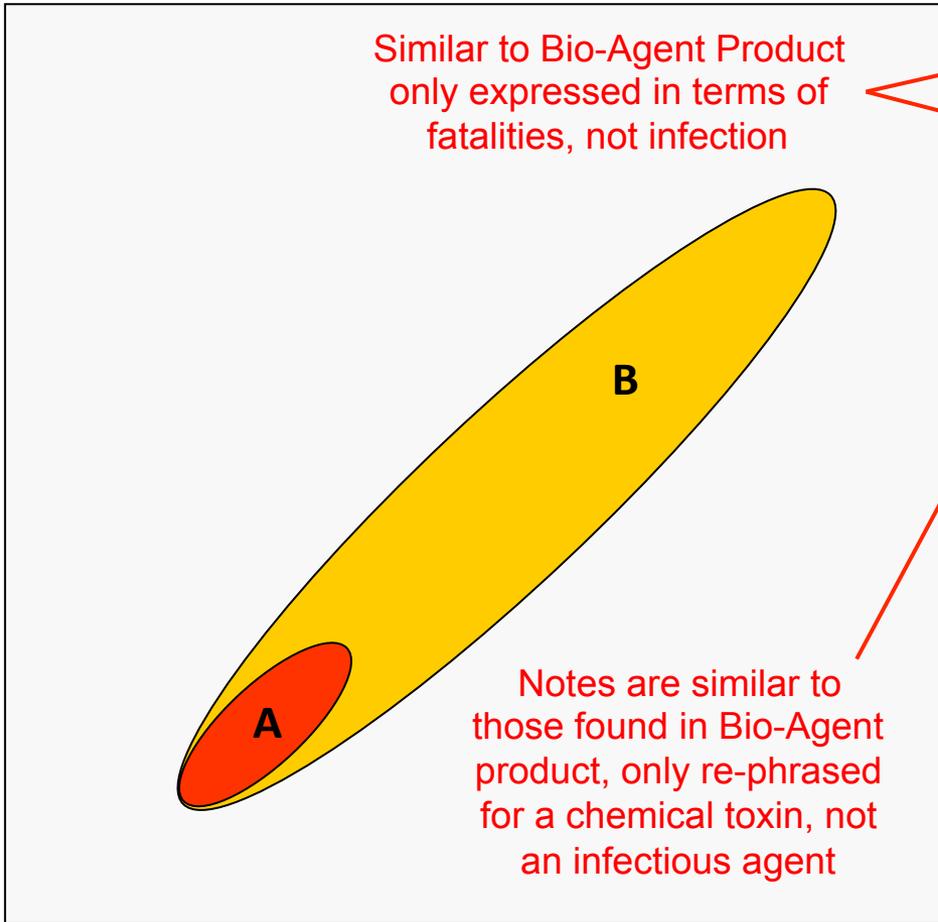
- Uses a probit analysis to define two areas-of-concern:
 - Life-threatening concentrations resulting in more than 50% fatalities
 - Approximate extent of life-threatening concentrations (more than 2% fatalities)
- Applied to Ricin, Botulinum Toxin, and SEB
- Based on data from 1950's-1960's U.S. Weapons Programs
- Based on integrated air concentration and associated toxin inhaled during entire plume passage
- New technical product added to the original CB Briefing Product set
 - Mix of biological and chemical features
 - Combined text from other chemical and biological pre-designed Briefing Products
 - Needs additional external review



[Product Set #:] [Event Category]
[Location Name and/or Coordinates]
[Event Type] at [Date/Time]

Predicted Bio-Toxin Life-Threatening Effects Areas

Areas exceeding fatal air concentration exposure limits
[Material name] near-surface cloud present – Inhalation hazard



Similar to Bio-Agent Product only expressed in terms of fatalities, not infection

Notes are similar to those found in Bio-Agent product, only re-phrased for a chemical toxin, not an infectious agent

- A** → Expect life-threatening health effects in most of the exposed, untreated population (exceeds [conc level] CFU-min/m³). Estimated total population: [pop]
- B** → Approximate extent where life-threatening health effects are likely (exceeds [conc level] CFU-min/m³). Estimated total population: [pop count]

Notes

- Populations in areas shown may develop incapacitating or fatal health effects from inhalation of passing toxic cloud.
- This material is a chemical toxin of biological origin, but is not a living organism; toxin is not contagious.
- Prompt evacuation and/or sheltering reduces health risks, including exposures to subsequent evaporation.
- Predicted health effects are for an unprotected, unsheltered population from initial plume passage.
- Health effects are not universal across all populations; some individuals outside these areas may experience life-threatening affects.
- Prediction includes environmental degradation effects on toxin concentrations.

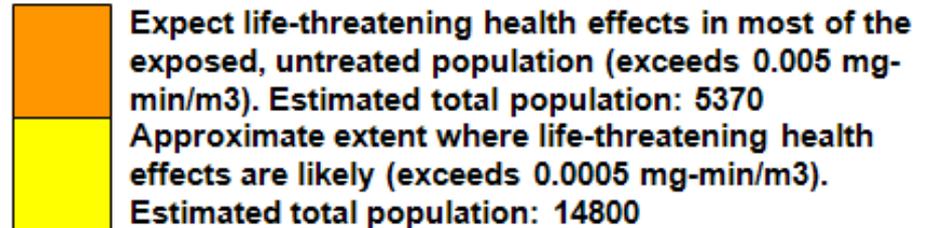
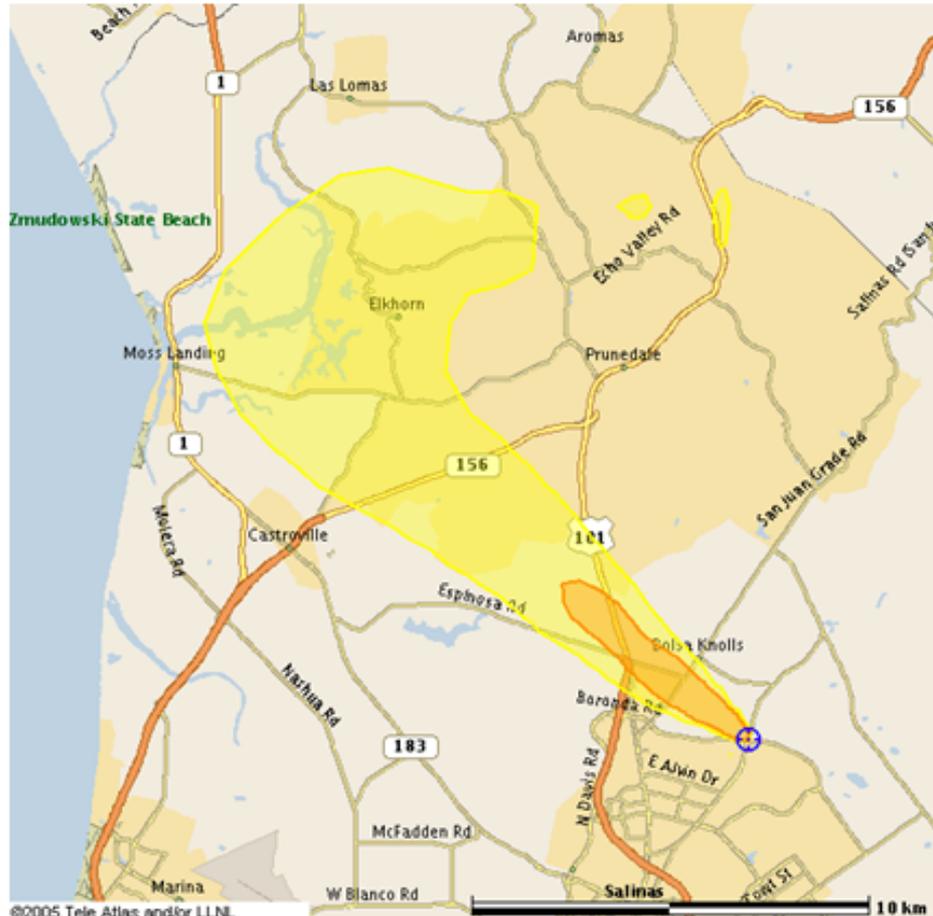
Assumptions:

- This is a model prediction based on an estimated source; confirm with measurements or medical diagnosis.
- Plume Phase – Biological toxin cloud poses inhalation risk

Predicted Bio-Toxin Life-Threatening Effects Areas

Areas exceeding fatal air concentration exposure limits

BOTULINUM TOXIN-DRY near-surface cloud present - Inhalation hazard



Notes:

- Populations in areas shown may develop incapacitating or fatal health effects from inhalation of passing toxic cloud.
- This material is a chemical toxin of biological origin, but is not a living organism; toxin is not contagious.
- Prompt evacuation and/or sheltering reduces health risks, including exposures to subsequent evaporation.
- Predicted health effects are for an unprotected, unsheltered population from initial plume passage.
- Health effects are not universal across all populations; some individuals outside these areas may experience life-threatening affects.
- Prediction includes environmental degradation effects on toxin concentrations.

Assumptions:

- This is a model prediction based on an estimated source; confirm with measurements or medical diagnosis.
- Plume Phase - Biological toxin cloud poses inhalation risk.

Briefing Product for Public Officials
Current: 09 Feb 2012 16:46 UTC
Check for updates

Technical Details: IMAAC 925-424-6465
Federal POC for Advice: EPA/OSC



Predicted Bio-Toxin Life-Threatening Effects Areas

Areas exceeding fatal air concentration exposure limits

[Material name] near-surface cloud present – Inhalation hazard

Key Points

- Evacuate or shelter as soon as possible to minimize potentially severe to fatal effects
- Evacuation before start of potential release affords the greatest protection
- Sheltering-in-place may be preferable to evacuation if
 - Anticipated release and subsequent evaporation period is shorter than time required to prepare and execute evacuation
 - Populations need special consideration (e.g. hospitals/nursing homes)
 - Winds or source are variable, leading to shifting evacuation area size and shape
- Sheltering-in-place may not be the best option if buildings (while possibly affording some protection) cannot be tightly closed
- If sheltering, close and stay away from doors/windows and shut off ventilating systems
- If evacuating, start with those outdoors and nearest to the scene
- Emergency workers without inhalation protection should not approach contoured areas
- Due to uncertainties, some individuals outside the hazard areas shown could be exposed to significantly harmful, possibly fatal, air concentration levels
- Effects are calculated based on initial plume passage and do not include subsequent effects due to evaporation or resuspension; confirm with measurements
- Percentage of fatalities from airborne plume is expected to increase nearer the source



Predicted Bio-Toxin Life-Threatening Effects Areas

Areas exceeding fatal air concentration exposure limits

[Material name] near-surface cloud present – Inhalation hazard

Presenter Notes – Additional Information:

- Estimates of potentially lethal air concentrations derived from U.S. military reports are used to identify areas of high concern.
- Military-based thresholds are based on health effects in unprotected soldiers, which may differ from those experienced by the general population. The elderly, very young children, or those with pre-existing health issues may experience higher fatality rates.
- Contamination exists outside the plotted area, and may exceed air concentration levels that can cause some exposed individuals to experience significantly harmful, possibly fatal, health effects.
- Approach the scene from upwind, if possible. Emergency workers should wear appropriate protective gear.
- When initiating protective actions, begin with those closest to the release location and work away from the site in the downwind direction.
- If evacuating, direct persons to move, in a crosswind direction, away from release location and then out of the contoured areas.
- Maintain communications with populations sheltering-in-place. Direct sheltered populations to close and stay away from windows and doors and to turn off air circulation systems.
- Protective actions should be considered over larger areas and at lower contamination/dose levels in order to account for uncertainties in the predicted dose and mapped areas, to prevent possible significant non-life-threatening health effects, and/or to use boundaries, such as roads, that are convenient.
- Emergency response workers should not approach these areas without sufficient personal protective equipment prior to confirmation that the airborne plume has passed.

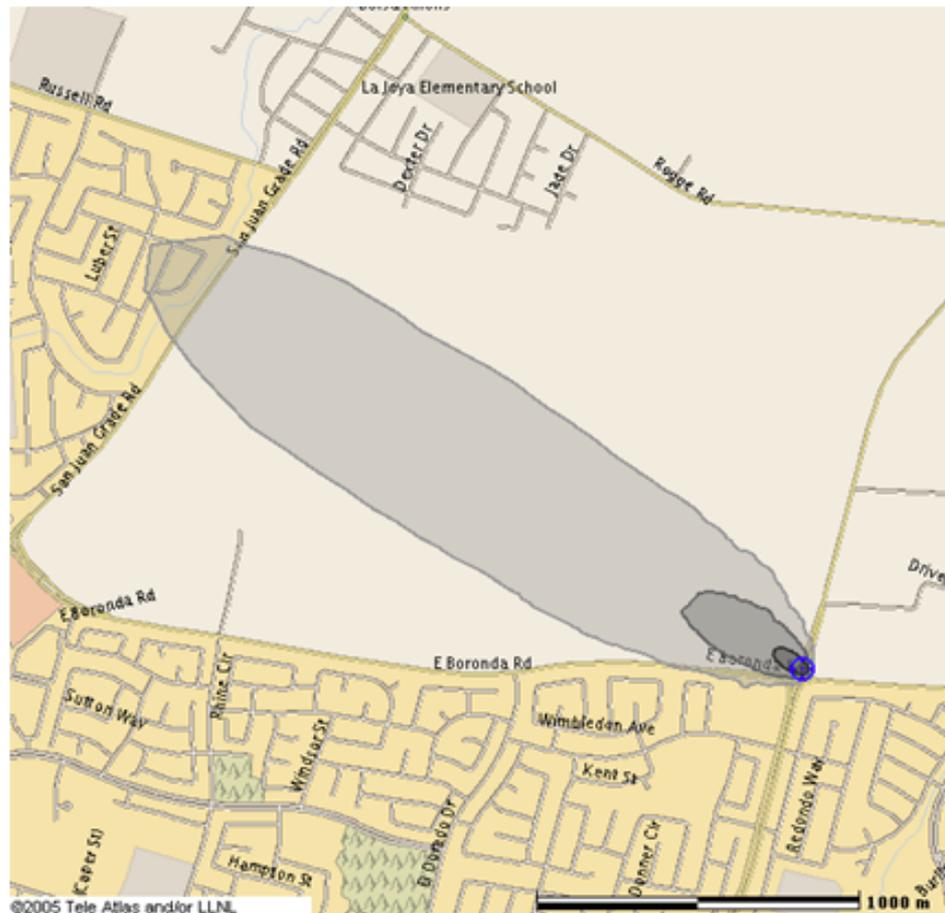
Presenter Notes - Technical Background:

- Air concentration health threshold levels used to define the contoured areas are derived from data presented across multiple U.S. Army reports.
- Predicted air concentrations are calculated as the maximum concentration of 15-minute averages at downwind locations.
- Area where most individuals may experience life-threatening effects is based on 50% fatality rate threshold for military populations. This area will not be shown if the maximum predicted air concentrations do not reach the level corresponding to the 50% fatality rate threshold.
- Approximate extent of area where life-threatening effects are likely, if shown, is based on the military 2% fatality rate threshold in the exposed population.
- The 2% probability level for potential fatality is determined from probit-slope statistical calculations using the LCt50 (dose which causes fatality in 50% of the exposed individuals). As such, the associated extent of this area should be treated as more approximate than those based directly on the LCt50. Some individuals outside this area may be significantly affected.
- Material specific information
 - This is a CDC category [X] biological toxin.
 - [insert health effects text]
 - [insert transmission text]
 - [insert environmental degradation text]
 - [insert treatment text]
- Additional background information on this toxin can be found at these Centers for Disease Control and Prevention (CDC) web pages: <http://emergency.cdc.gov/bioterrorism/factsheets.asp> or <http://www.bt.cdc.gov/agent/agentlist.asp>

New Biological Agent Technical Product: Initial Surface Contamination

- Shows deposited biological agent concentration
- Product sub-title indicates how environmental decay was modeled:
 - Decay during plume transport, but no decay after material has been deposited (default)
 - Decay continues after deposition
 - No decay applied during transport in air or after deposition
- By default, contour areas are chosen to show three highest order-of-magnitude surface concentration levels, but may be set to instrument detection or analysis thresholds if available
- Products may be appropriate for matching to field measurements of viable, or total, agent deposited

Initial Surface Contamination
 (No Material decay from ambient effects is applied post-deposition)



Effects and Actions			
	Description	(CFU/m ²) Extent Area	Population
	No guidelines specified. Possibly contaminated area. Use to confirm with monitoring surveys	>1.00E7 0.1km 0.006 km ²	0
	No guidelines specified. Possibly contaminated area. Use to confirm with monitoring surveys	>1.00E6 0.4km 0.06 km ²	0
	No guidelines specified. Possibly contaminated area. Use to confirm with monitoring surveys	>100,000 2.5km 1.2 km ²	280

Areas and counts in the table are cumulative. Population Source = LandScan USA V1.0.

Effects or contamination at January 18, 2012 19:00 UTC
 Release Location: 36.715775 N, 121.623420 W
 Material: ANTHRAX-DRY
 Generated On: February 03, 2012 16:31 UTC
 Model: ADAPT/LODI
 Comments: Hypothetical release of 5 g starting at 01/14/2012 11:00:00 PST for 1 hr met obs

Map Size: 2.9 km by 2.9 km Id: ProductionT.rcE17641.rcC1
 NARAC Operations: (onDuty Assessor); narac@llnl.gov; 925-424-6465
 Requested by: {Connee Foster (mgr); NARAC – Operations; 925-422-1867}
 Not approved for further distribution

Additional Information



Web: narak.llnl.gov
Email: narak@llnl.gov

