

# Response & Recovery Preparedness for ChemBio Agent Incident at a DOE Facility

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# Response and Recovery Preparedness for Chem/Bio Agent Incident at a DOE Facility

## Overview



# Preparedness goals for your site

- The focus of this presentation is on adapting or augmenting Chem/Bio Preparedness at your site
  - Response Plan on file
  - Remediation plan vetted and on file
  - Training and exercises



# An accident or a deliberate terrorist attack against DOE facilities could have an impact on site operations

- May require closure of a building or buildings, an area of the site or the entire site
- Attacks are easy, even with security measures and can even be conducted from offsite
- Remediation/recovery challenges could be complex and time consuming



# Chemical Restoration

Many of the concepts will be similar to Biological Restoration except..

- Agent decay may occur
- Surface interactions with chemical agents must be considered
- More rapid sampling and analysis techniques are available
- Decon formulation may vary depending on the agent
- Clean-up standards better defined
- Long term air monitoring may be required



# EMERGENCY MANAGEMENT ROUNDUP

EXPECT THE UNEXPECTED

Six phases are central to response and recovery activities and represent the key decision framework

Response and Recovery Activities					
(Crisis Management)		(Consequence Management)			
Notification	First Response	Remediation			Restoration (Recovery)
		Characterization	Decontamination	Clearance	
Receive and assess information	HAZMAT and emergency actions	Detailed characterization of biological agent	Source reduction Decontamination strategy	Clearance sampling and analysis	Renovation Reoccupation decision
Identify suspect release sites	Forensic investigation	Characterization of affected site	Remediation Action Plan	Clearance decision	Potential environmental and public health monitoring
Relay key information and potential risks to appropriate agencies	Public health actions Screening sampling Determination of agent type, concentration, and viability Risk communication	Site containment Continue risk communication Characterization environmental sampling and analysis Initial risk assessment Clearance goals	Worker health and safety Site preparation Waste disposal Decontamination of sites, items, or both Verification of decontamination parameters		



## Significant time reductions possible in all phases of response by preplanning

- Identification of roles and responsibilities will reduce transition time from first response to restoration
- Preplanning enables facilities to make *a priori* decisions:
  - Identify available resources (laboratories, sampling and remediation vendors)
  - Identify characterization and remediation techniques
  - Identify barrier and containment technology
  - Make dispose or remediate decisions

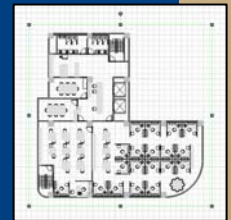
**Preplanning will ensure a consistent site-wide response and reduce the time required to resume site operations, thus supporting operational continuity**





# Preparedness and response planning needs

- Review/update notification protocols to achieve enhanced communication
  - Ensure interoperability of communication across agencies
- Update physical infrastructure data bases (e.g., computerization of current architectural drawings)
- Test HVAC systems to learn more about airflow in case of an attack
- Identify experts for scientific advisory committees
- Learn more about decontamination options for key agents
- Enhance/document knowledge of waste-disposal requirements



## A decision framework/flowchart is key to guide a risk-informed decision-making process

- Specify what emergency-response actions need to be taken at the outset
- Determine if an actual or potential impact to health, property or the environment exists
- Determine any actions necessary to restore essential facilities and/or operations
- Determine whether or not decontamination is needed and evaluate options
- Address other decisions for long-term regulatory and stakeholder review
  - Whether or not cleanup criteria have been met
  - Whether or not to reoccupy or resume operations



A modified interagency framework is used to help guide decisions

# LLNL Biological Terrorism Response Plan

Introduction

Scope

Organization

Response Steps

Notification Phase

First Responder Phase

RestOps Phase

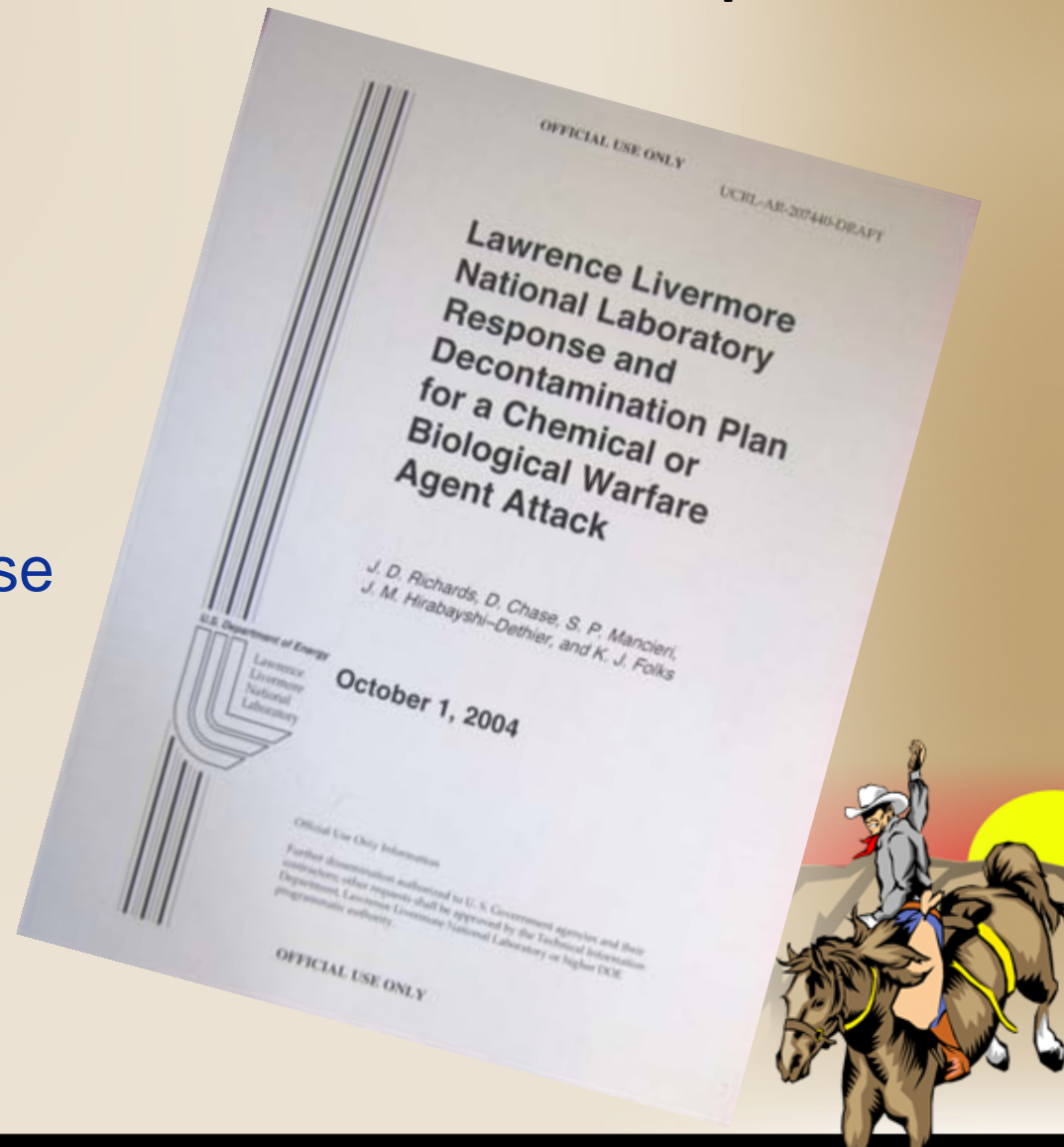
Characterization

Phase

Cleanup Phase

Reference

Appendix A



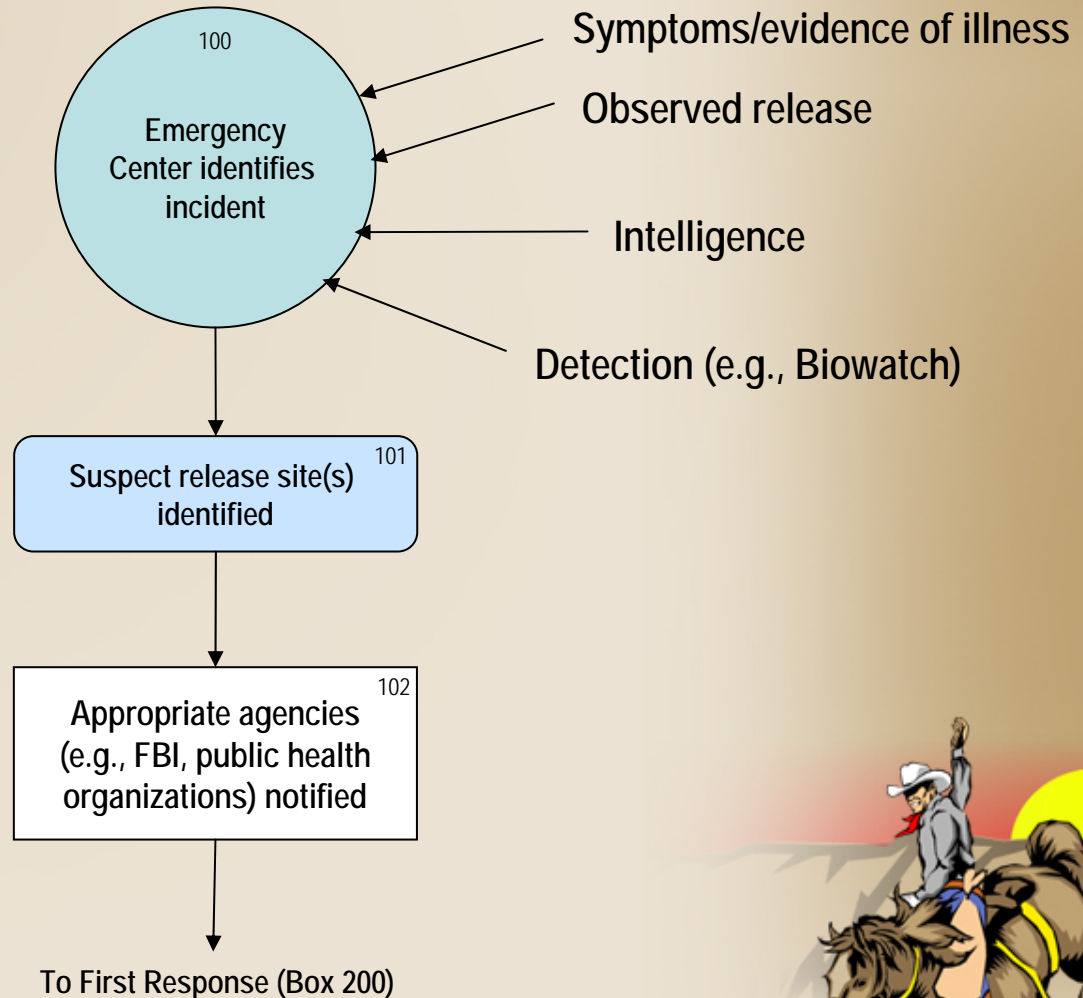
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**Notification and First  
Response**



# NOTIFICATION Phase

- Determine avenues for identifying an incident
- Identify pathway (who, order/priority) notifications will be made
- Identify response organizations and agencies that will be contacted



# Potential Response Organizations

## In-House Resources

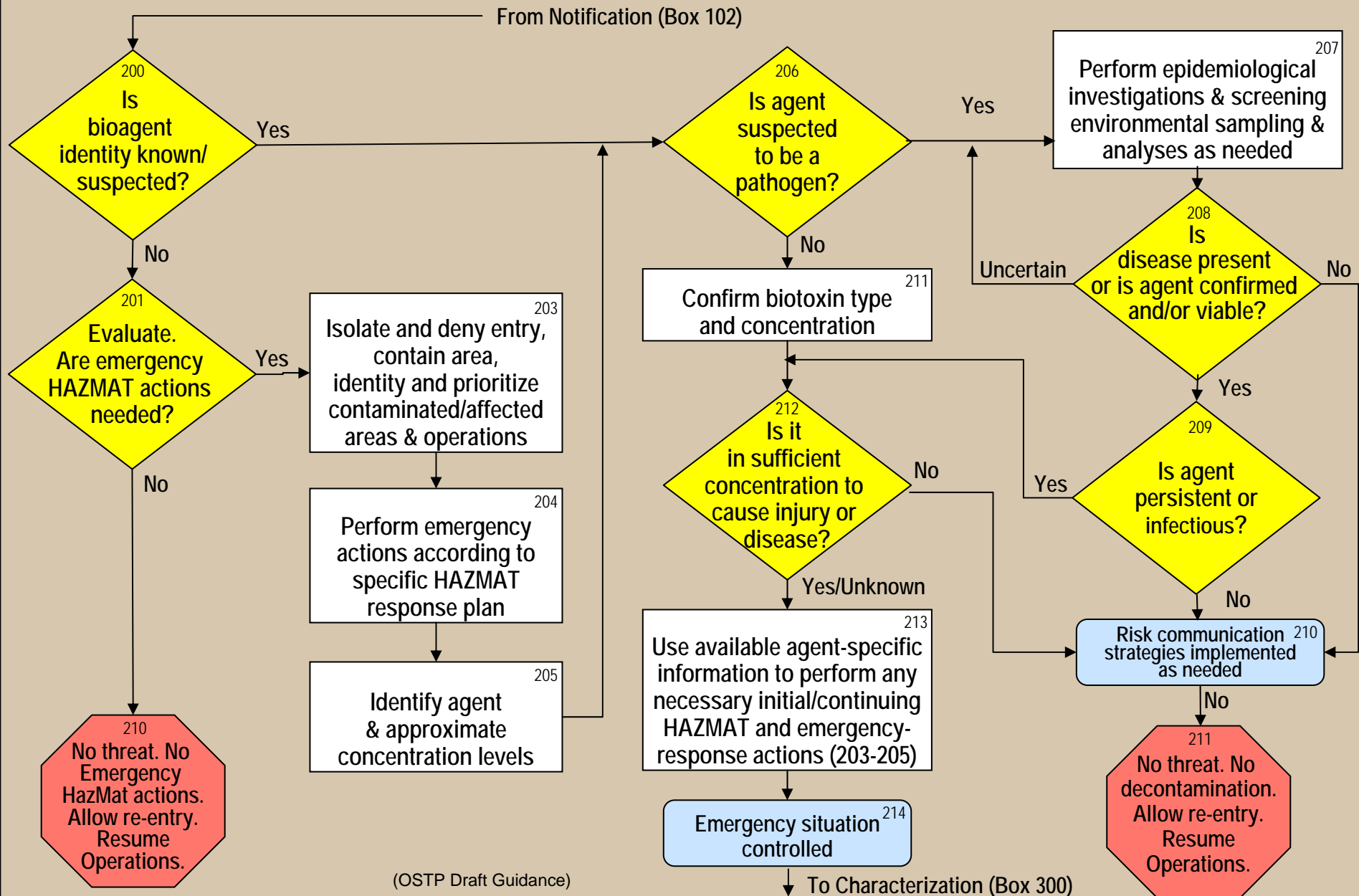
- Building Maintenance
- Security
- Engineering
- Management
- Health and Safety /  
Medical Unit / Human  
Resources
- Environmental
- Contract Support / Legal
- Communications
- First Response  
organization

## Outside Resources

- USEPA On-scene  
Coordinator (OSC)
- USEPA Office of  
Pesticides
- State Regulatory Agencies
- CDC NIOSH
- Local / State Public Health
- OSHA
- Law Enforcement (FBI)
- Security Services
- Contractor services



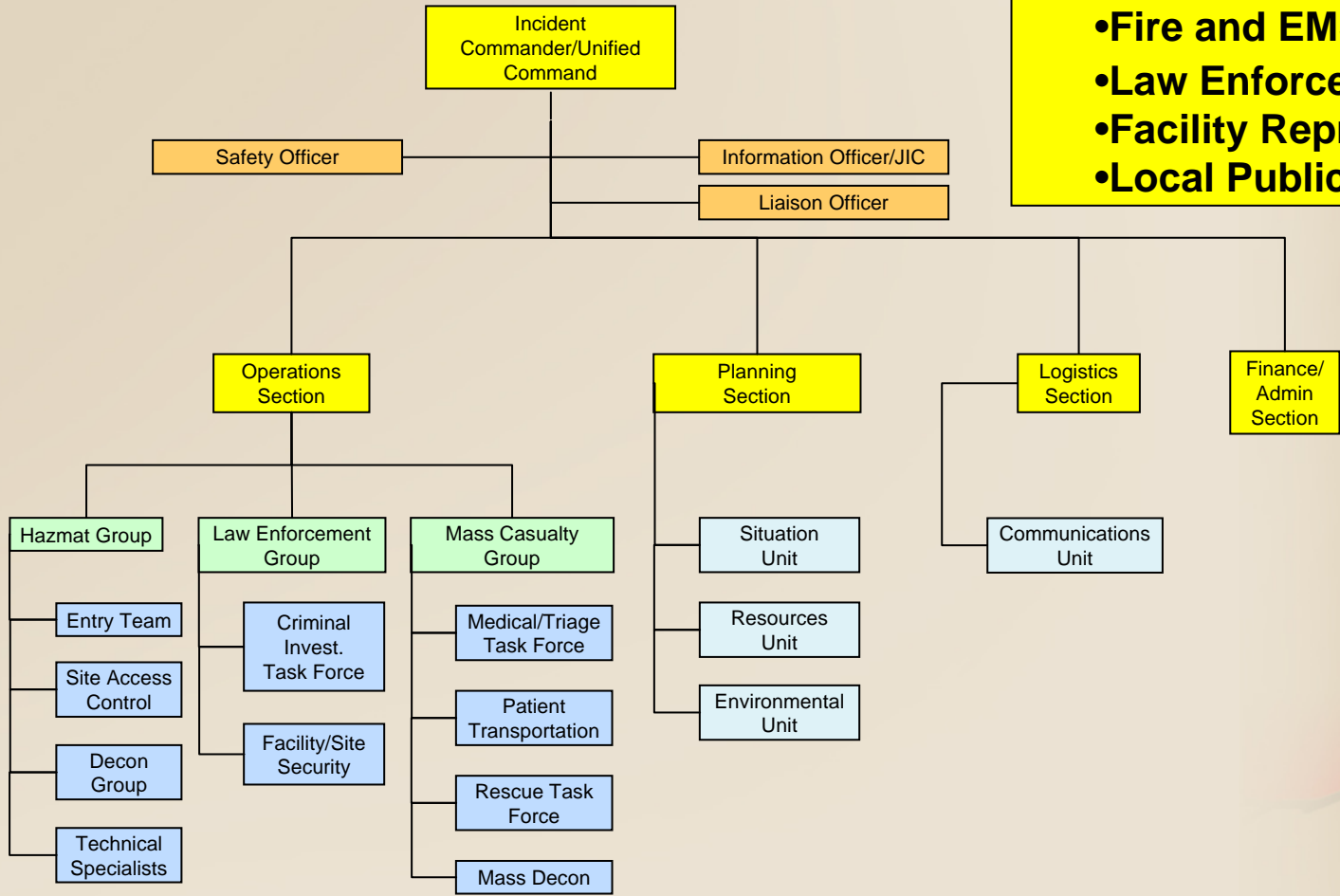
# Biological Agent Incident-Response Decision Process - **FIRST RESPONSE**



## First Response Organizational Structure

**Unified Command**

- Fire and EMS
- Law Enforcement
- Facility Representative
- Local Public Health



Response resources need to be predetermined



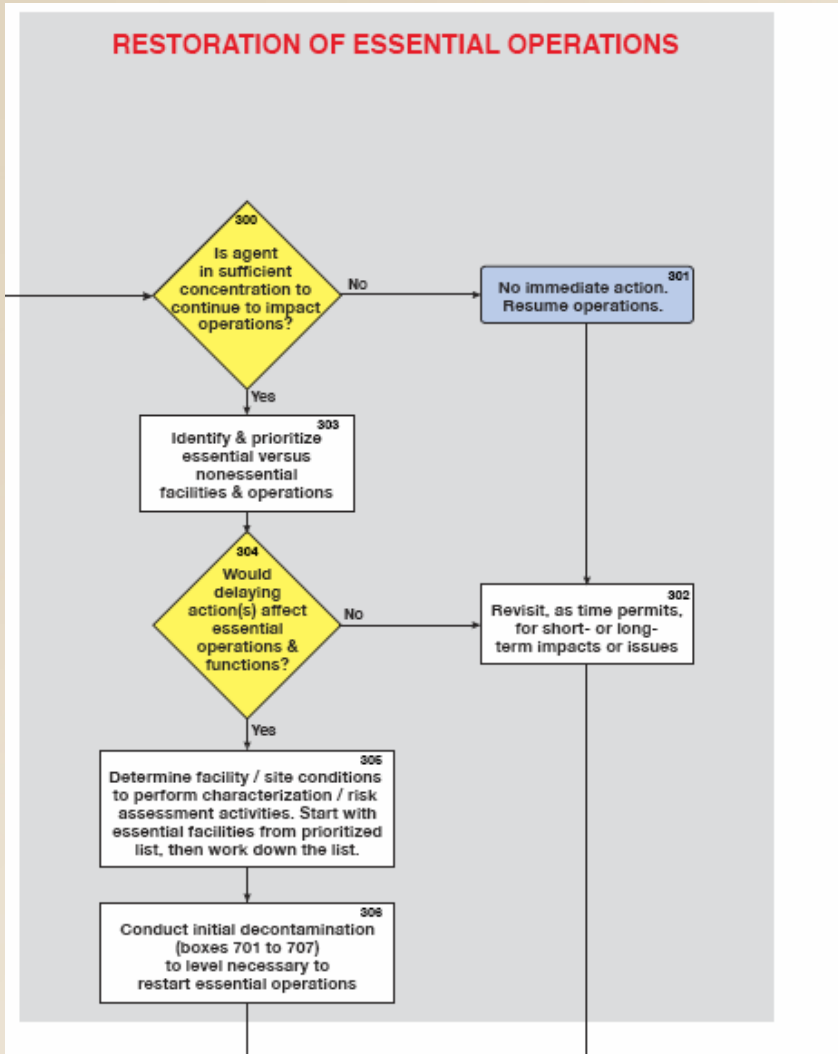


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**Characterization**



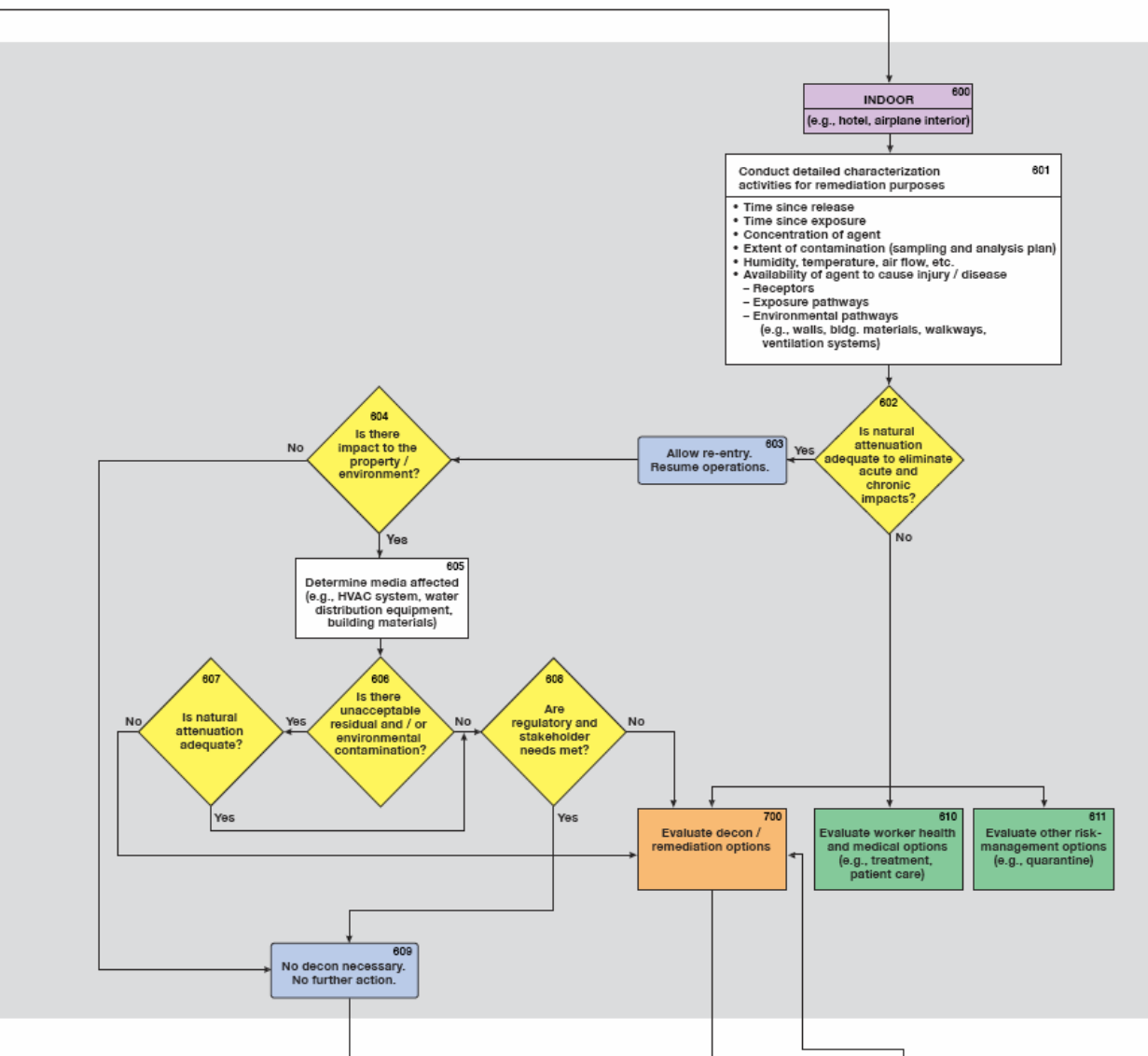
## Initial Assessment Criteria



- Does release impact operations
- Would delaying response actions affect operations



## Characterization Planning



## Planning Considerations:

- Concentration of agent
- Time since release
- Potential extent of contamination
- Migration pathways (HVAC, hallways, etc)
- Facility construction



# Characterization Planning

- Review data from the initial response
- Sampling resources (in house, local, state, federal)
- Sampling method(s) (swipe, vacuum, grab)
- Analytical tests (Field vs laboratory)
- Available analytical resources (capabilities, throughput, detection limits, location)
  - CDC Laboratory Response Network
  - State Public Health Laboratories
- Sample shipping requirements



## Characterization template facilitates preparation of a incident-specific plan

- Structure for quickly preparing incident-specific operational characterization plan
- Focuses on gathering information for decisions
- Requires evaluating the facility *a priori* to determine logical characterization zones and sampling units
- Requires selecting Sampling and Analysis methods
- Requires selecting Sampling Design

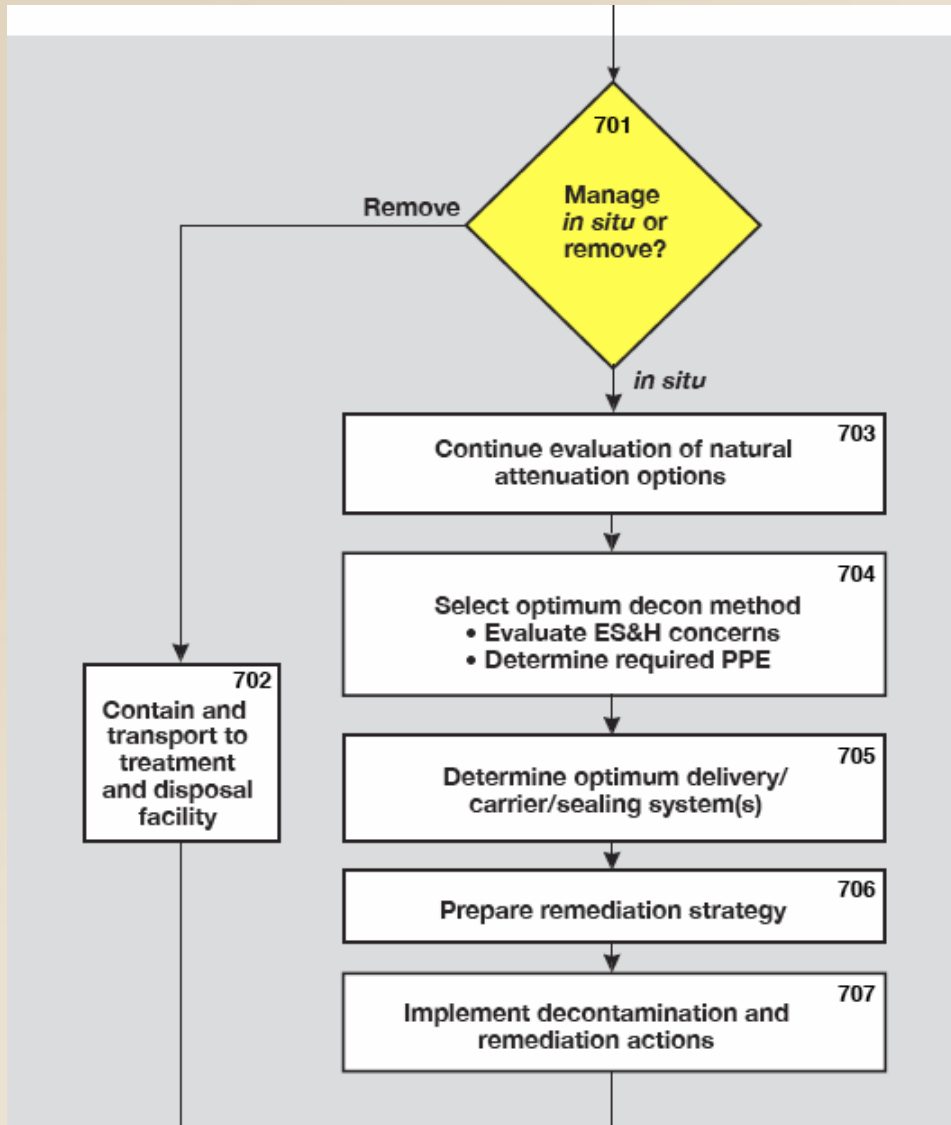


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**Decontamination**



# Remediation/Decontamination



- Decontamination method(s): natural attenuation, surface, fumigation
- Selecting decontamination agent
- Delivery system
- Treat in place or remove and treat
- Facility preparation requirements
- Direct impacts to facility from decontamination process



# Decon Agent Selection

## Fumigant

Chlorine dioxide was selected in November 2001 by the USPS as the fumigation treatment approach and best available technology. The selection was based on the results of tests performed by EPA at the USPS Washington D.C. Curseen-Morris facility and successfully demonstrated at the Hart Senate Office Building.

## Surface Decon Agents

Primary – pH adjusted bleach solution

Secondary – peroxide solutions (Vortex, Sanosil)





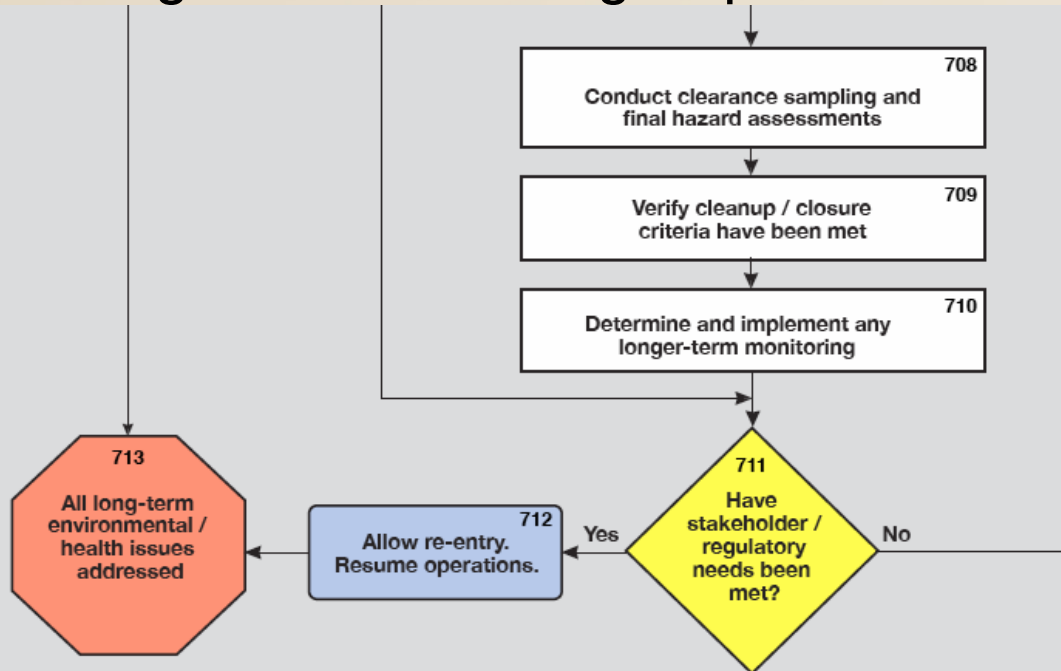
# Remediation/Decontamination Issues

- Decon Agents for Biological releases must be approved under FIFRA for the application method being used
  - Crisis exemption from EPA
- Necessary permits/approvals should be identified
  - Air and water permits
- Required decontamination activities
  - Ambient air monitoring
  - Process control parameters (concentration, temperature, humidity)
  - Decon verification method(s)
    - Biological indicators



# Clearance Phase

- Sampling plan based on results from characterization and decontamination verification phases
- Sample plan must be a transparent process to ECC and stakeholders
- Requires pre-planning similar to characterization phase
- Include long term monitoring requirement



# Waste disposal from a CWA/BW Incident will be a significant issue

- Wastes will be generated from all phases of the restoration operation
- Treat in place vs treat in central location vs no treatment
- Several broad categories of waste are likely to be generated
  - PPE
  - Spent decontamination reagents
  - Debris (Facility material: rug, ceiling tile, furniture)
  - Facility equipment (telephone, computers, etc.)
- Treatment Residues will need to be managed appropriately
  - Prevent liquid waste streams from entering drainage systems or surface waters
- Characterization (Hazardous, Nonhazardous, Medical Waste)
- Pre-selecting potential vendors is very important
- EPA web-based tool available to estimate waste potentially generated



# Building Restoration

## Pre-Fumigation Factors

- Age of building, type of equipment, and current state of maintenance
- Surface cleaning (bleach) effective but destructive
- Building systems may be inoperable after the building is evacuated subjecting interior to high temp and RH (especially after sealed)
- Building systems & interior degrade without normal routine maintenance

## Restoration Considerations

- Direct impacts from “Decon” activities
- Cost of inspecting and servicing components vs. replacement
- Useful service life of existing building equipment
- Needed building upgrades
- Building aesthetics – employee and customer relations



# Response and Recovery Preparedness for ChemBio Agent Incident

## Lessons Learned



# Key Biological Expertise/Agencies in the TWG and ECC

## Technical Working Group

### Areas of Required Expertise

- Microbiology
- Sterilization science
- Waste disposal
- Ambient air monitoring
- Environmental sampling
- Chemical engineering

### Representatives from

- Facility
- EPA
- CDC, NIOSH
- State and local public health and analytical labs
- Other affected public health
- OSHA
- Private sector
- Universities

## Environmental Clearance Committee

### Areas of Required Expertise

- Microbiology
- Epidemiology
- Sterilization science
- Environmental sampling
- Risk assessment
- Industrial hygiene

### Representatives from

- State and local health department (Chair)
- EPA with ECC experience (Co-Chair)
- Local health officer
- CDC, NIOSH
- CDC, NCID
- OSHA
- Stakeholder representatives (ex officio)

# Pre-planning is especially necessary when fumigation is required

- Fumigation techniques are costly and time consuming
- If required, will drive the timeline and expense of overall restoration
- Will likely be required if evidence suggest aerosolized, persistent biological agent is present



CIO2 fumigation at AMI



VHP fumigation at Dept of State



# Cost Considerations

- Direct Costs
  - Laboratory
  - Regulatory
  - Waste Disposal
  - Decontamination
  - Building Restoration
- Indirect Costs
  - Continuity of Operations
  - Operational Impacts





# Chlorine Dioxide vs Vaporous Hydrogen Peroxide

	Chlorine Dioxide	VHP
Singe-treatment Volume	14,000,000 cf	200,000 cf (tandem generation possible)
Penetration	Good	Limited (?)
Environmental parameters	Narrow temperature and humidity range	Wider temperature and humidity range
Fumigant removal	Chemical neutralization or carbon scrubbing	Catalytic breakdown to oxygen and water
Material compatibility	Metal corrosion, salt residue	Used on electronics in pharm. industry
Monitoring	Labor-intensive	Real time
Other considerations	Protect from UV exposure	Many materials absorb or breakdown VHP



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**References**

EXPECT THE UNEXPECTED



# Available reference documents for preparedness and response

- Remediation Guidance Document is now vetted, approved and available for use (2007)
- Proceedings from Airport Bio Restoration Demonstration Project
  - Enhanced sampling and characterization
  - Decision and tracking tools
- National Academy of Sciences “Reopening Public Facilities after a Biological Attack: A Decision-Making Framework” (2005)
  - De facto cleanup level is “no growth” from any environmental sample collected and analyzed



# Surface and 'Hot Spot' Decon - Chem

## Liquids, Foams, and Gels



**DF-200**



**10% Bleach**



**L-Gel**



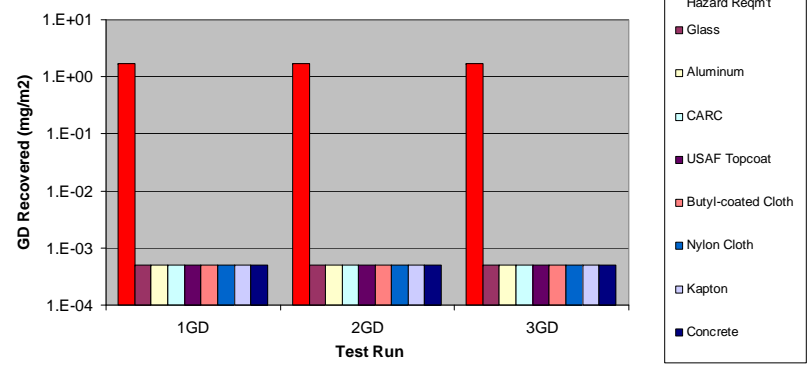
## Decon of Large Spaces

### Gases, Vapors, and Aerosols



mVHP

Contact Hazard Decontamination of GD by mVHP  
24 Hour Exposure



ClO<sub>2</sub>



*DOD testing against chemical agents in progress*



## Sensitive Equipment Decon

### Solvent Baths, Gases, Vapors, and Aerosols



mVHP



Solvent Wash

Contact Hazard Decontamination of GD by mVHP  
24 Hour Exposure

