CHEMICAL SECURITY SUMMIT

CFATS Risk Tiering

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#ChemicalSecurity

The CFATS Universe

- "Appendix A" – a list of 322 chemicals of interest (COI) at screening threshold quantities (STQ) and concentrations that require reporting to CISA

Appendix A to Part 27. -- DHS Chemicals of Interest [1]

Chemicals of Interest (COI)	Synonym	Chemical Abstract Service (CAS) #	Release		Theft		Sabotage		Security Issue						
			Minimum Concentration (%)	Screening Threshold Quantities (in pounds)	Minimum Concentration (%)	Screening Threshold Quantities (in pounds unless otherwise noted)	Minimum Concentration (%)	Screening Threshold Quantities	Release -- Toxic	Release -- Flammables	Release -- Explosives	Theft -- CW/CWP	Theft -- WME	Theft -- EXP/IEDP	Sabotage/Contamination
Acetaldehyde		75-07-0	1.00	10,000						X					
[illegible]							ACG	APA							X

- Any facility with COI at or above STQ is subject to comply with CFATS

Chemical Facilities Come in All Shapes and Sizes

Chemical Manufacturing

Oil Refineries

Food Processing

Wineries

Colleges and Universities

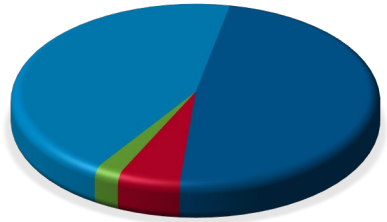
Farm Cooperatives

Essentials of the CFATS Program

- Facilities with **Chemicals of Interest** at or above the screening threshold quantities and concentrations must submit an online risk assessment (**Top-Screen**)

- CISA uses information submitted through the **Top-Screen** to determine if a facility is high-risk / covered
  - The tiering methodology accounts for elements of risk
    - **Threat, Vulnerability, Consequence**
  - Covered facilities are placed in one of four tiers
  - **Tier one** represents the **highest risk**
  - Covered facilities are required to develop and implement security plans that meet applicable risk-based performance standards (**RBPS**)
  - Chemical Security Inspectors across the U.S. conduct inspections, assist with compliance, and perform outreach

Current Population Distribution



Tier 1
Tier 2
Tier 3
Tier 4

The CFATS Process

Facility may be tiered in or drop out

If the facility receives a tier…

- CISA provides compliance assistance upon request at any stage of this process
- More than 150 Chemical Security Inspectors are available for support across the country

Filing Top-Screens

Predictive & Hypothetical

Business Operations

Predictive Top-Screen Filing

- Recommended for business operations that require constantly fluctuating quantity of COI

Business Planning

Hypothetical Top-Screen Filing

Businesses may request consults with CISA when planning future operations to analyze tiering impacts

May include:

- Changes in quantity, concentration, storage conditions or location of COI
- New facility construction

Common Tiering Questions

FAQ 1557

What should a facility do if it believes the risk-based tier determination that DHS has assigned it no longer reflects the actual security risk posed to the facility?

Section 27.120(d) of the CFATS Rule allows a covered chemical facility that has modified the facility, its processes or quantities of materials it possesses, and that believes those modifications could affect its obligations under CFATS, to request a consultation under § 27.120(c). In addition, under § 27.205(b), a covered chemical facility that has materially altered its operations may file a Request for Redetermination and may request a meeting regarding that request. Section 27.205(b) requires DHS to notify the facility of the results of the Redetermination request within 45 days of the request or within 45 days of the meeting.

Common Tiering Questions

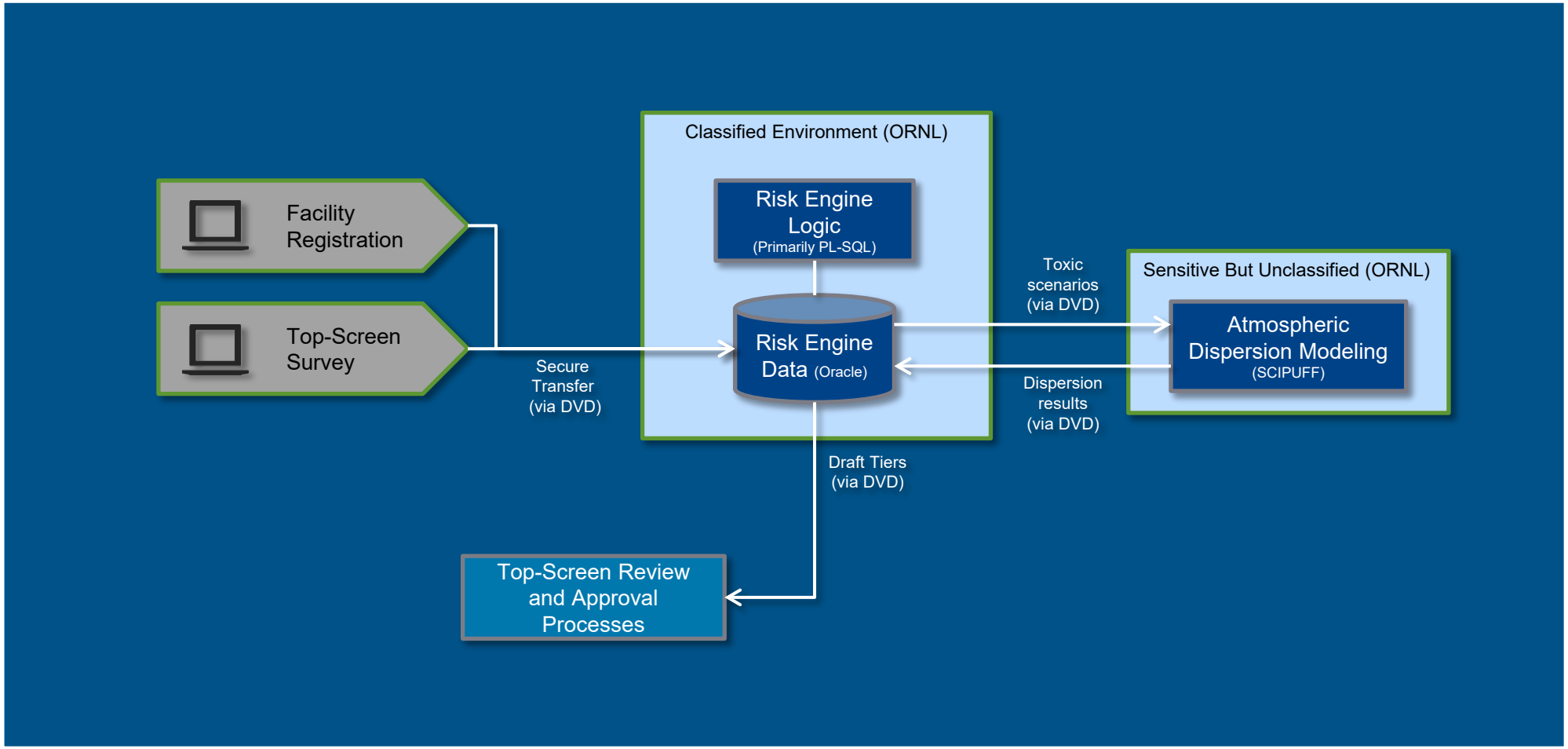
FAQ 1660

Can a facility's tiering level ever change?

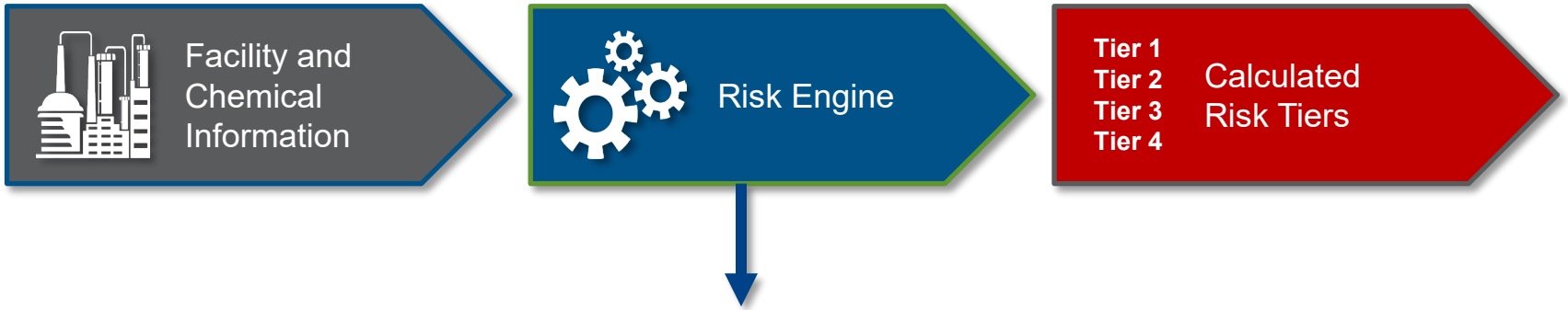
A facility's tier can change based on a revised Top-Screen submitted to DHS. For example, a tier determination may change if:

- Facility operations change significantly. This could include, for example, the removal or addition of COI, changes in operations or processes, and/or changes in threats or vulnerabilities. Such changes typically would be site-specific and will be reviewed on a case-by-case basis.
- Resubmission of a Top-Screen reveals changes in threat, vulnerability, or consequence. Facilities with approved SVA/SSPs are required to resubmit Top-Screens every two years for Tier 1 and 2 facilities and every three years for Tier 3 and 4 facilities.
- In rare cases, DHS considers new information about a site, chemical, threat, or process that warrants revising an existing facility's tier up or down. DHS will provide appropriate notification to the facility of the reasons justifying a change in the facility's existing tier.

High-level Components and Data Flow



Risk Engine



- Algorithms
- Software code
- Databases
- Supporting data
  - Threat scoring
  - Vulnerability scoring
  - Chemical properties

Risk Approach

$$R = T \times V \times C$$

Consequence
- Characterization of the severity of an attack, if an adversary succeeds in causing their desired outcome
- Scored as estimated number of potential fatalities using physics-based modeling

Vulnerability
- Relative likelihood of an attempted attack being successful
- Based on inherent facility and storage/packaging characteristics that reduce vulnerability

Threat
- Relative likelihood that an adversary will undertake an attack
- Adapted from threat data from Intelligence Community elicitation and subject matter expert opinion

Risk Score
- Multiplication T × V × C applies 'AND' logic to risk
- Risk scores are mapped to Tiers 1 – 4
- Scores below the Tier 4 threshold are designated as not high risk

Risk Model Summary

CFATS Security Issue		Threat	Vulnerability	Consequence (Potential Fatalities)
Release	Toxics	Adapt from Intelligence Community elicitation	Inherent vulnerability reduction	SCIPUFF dispersion modeling
	Flammables	SME elicitation		VCE and blast modeling
	Explosives	SME elicitation		Blast modeling
Theft/ Diversion	Weapons of Mass Effect	Adapt from Intelligence Community elicitation	Inherent vulnerability reduction	Toxic or blast effects for four offsite scenarios: 1. Subway car 2. Office building exterior 3. Outdoor urban event 4. Bulk transportation release urban area
	Chemical Weapons and CW Precursors			
	Explosives and IED Precursors	SME elicitation		
Sabotage/ Contamination		SME elicitation	Inherent vulnerability reduction	SCIPUFF dispersion modeling

Attack Scenarios by Security Issue

Security Issue		Applicable Attack Scenarios							
		VBIED	Assault Team	Urban Mass Transit	Urban Event	Office Building	Bulk Rail	Bulk Road	Urban Area
Release	Toxic	×	×						
	Flammable	×	×						
	Explosive	×	×						
Theft and Diversion	CW			×	×				
	CWP			×	×				
	WME			×	×		×	×	
	EXP			×	×	×	×	×	
	IEDP			×	×	×			
Sabotage/Contamination									×

Attack Scenarios for Release

Release attacks are on-site, potentially affecting facility and community populations.

1. Vehicle Borne Improvised Explosive Device (VBIED)
    1. Attack with a vehicle
    2. Adversary may ram through perimeter barriers, covertly reach a target, or for targets near a perimeter, detonate from offsite
2. Assault Team
    1. Group of armed adversaries breach the facility using force
    2. Place separate charges on one or more targets

- Scenario quantities (for both scenarios) are:
    - Toxics: Largest quantity withing a 170-ft radius circle
    - Flammables: Single largest inventory
    - Explosives: Total of all explosives within 170-ft radius circle

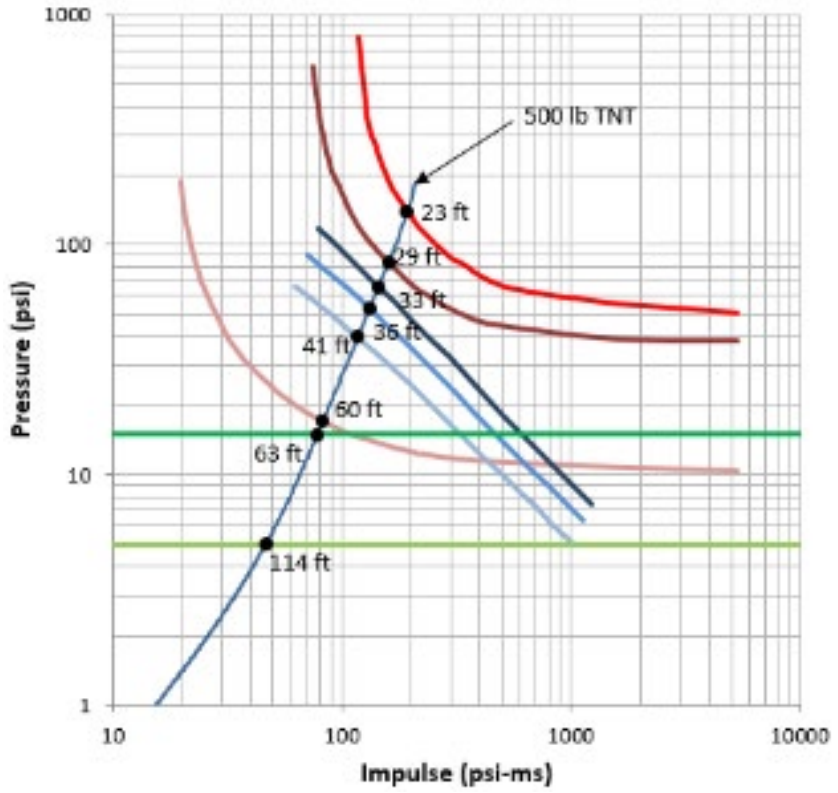
Blast Casualty Model

Outdoor populations	Direct blast effects (e.g., lung damage) Indirect blast effects (e.g., head injury)
Indoor populations	Blast effects on structure, for example: • Shrapnel (Flying glass and wall debris) • Building Failure (Collapse of walls or roofs)

- Independent casualty models based on population location
- Models used for
  - Release flammables
  - Release explosives
  - Theft and diversion
    - Urban event (outdoor populations only)
    - Office Building (indoor and outdoor populations)
    - Bulk transport (road/rail)

Release Explosives and Flammables

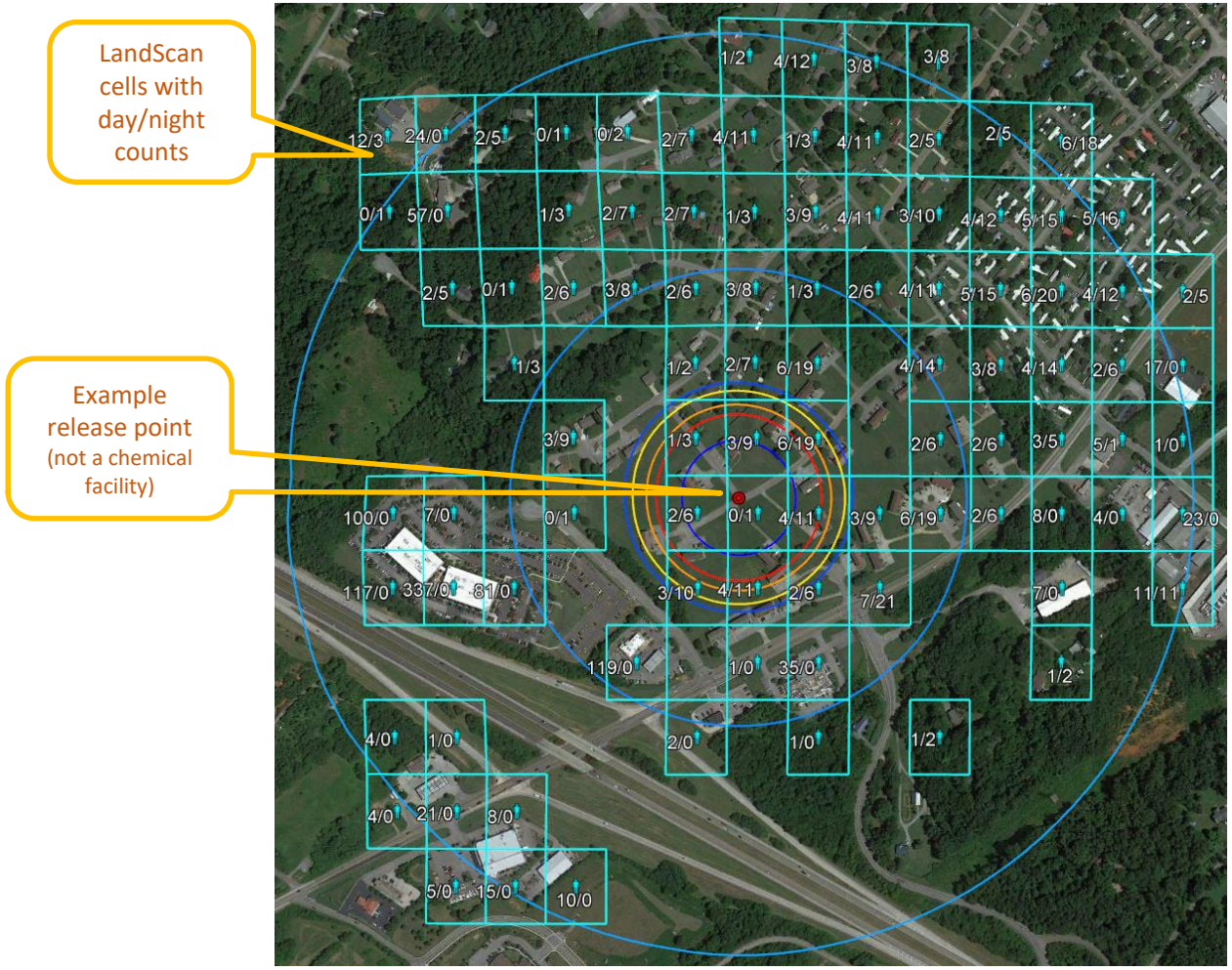
- Consequence scoring based on death and injury curves which are translated to fatality zones laid over LandScan™ population data



Population Exposure

LandScan™ population data

- Developed and maintained at the Oak Ridge National Laboratory
- Three arc second (300 ft) grid
- Day and night population estimates

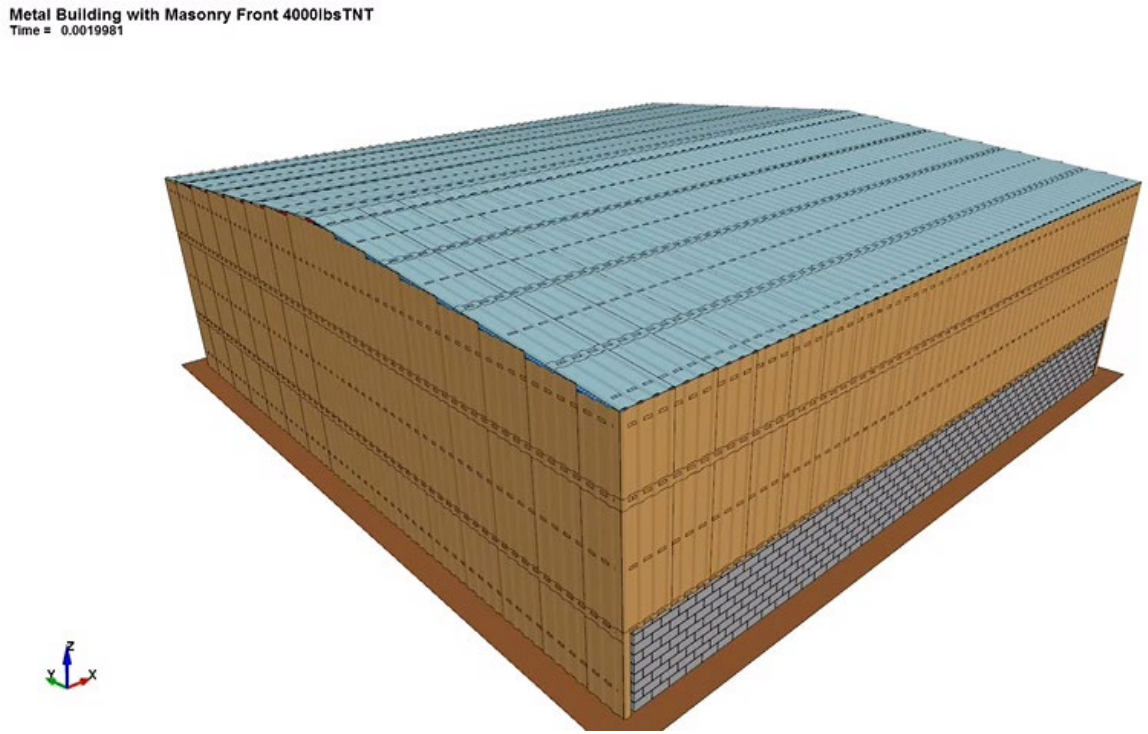


Pre-engineered Metal Buildings with Partial Masonry Block Wall

Building Examples

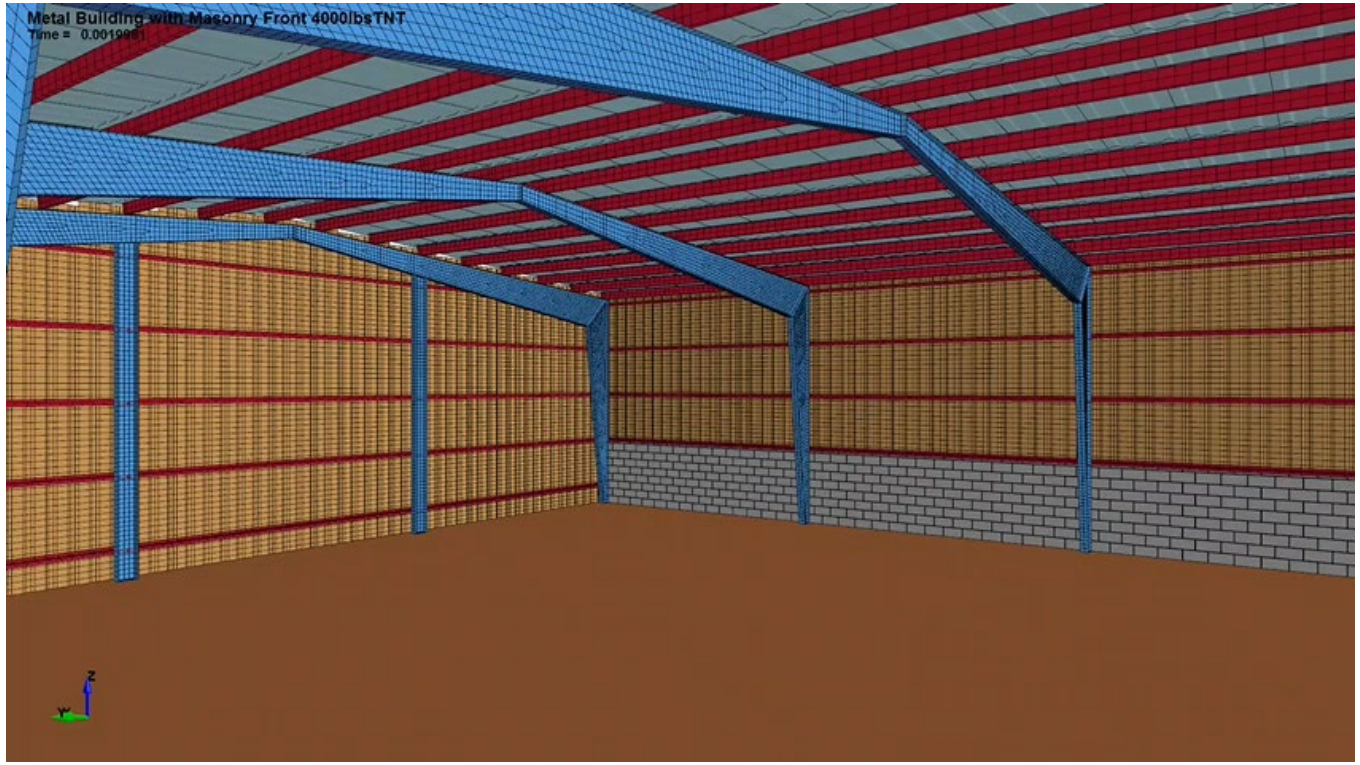
Pre-engineered Metal Buildings with Partial Masonry Block Wall - Animation

Pre-engineered Metal Buildings with Partial Masonry Block Wall: 4,000 lb TNT – 200 ft (Isometric View)



Pre-engineered Metal Buildings with Partial Masonry Block Wall - Animation

Pre-engineered Metal Buildings with Partial Masonry Block Wall: 4,000 lb TNT – 200 ft (Inside View)

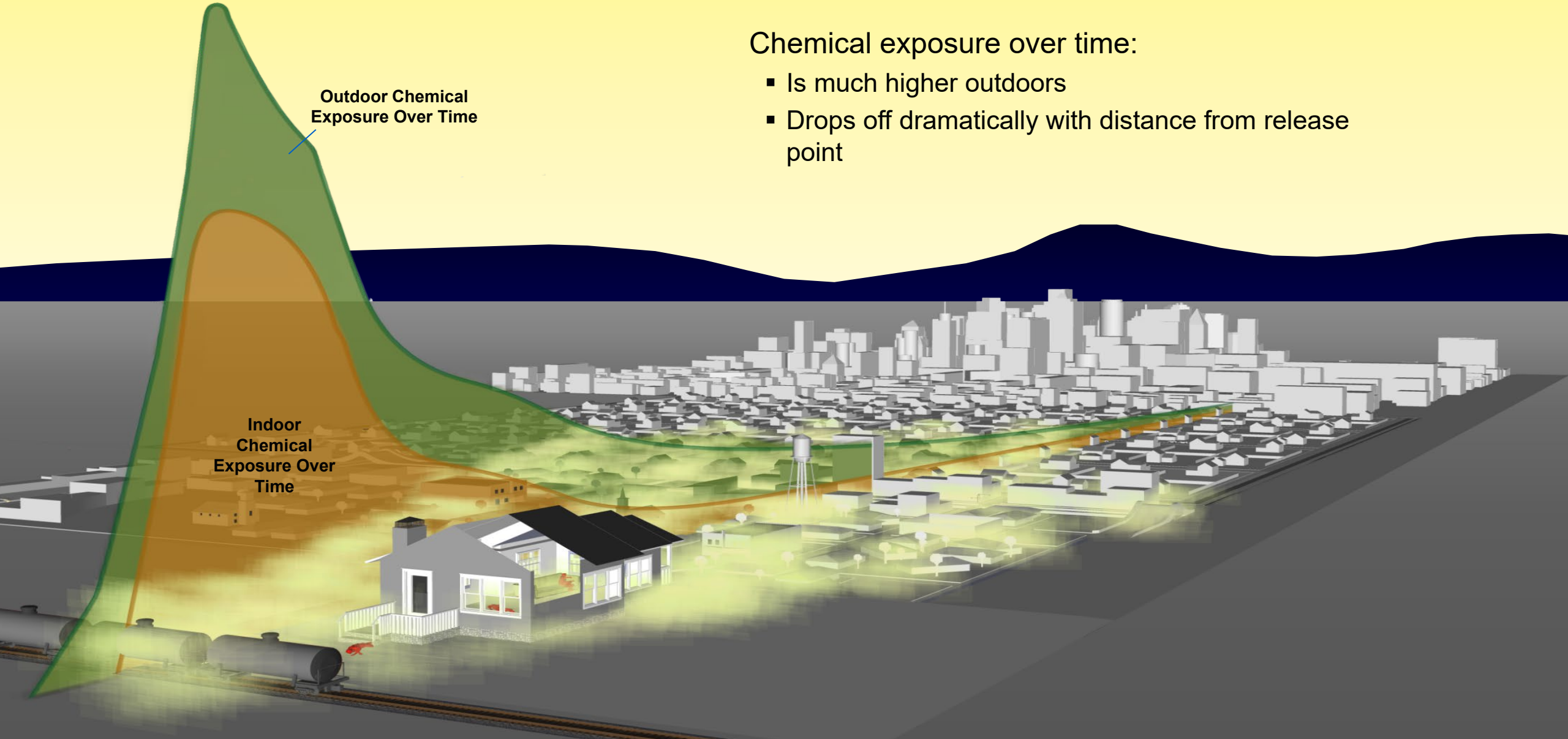


Release Toxic Modeling Approach

- Physics-based approach using reasonable worst-case modeling assumptions
  - Atmospheric dispersion modeling
    - Second-order Closure Integrated Puff (SCIPUFF) model
  - Casualty modeling
    - Fatality probability from toxic vapor exposure
  - Population exposure
    - LandScan™ population data
- Primary drivers for results
  - Chemical toxicity
  - Quantity and concentration released
  - Potentially exposed population
- It is assumed that self-evacuation can occur.

CHEMICAL EXPOSURE OVER TIME

DISTANCE FROM RELEASE POINT



Chemical exposure over time:

- Is much higher outdoors
- Drops off dramatically with distance from release point

Population Exposure

LandScan™ population data

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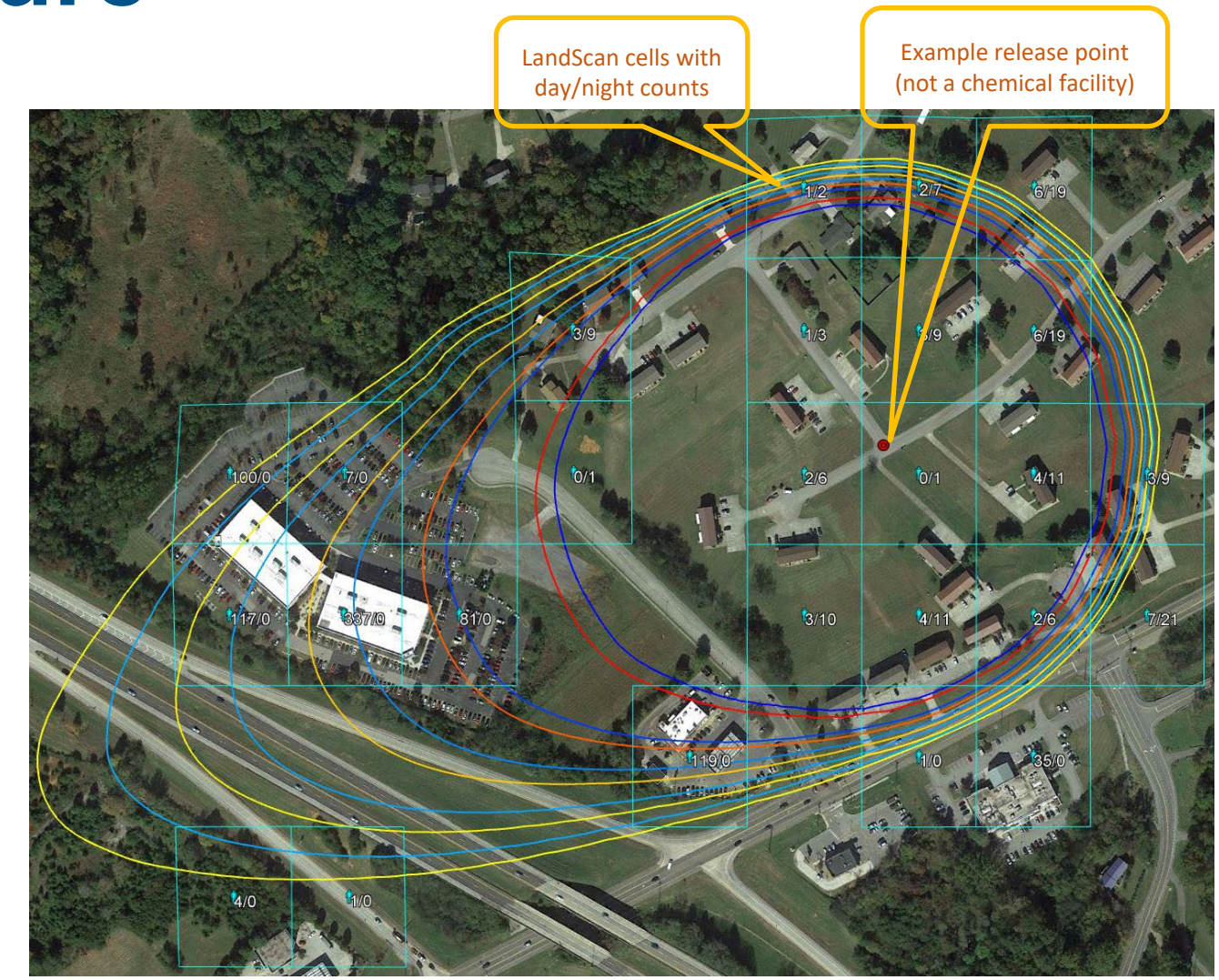
- Day and night population estimates



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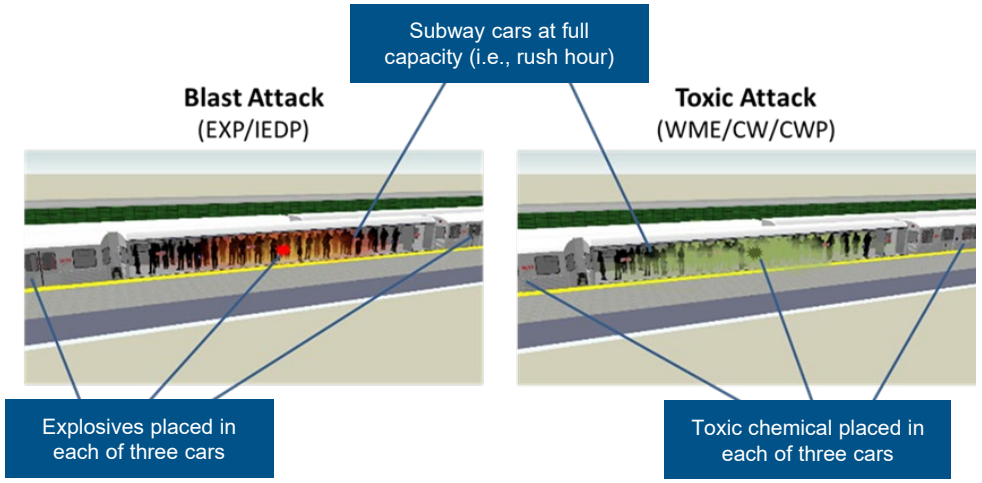
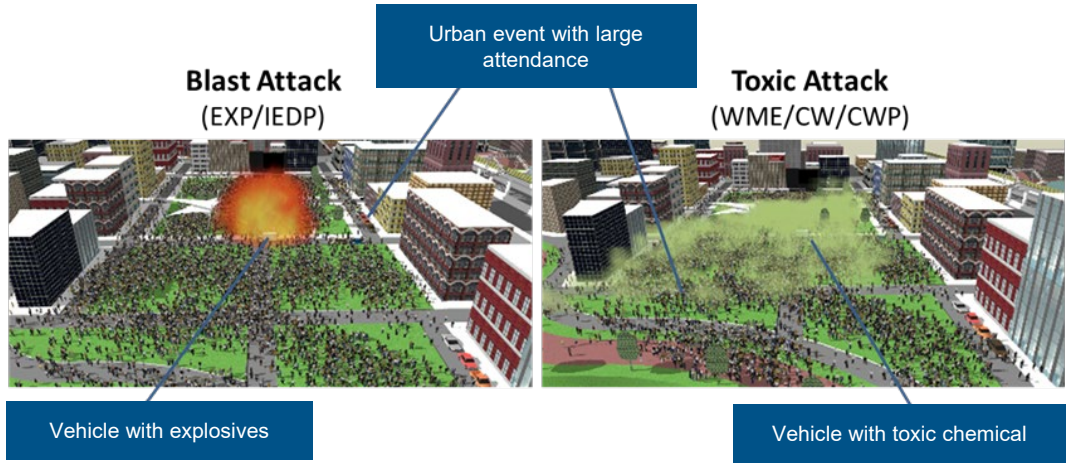
Attack Scenarios for Theft and Diversion

1. Urban Mass Transit



2. Urban Event

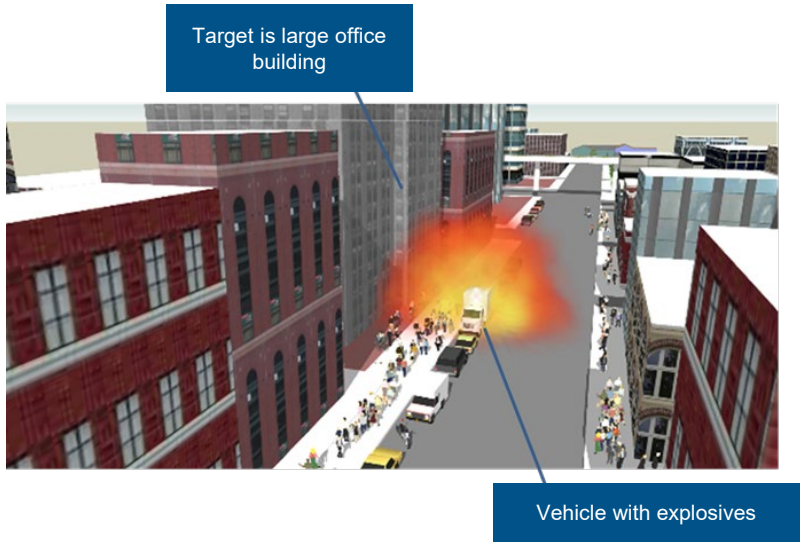


Scenario quantities are determined based on facility reported data and considerations as to what can be reasonably brought into the target area

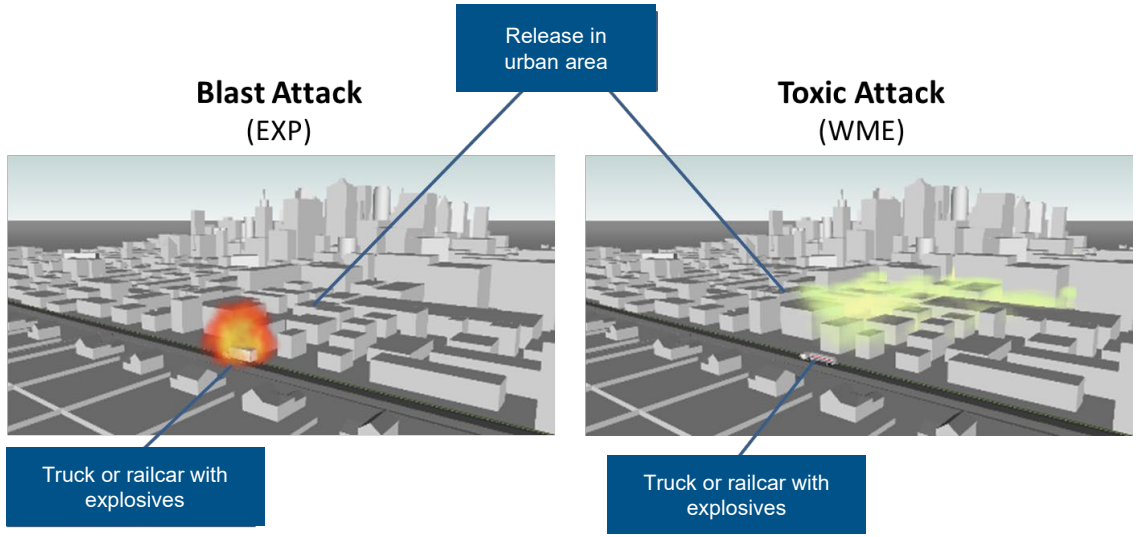
Theft/diversion attacks are off-site, potentially affecting scenario-specific populations.

Attack Scenarios for Theft and Diversion

3. Office Building Blast



4. Bulk Transport – Road or Rail



Scenario quantities are determined based on facility reported data and considerations as to what can be reasonably brought into the target area

Theft/diversion attacks are off-site, potentially affecting scenario-specific populations.

Attack Scenario for Sabotage and Contamination

- Attack causing
  - Contamination of a transport container on-site
  - Release from contaminated road or rail transport container offsite
- Sabotage COIs are water-reactive chemicals that generate a toxic inhalation product when exposed to water
- Two versions of this scenario: Road and Rail.
  - The version of the scenario used depends on what type of transportation container is reported by the facility. Both versions of this scenario are evaluated for facilities that report both Road and Rail types.
- Scenario modeled as a release in an urban area of a toxic reaction product generated from a bulk transportation container that has been contaminated with water.
- Scenario quantities determined based on facility reported data and chemical-specific characteristics for reaction of the COI with water.

Outreach Resources

CISA is committed to promoting chemical security awareness through outreach and fostering relationships within communities. CFATS continually develops new outreach resources in support of its outreach efforts and commitment to provide stakeholders with informative resources, including:

- Tiering Methodology Fact Sheet
- Top-Screen Submission Considerations
- CFATS Overview Fact Sheet
- CFATS First Steps Fact Sheet
- Top Regulated COI Fact Sheet
- RBPS-Specific Fact Sheets
- Industry-Specific Fact Sheets

For further questions & technical consultations:

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