# FEMA City Planner Resource (CPR) Chemical (chemCPR) Outreach

## NY/NJ Regional Response Team Meeting

## Liberty State Park; Jersey City, NJ

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# Agenda

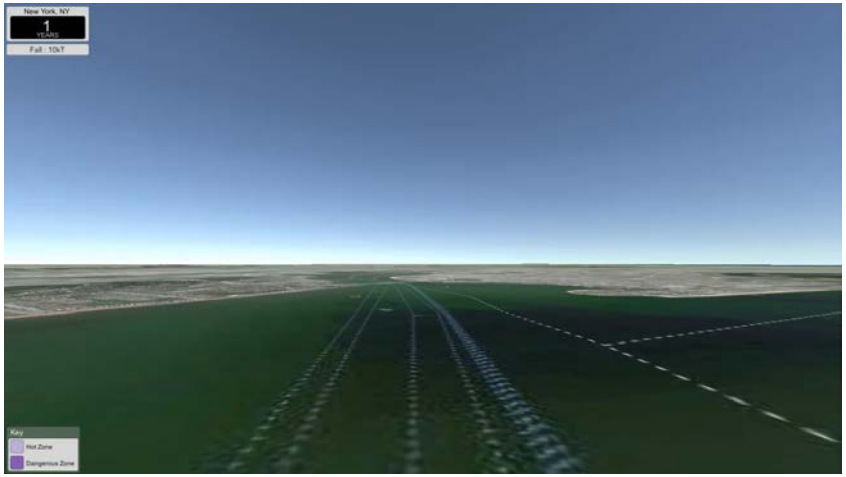
- Overview of City Planner Resource (CPR) tool
- Demo of improvised nuclear device CPR (iCPR) tool
- Introduce Chemical CPR (chemCPR) development effort
- Identify regional subject matter experts to provide input to chemCPR requirements gathering effort

**chemCPR is in "scoping" stage. Need State, Local, Tribal input to help identify appropriate user community, key scenarios of interest, and output products.**

# LLNL has supported OHA/FEMA's CBRN Office since 2007

***LLNL draws on its role as a nuclear weapons design lab, and other Federal Agency investments in:***

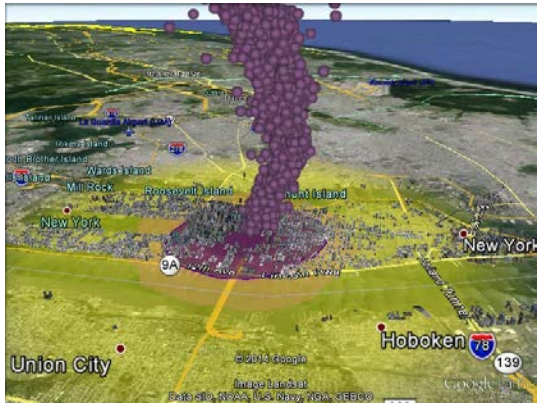
- Modeling and simulations of CBRN effects
  - Atmospheric dispersion models
  - Blast Effects
- Expertise
  - Health Physics
  - Chemical
  - Biological
- High performance computing



**LLNL Modeling & Simulations used for range of CBRN effects**

# City Planner Resource (CPR)

- Evolved out of LLNL's IND Planning support to FEMA
  - Key Planning Factor (KPF) Reports, Presentations, & Custom Analyses: IND effects on a major US city, consequences, and strategies to save lives


- While the KPF products were well received, the serial city-by-city approach is expensive, takes a long time, and is not feasible to deliver to larger number of US cities
- CPR more sustainable approach to reach broader planning community
- *No cost to users*

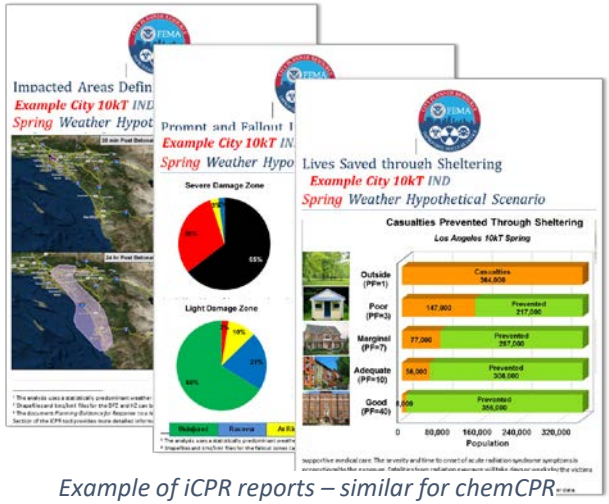
# City Planner Resource
# SUITE of Tools for Fed, State, Local, Tribal (FSLT) Response and Exercise Planners

Web-GIS based suite of CBRN planning tools

***iCPR**: IND City Planner Resource – **beta version complete***
***chemCPR**: Chemical City Planner Resource – **in development***
***bioCPR**: Biological City Planner Resource – in planning*
***radCPR**: Radiological City Planner Resource – in planning*

## *CPR focused on PLANNING at all levels of government, with information and products geared for planners*

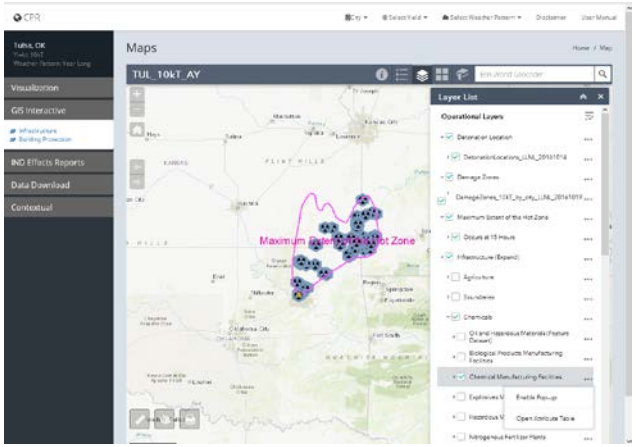
- Scenario specific reports describing
  - Health, population, & infrastructure impacts
  - Applying federal response guidance
- Contextual information
  - Federal guidance
  - Relevant guidance, i.e. medical




*Example of iCPR reports – similar for chemCPR*

# City Planner Resource
# CBRN Effects Planning Tool

- Supports strategic planning for large scale, high consequence events
- Builds off existing modeling capabilities
- Scenarios that will inform key planning considerations for a response at all levels of government (FSLT) to save lives
- Provides in-depth contextual information informed through science based analyses
  - Animations of event progression
  - Buildings, terrain, time and spatially varying weather, and gas density effects
  - Detailed community specific visuals
  - Scenario specific infrastructure impacts
  - GIS files for use in planner's GIS system

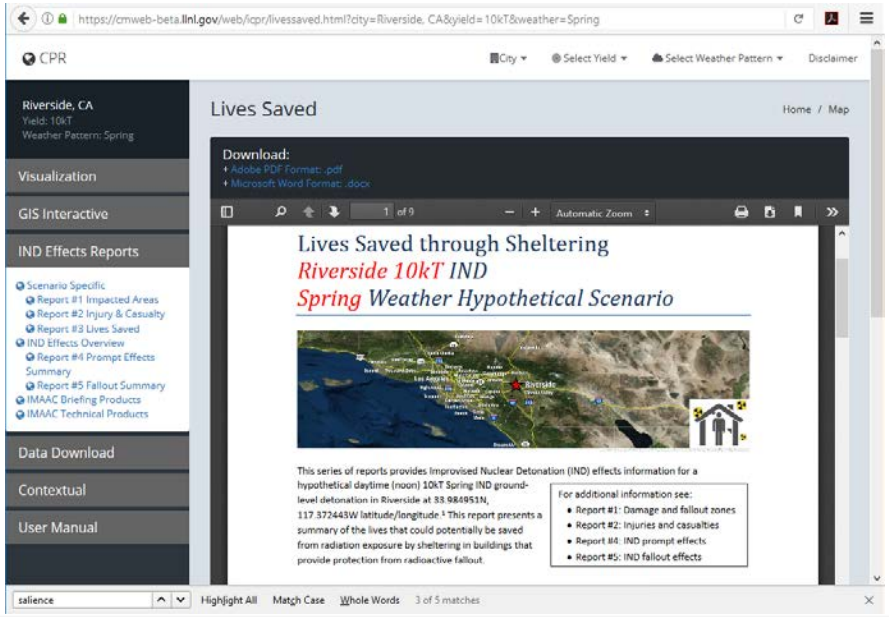



*Example of iCPR infrastructure-HSIP Gold Data*

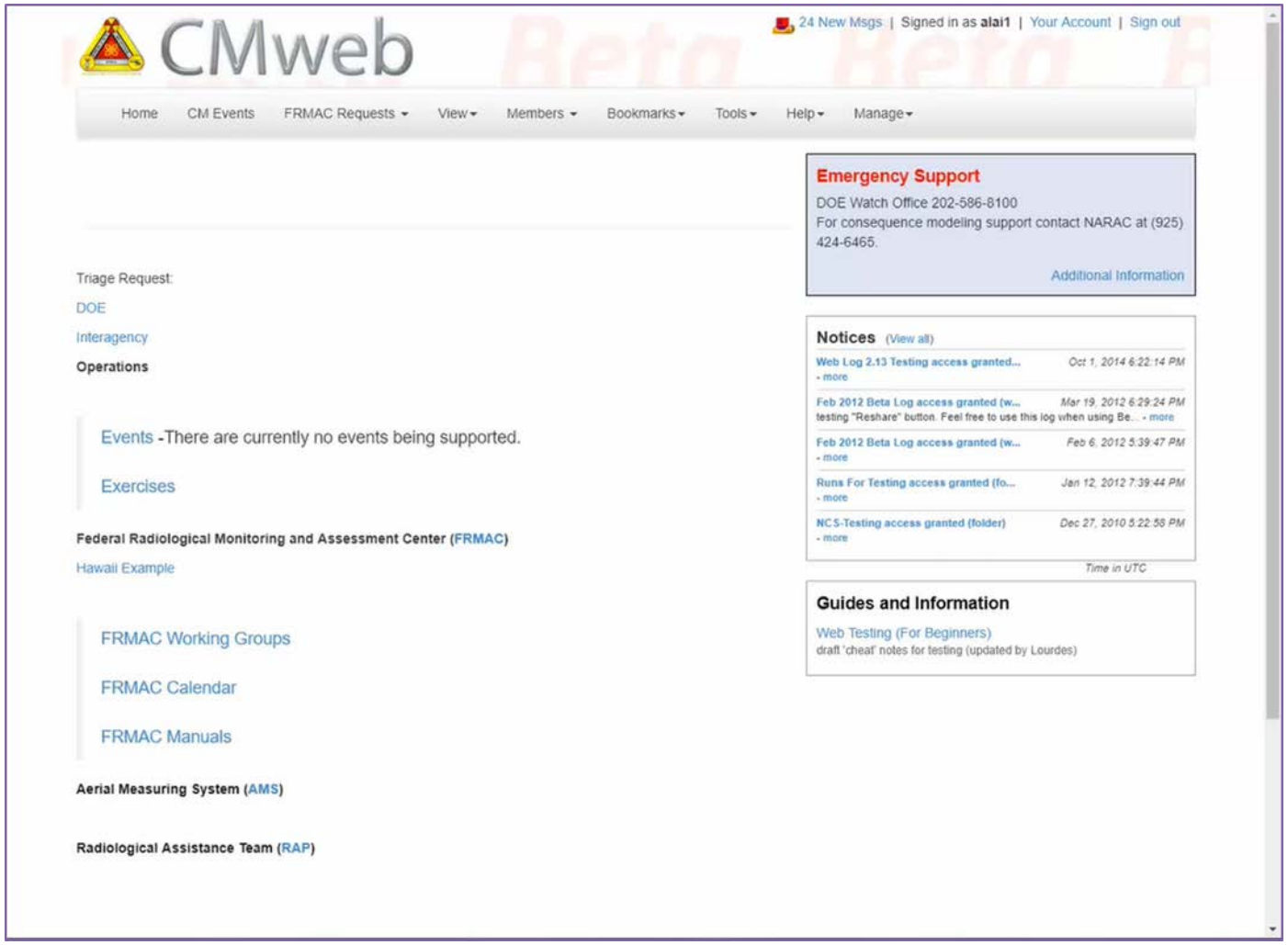

*results*

# Improvised Nuclear Device City Planner Resource (iCPR) Tool

- Pre-calculated IND effects for 60 major cities
  - Accessible through web-based interface
  - 2 yields: 1 kT and 10 kT ground level detonations
  - Downtown business district location at daytime
  - 5 statistically predominant weather patterns
- Web GIS-based user interface to overlay weapon effects on key infrastructure and local shelter data
- Available through CMweb

# IND City Planner Resource DEMO



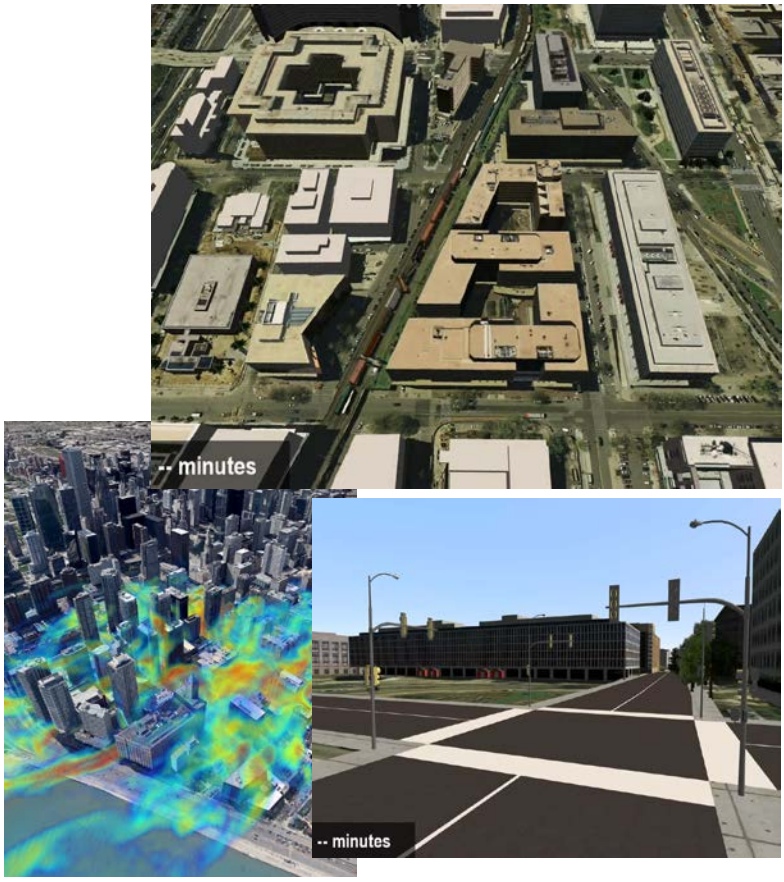
# How does this information benefit Planners?

- Understand how event will unfold, the impacts, and actions that can be taken to save lives
- Scale of resources that could be needed
  - Medical
  - First responders and associated equipment
  - Transportation
  - Evacuation and Sheltering
    - Relocation housing – how much and how long
    - Number of and considerations in identifying shelter locations
  - Debris removal
- Identify critical infrastructure that could be impacted
- Cross-jurisdictional considerations and roles
- How to apply federal guidance
- Use in developing and executing exercises

# chemCPR: Another Tool in the Planner Toolbox

***CPR focuses on providing detailed understanding and progression of a potential high consequence ACCIDENTAL event***

- *Supplements* CAMEO/ALOHA and other chemical release planning tools
  - Coordinating with EPA and NOAA CAMEO/ALOHA
- Scenarios that will inform key planning considerations for a response at all levels of government (FSLT) to save lives
- Detail information
  - involves evacuation/shelter-in-place for the general community, including potential members of the public seeking medical treatment, potential fatalities, etc.
  - Identify "bounding event" for planning
- Limited number of scenarios and chemicals, selected based on regional priorities
  - Airborne releases, high toxicity



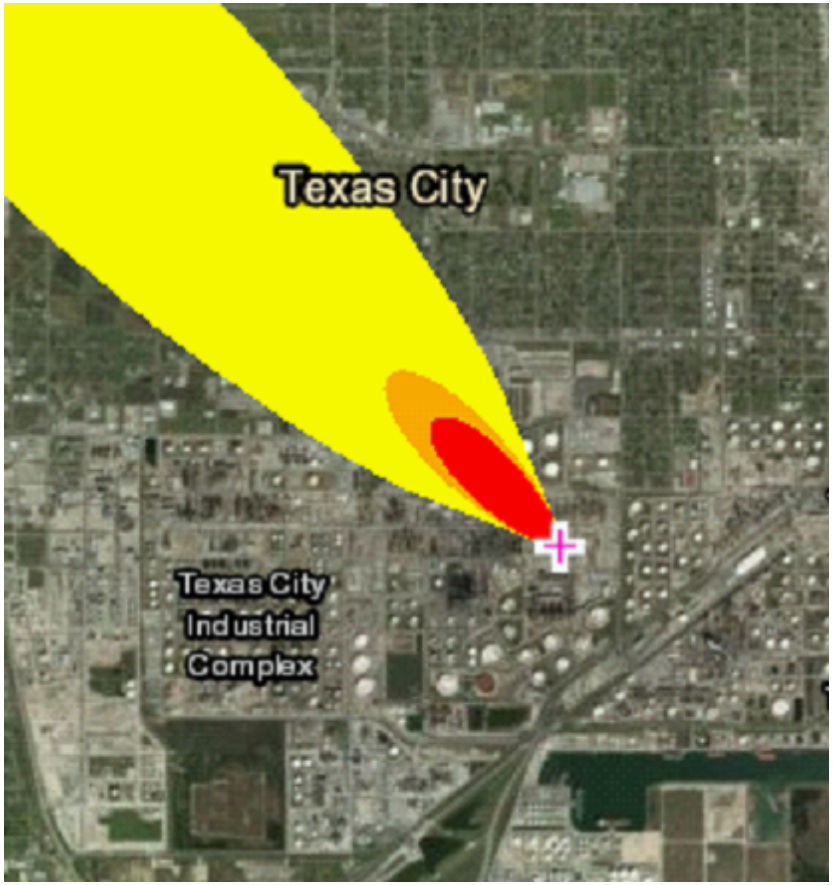
# CAMEO

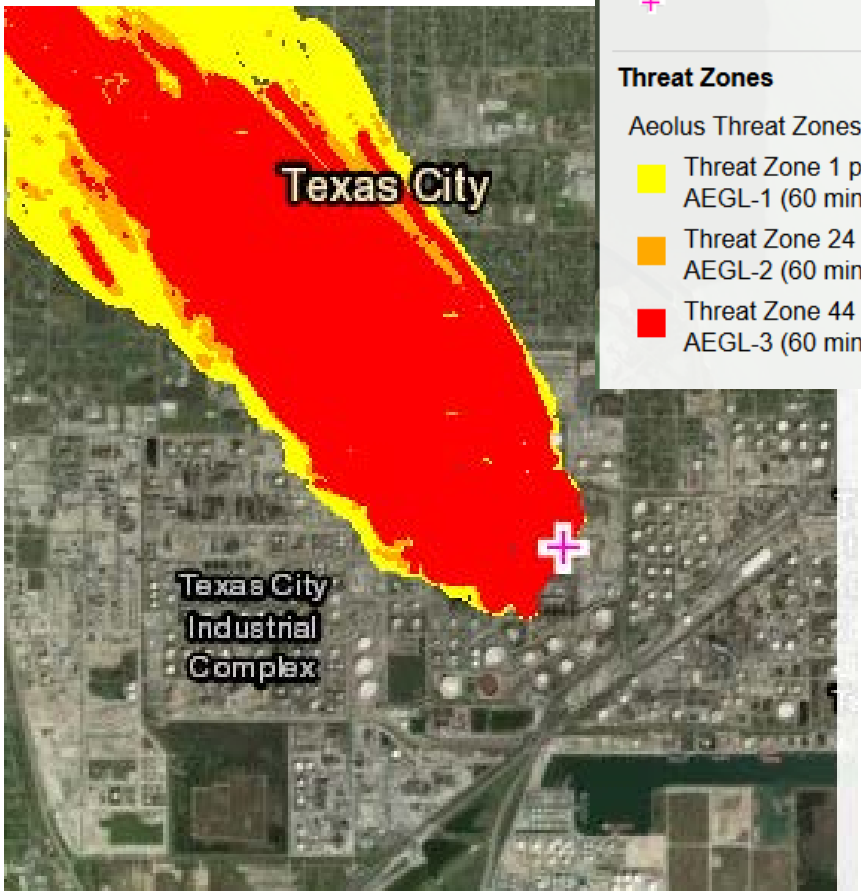
- CAMEO/ALOHA is well established chemical emergency response and planning tool for airborne releases
- ALOHA model has excellent source term generator models
- Plays a key role in releases/spills from small scale to large scale
- Resource for regulatory compliance

# chemCPR and CAMEO/ALOHA Products

| | CAMEO / ALOHA | chemCPR |
|---|---|---|
| Scenario Progression | • Scenario results shows final toxic threat zone and concentration at user defined locations<br>• No urban canyon effects<br>• Single meteorological time input<br>• Limited to 6 kilometers and 1 hour | • Visualize time progression of release and how concentrations change from flowing around buildings – customized to each city/location<br>• Time and spatially varying winds<br>• Time and distance covers full scale of event |
| Infrastructure impacts | • Key locations of concern can be added in MARPLOT<br>• Can import to user's GIS system | • Interactive<br>• Uses HSIP Gold data<br>• Can import to user's GIS system |
| Concentration Estimates | • Concentration estimates are always highest near source<br>• Use averaged air concentrations<br>• Estimate on indoor air concentrations at specific point for general building types | • More realistic concentration estimates<br>• High concentrations can occur far from source<br>• High concentrations can linger after release has stopped due to accumulation around buildings<br>• Outdoor only |
| Specific Planning Products | • Default 60 minute AEGLs/ERPGs/TEELs regardless of release duration – but can be customized by user<br>• NIOSH IDLH levels – customized by user<br>• Threat zone pictures, threats at specific locations, and source strength graphs<br>• Export kmz/kml/shapefiles | • AEGLs/ERPGs/TEELs for optimal duration of release<br>• NIOSH IDLH levels<br>• How to apply federal guidance and how a federal response unfolds<br>• Export kmz/kml/shapefiles |
| Result production | • Can be used in real-time for response | • Detailed scenarios run in advance for planning, not for real time modeling |

# chemCPR and CAMEO/ALOHA: HF Release: ALOHA and Aeolus

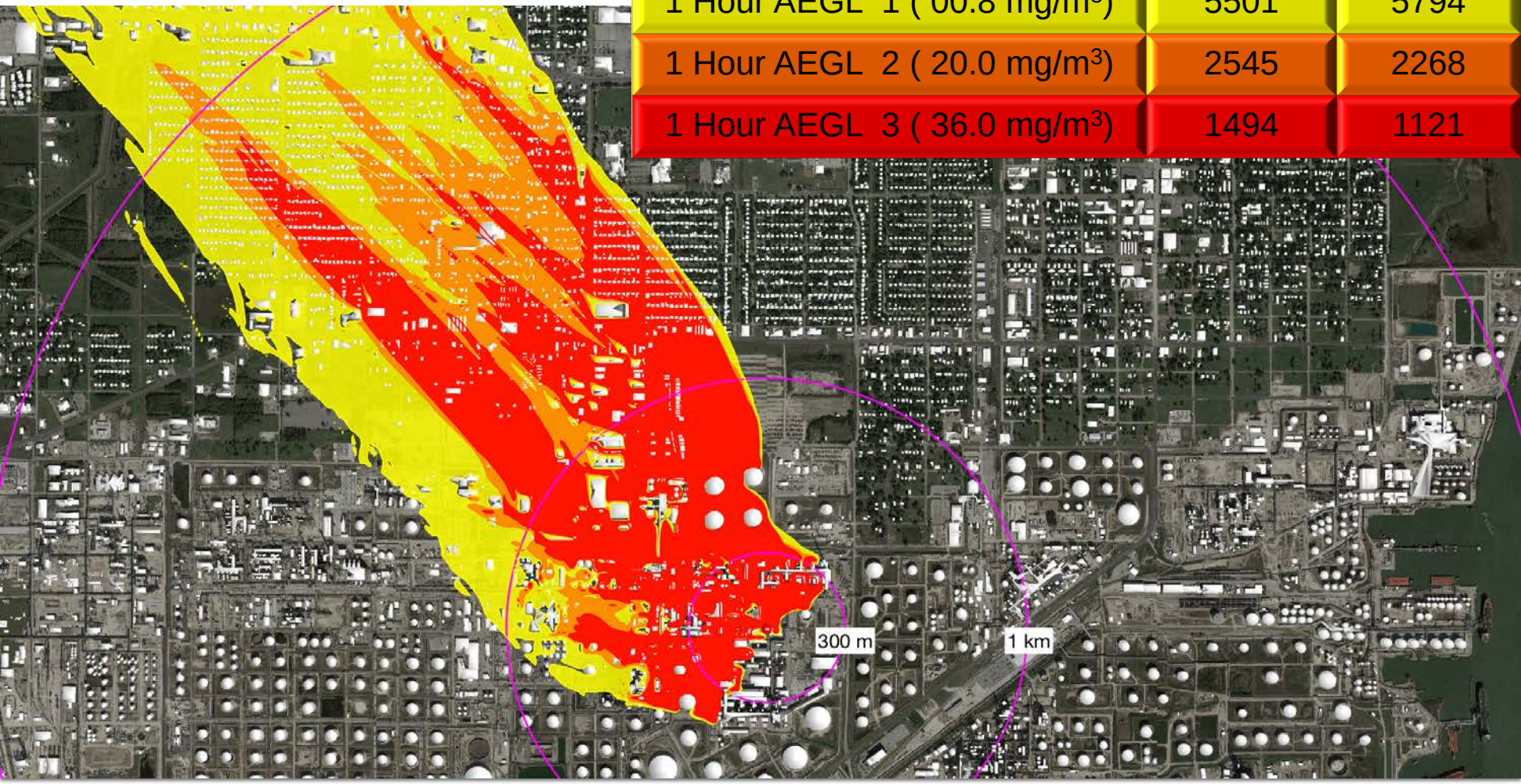


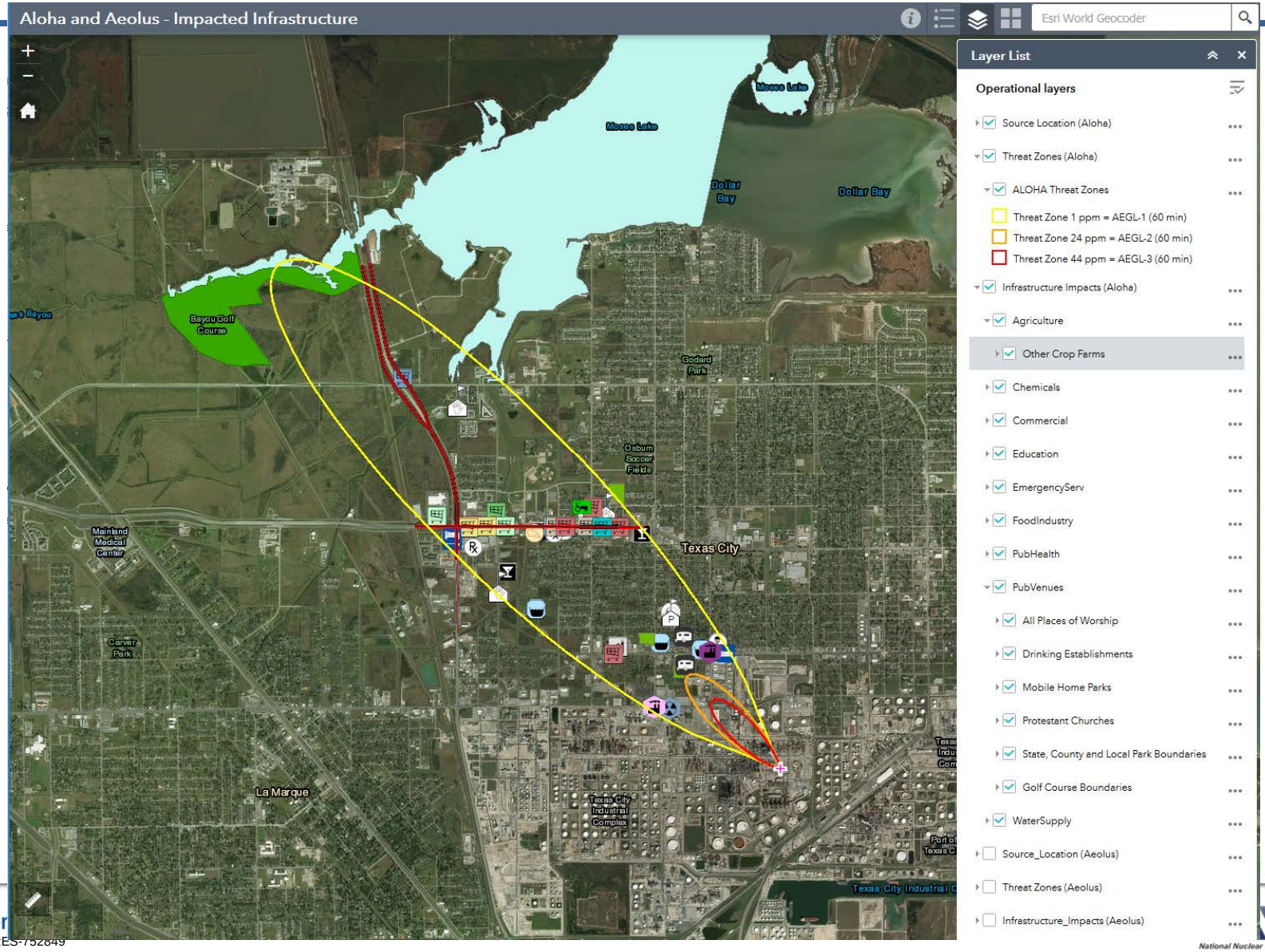

**chemCPR uses Aeolus Computational Fluid Dynamics (CFD) model**

# Possible chemCPR Product: Example Output, HF Release - Aeolus

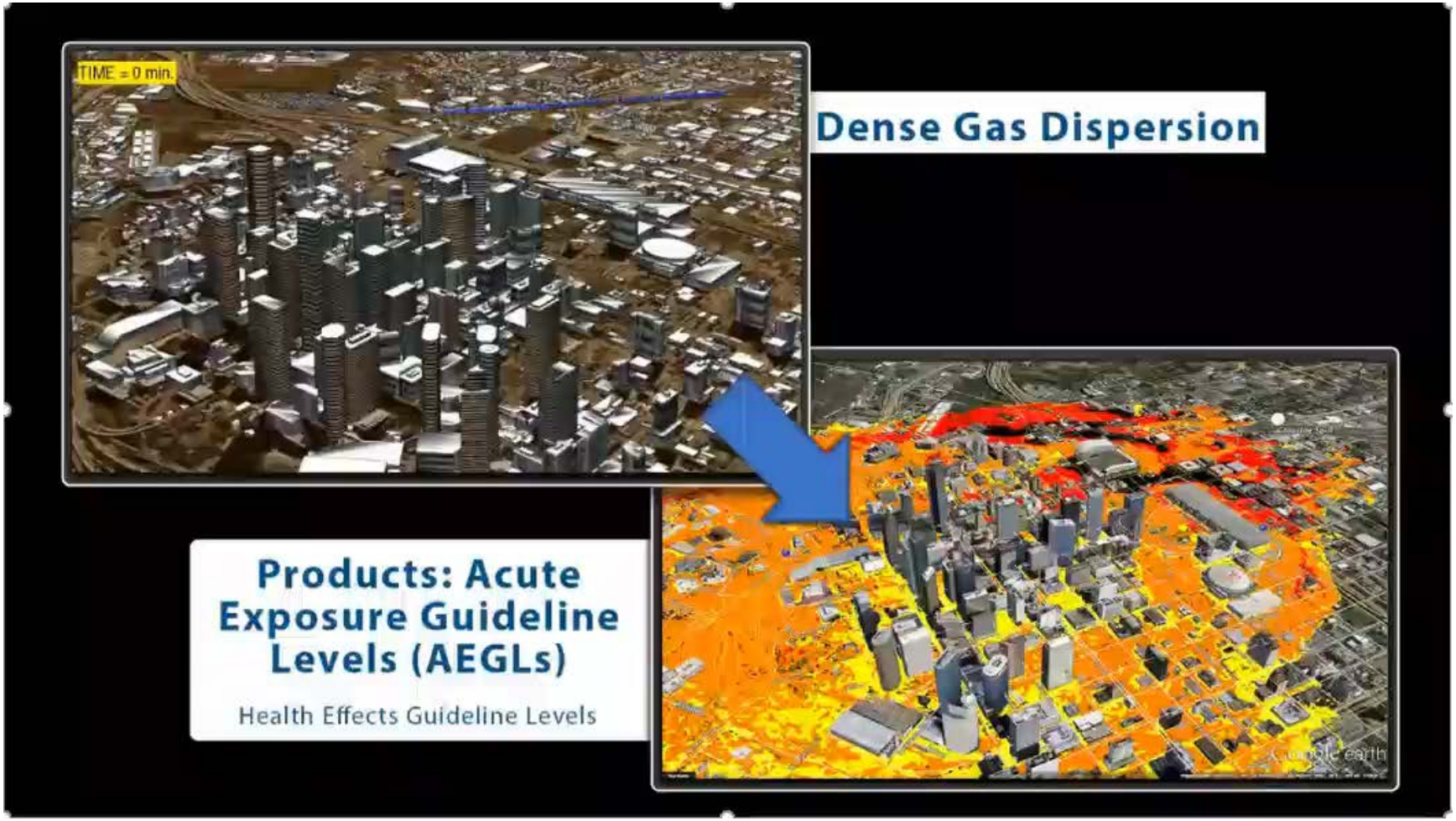
| Impacted Population | DAY | NIGHT |
|---|---|---|
| 1 Hour AEGL 1 ( 00.8 mg/m$^3$) | 5501 | 5794 |
| 1 Hour AEGL 2 ( 20.0 mg/m$^3$) | 2545 | 2268 |
| 1 Hour AEGL 3 ( 36.0 mg/m$^3$) | 1494 | 1121 |



# chemCPR and CAMEO/ALOHA Products: Example Output, HF Release – ALOHA, CIKR impacts



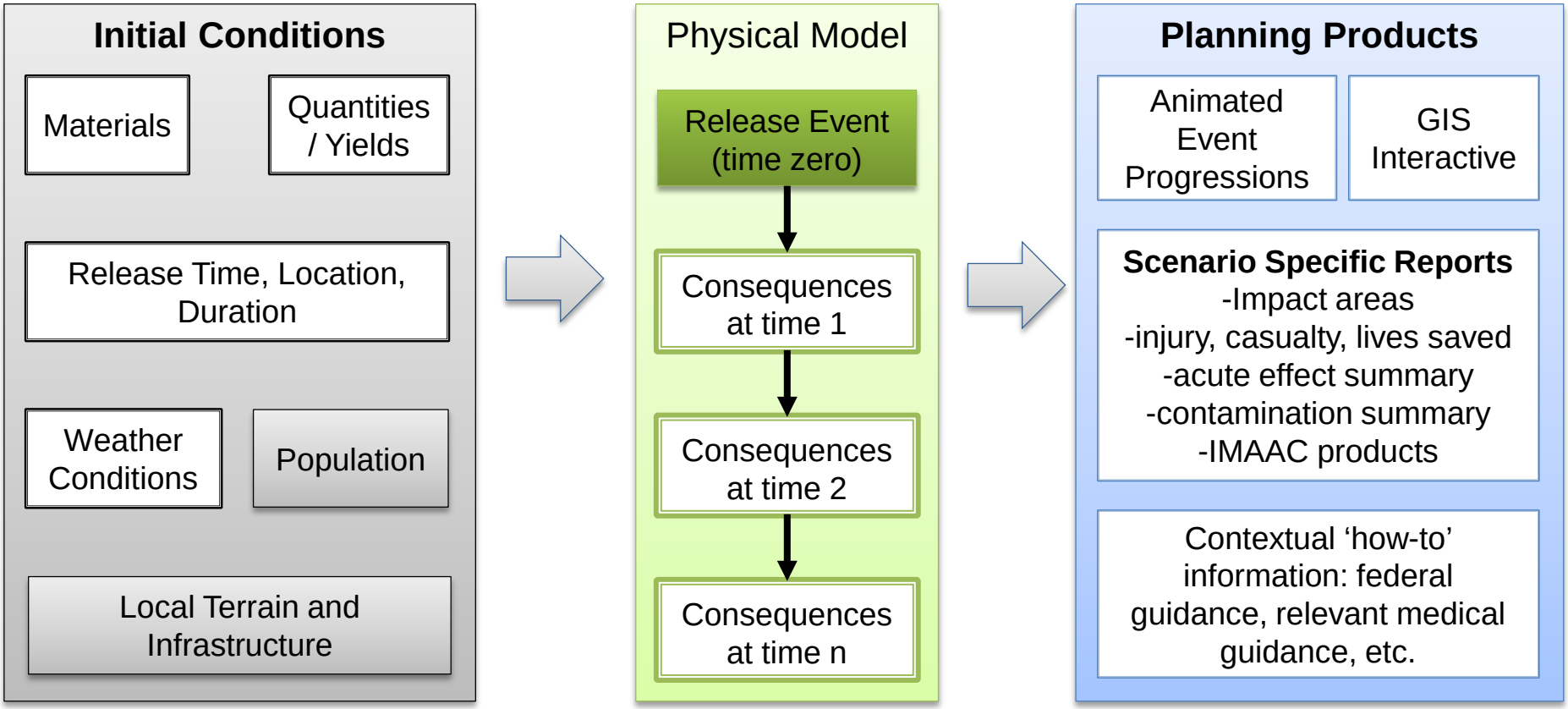
# chemCPR accounts for buildings and terrain
## Aeolus Computational Fluid Dynamic Model (CFD)



# Same Requirements Process – different parameters, chemCPR will not be the same as iCPR

| Example Requirement | iCPR | chemCPR |
|---|---|---|
| **Material of Interest** | **Nuclear detonation** | **Atmospheric release, ~2-3 chemicals TBD by region** |
| **Release Quantity/Yield** | **1kT and 10kT** | **"Catastrophic" amount*** |
| **Release Location** | **60 cities**<br>Downtown city center | **TBD by region**<br>• Process, storage facilities<br>• Transportation |
| **Weather** | **5 Predominant Weather Patterns: 4 seasons, all year** | **TBD**<br>• Statistical vs worst case bias?<br>• SME input, realistic, useful |
| **Products** | **Infrastructure, prompt & fallout casualties, applying federal guidance…** | **TBD by SME and end user engagement**<br>• CIKR impacts, health effects<br>• Impacted populations?<br>• Federal guidance? |

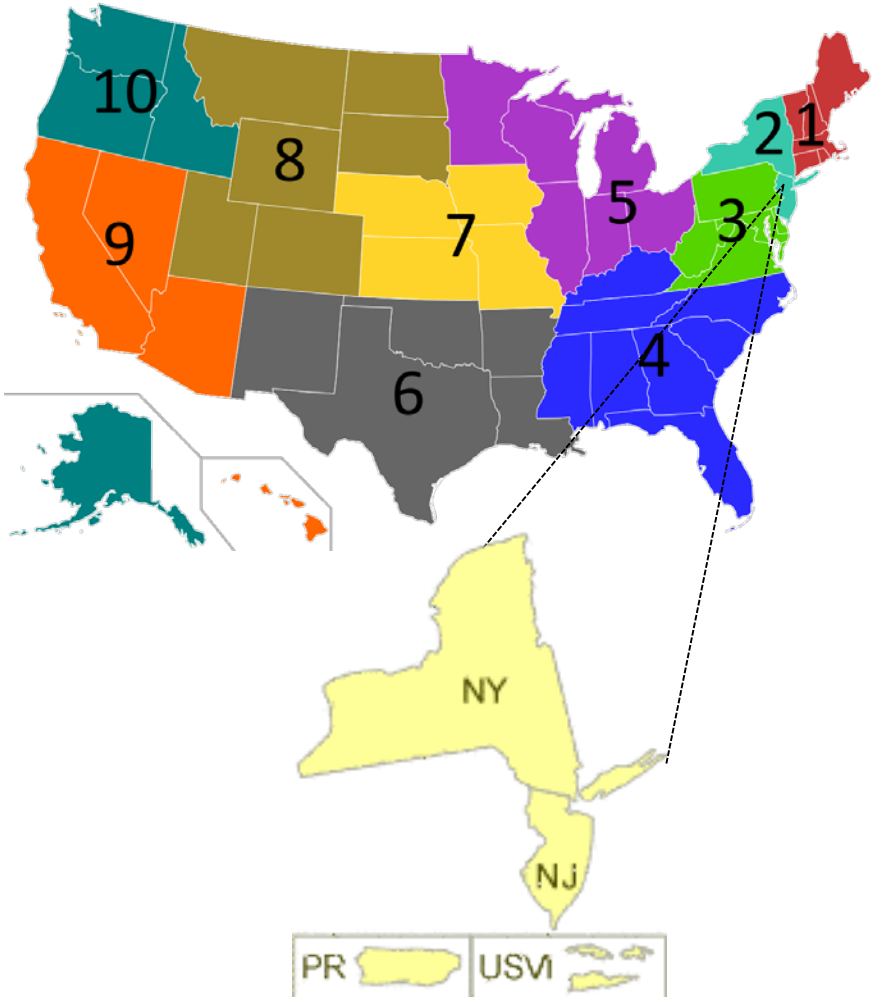
# City Planning Resource (CPR) Framework



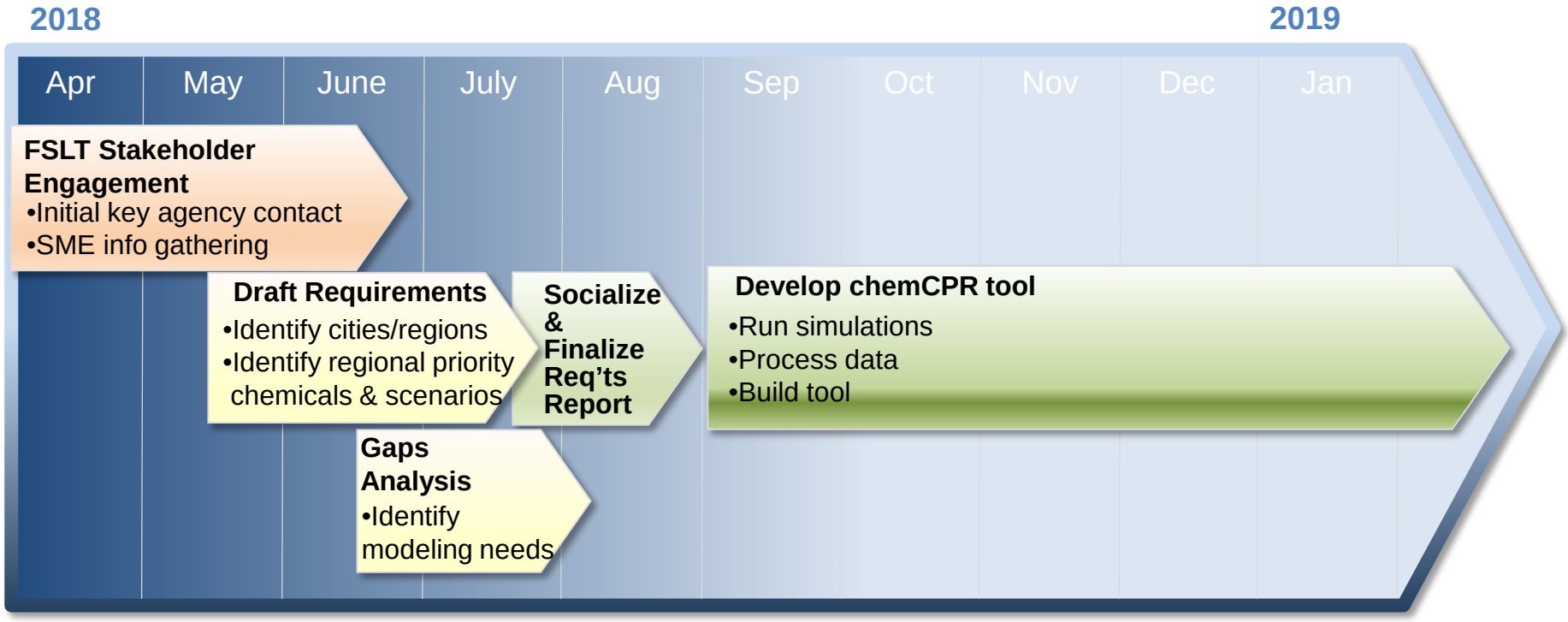

***Seeking SME input to develop requirements for chemCPR audience, inputs and planning products***

# chemCPR Requirements Development: Stakeholder Engagement

- Subject Matter Experts
  - Technical
  - Emergency Response Community
  - Planners
- Potential End Users
  - Federal
  - State
  - Local
  - Tribal
- Webinars, phone calls, in person meetings
- Focus on areas with most comprehensive chemical inventories



# chemCPR Scoping & Development Timeline



# chemCPR – FSLT Stakeholders

## What we need from you

***SME suggestions and POC info***

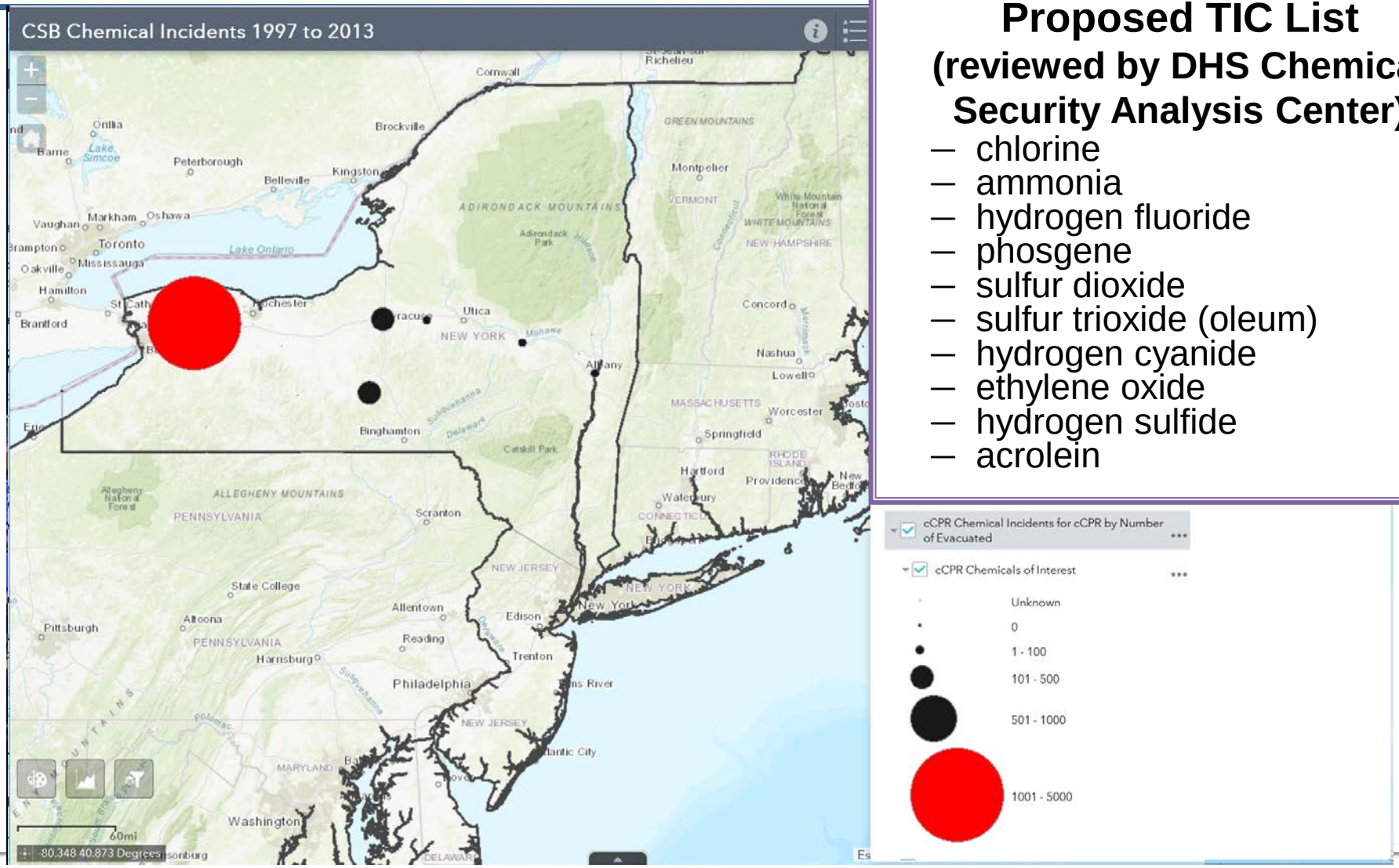
- City, County, State, Tribal planners
- EPA On-Scene Coordinators, FEMA regional planners, …

***SME input from Regions:***

- Identify potential SLT audience, who benefits most from this type of tool?
- Prioritize chemicals of concern
  - Airborne
  - High Consequence
- Review/recommend release points
  - Facilities
  - Transportation routes
- Useful effects information
  - Infrastructure
  - Population impacts
  - Health effects

# Preliminary Chemical List

## *Accident Databases are Incomplete*

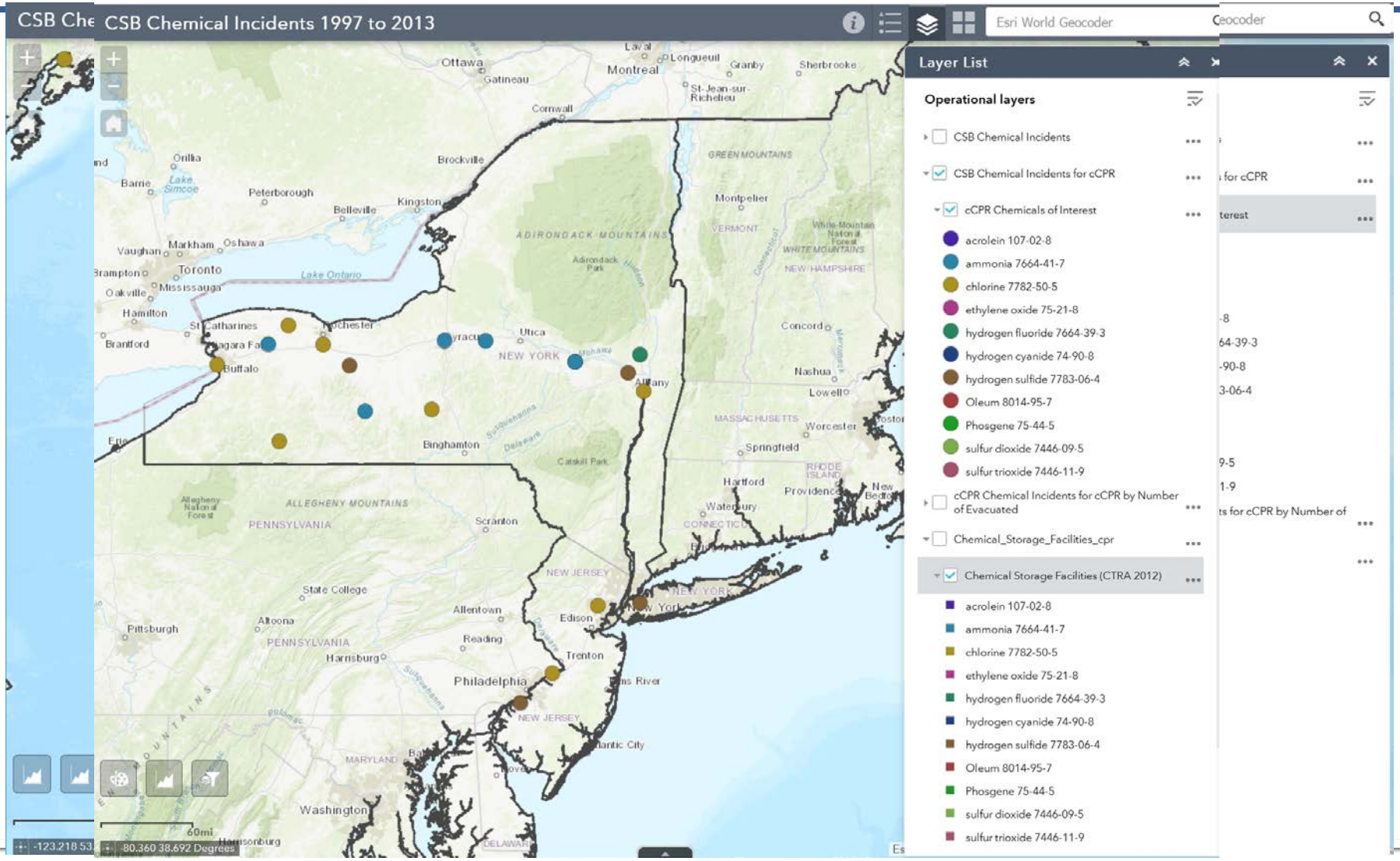



**Proposed TIC List**
**(reviewed by DHS Chemical Security Analysis Center)**

- chlorine
- ammonia
- hydrogen fluoride
- phosgene
- sulfur dioxide
- sulfur trioxide (oleum)
- hydrogen cyanide
- ethylene oxide
- hydrogen sulfide
- acrolein

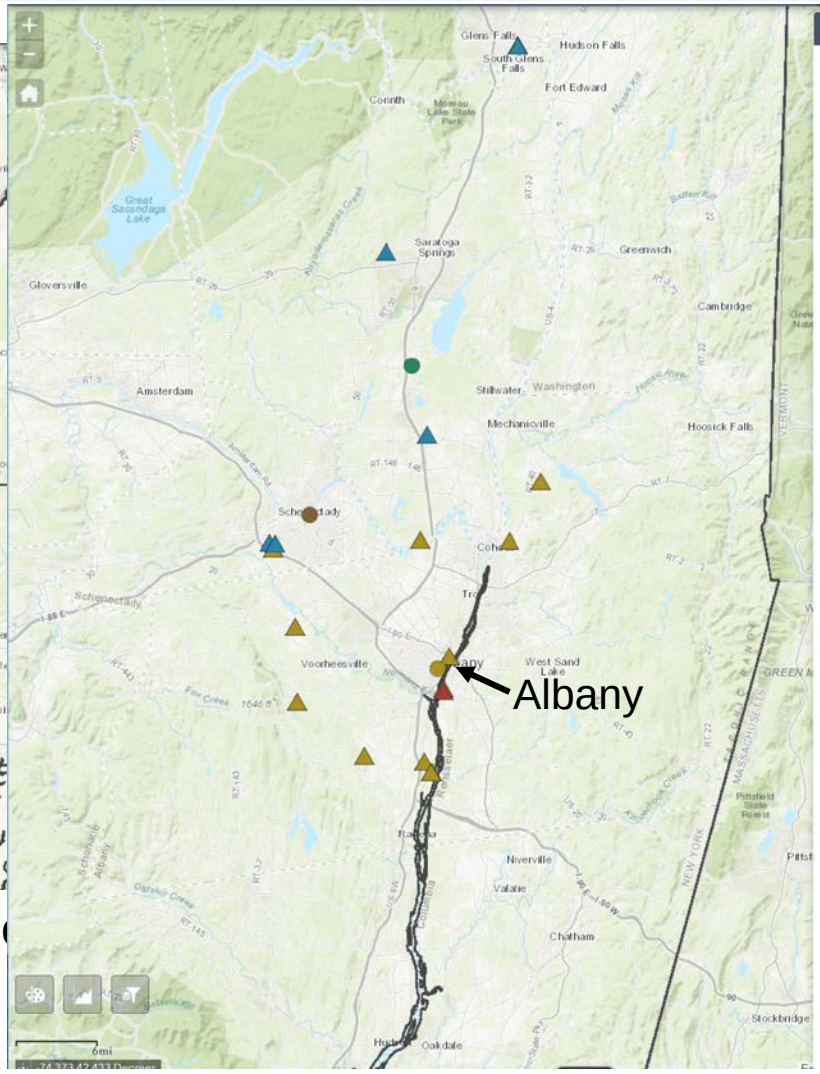
# Historical Chemical Incidents 1997-2013

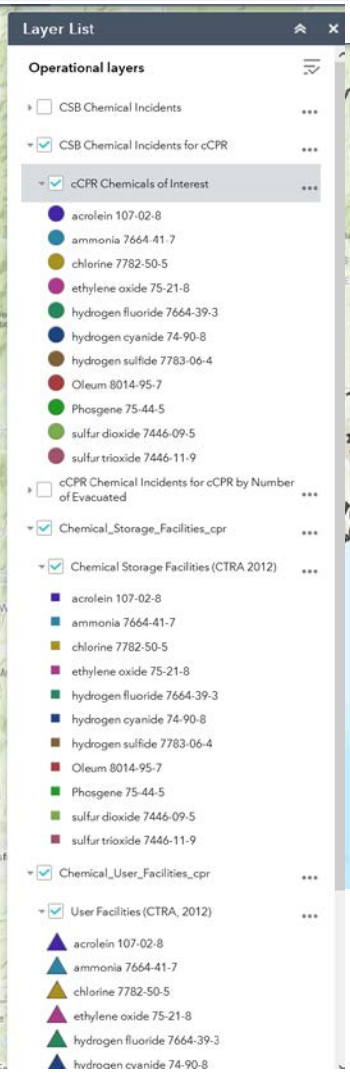
## *Accident Databases are Incomplete*

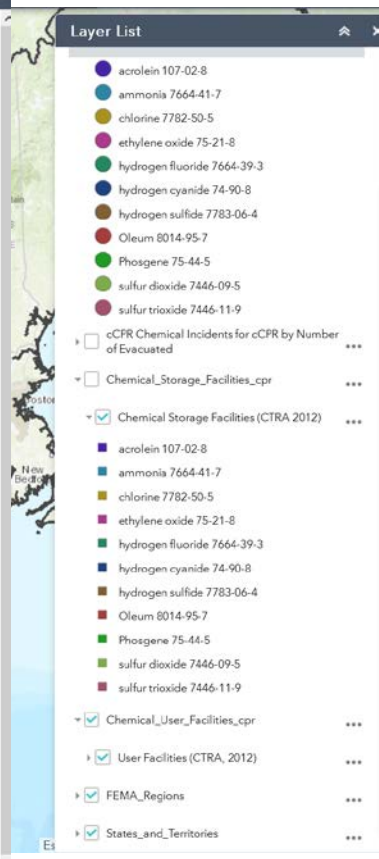


# Chemical Storage and Users Facilities: EPA RMP and State Tier II Data

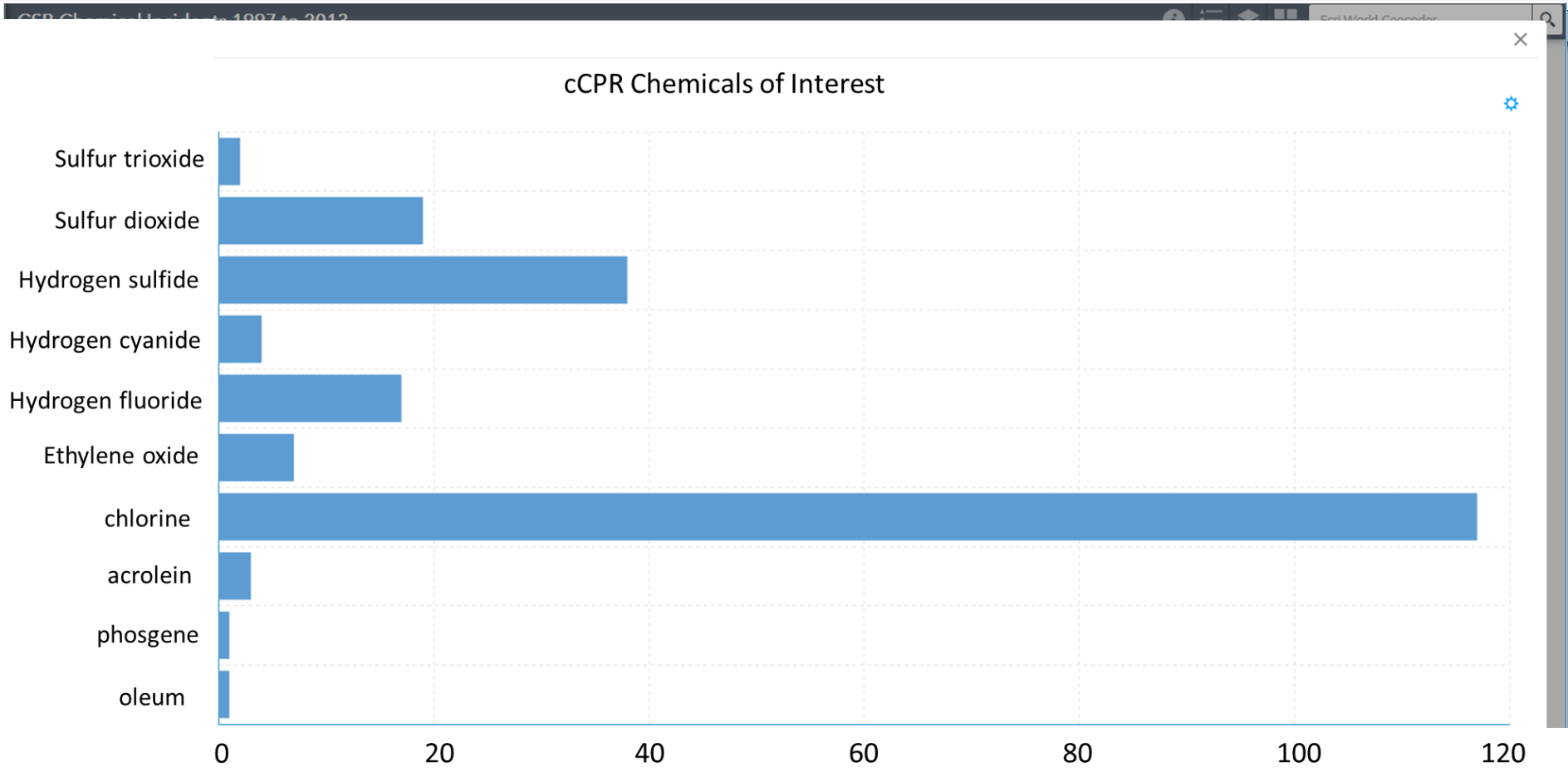

Storage



# Historical Accidents - without ammonia Across US



# *Thank you for your time*

***Questions?***

***FSLT SME Suggestions?***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