

FEMA Planning Tools: Introduction to the City Planner Resource (CPR)

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Agenda



- Overview of the City Planner Resource (CPR) tool
- Demo of Improvised Nuclear Device (IND) CPR (iCPR) tool
- Introduction to Chemical CPR (chemCPR) development
- CPR next steps

TODAY'S OBJECTIVE: *Gain awareness* of the FEMA CPR tool being developed for federal, state, local, territorial, and tribal (FSLTT) response and exercise planners.

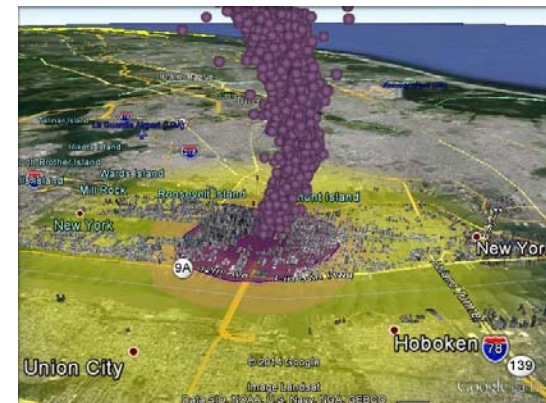


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City Planner Resource (CPR)

- Evolved out of Lawrence Livermore National Laboratory'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*



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City Planner Resource: SUITE of Tools for Fed, State, Local, Tribal, and Territorial Response and Exercise Planners



Web-GIS based suite of CBRN planning tools

iCPR: IND City Planner Resource – **beta version complete**

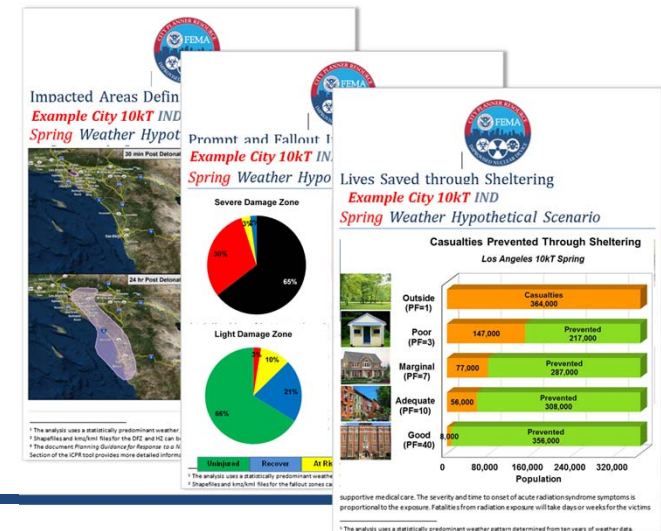
chemCPR: Chemical City Planner Resource – **in development**

bioCPR: Biological City Planner Resource – **in development**

radCPR: Radiological City Planner Resource – **in planning**

*CPR focuses 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



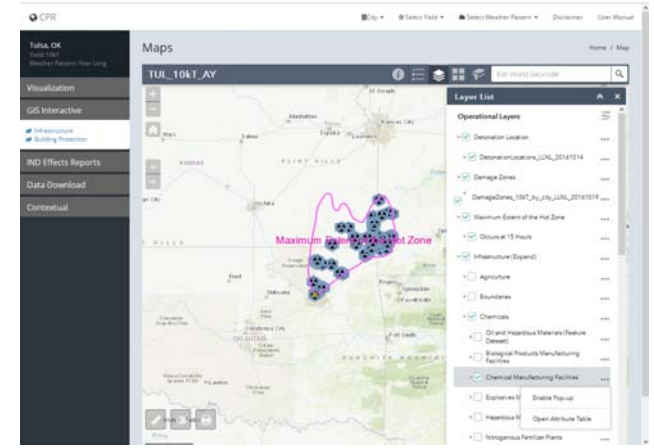
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Example of iCPR reports – similar for chemCPR

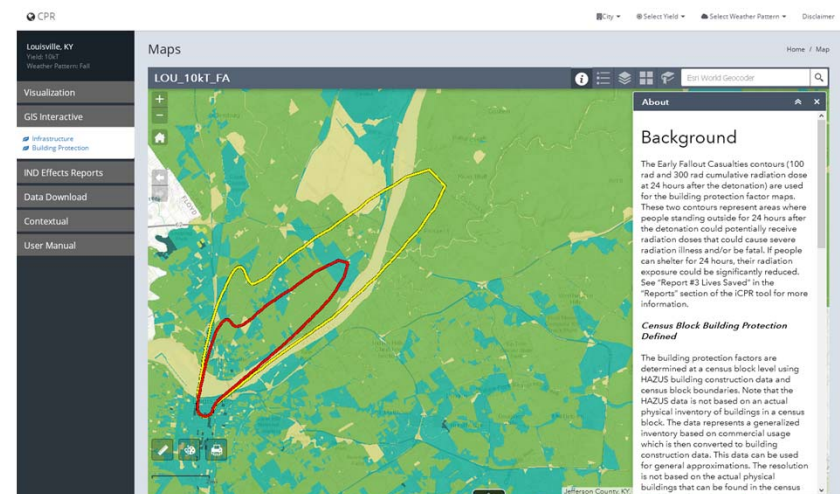
City Planner Resource: CBRN Effects Planning Tool



- 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 (FSLTT) 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



Example of iCPR Building Protection Maps

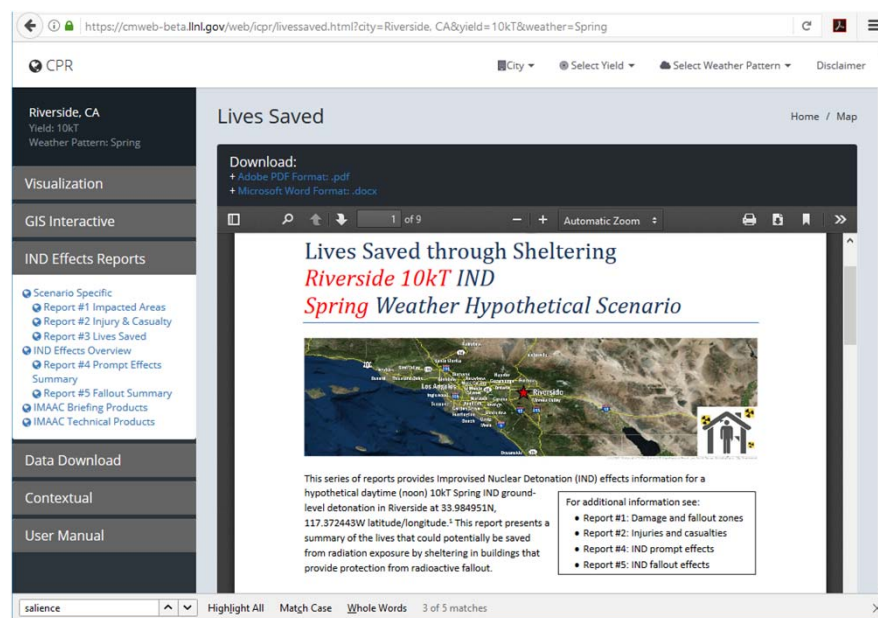
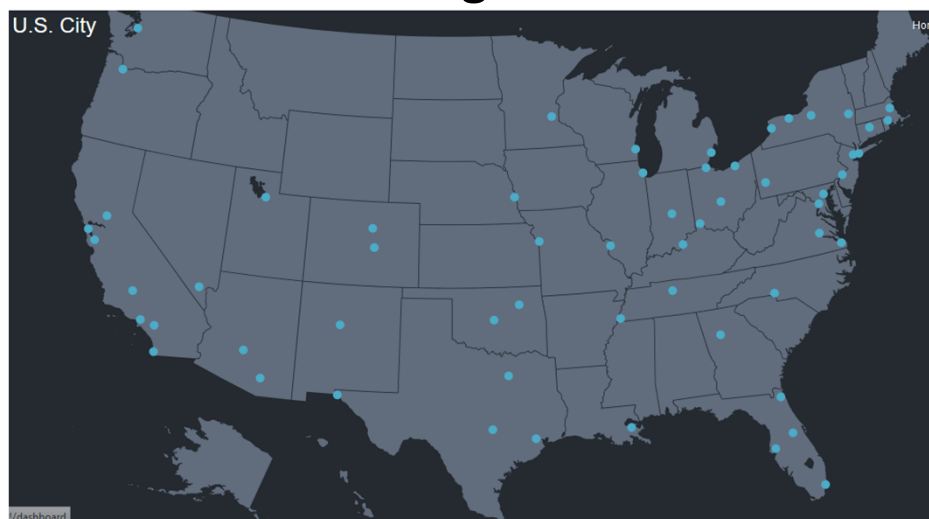


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Improvised Nuclear Device City Planner Resource (iCPR) Tool



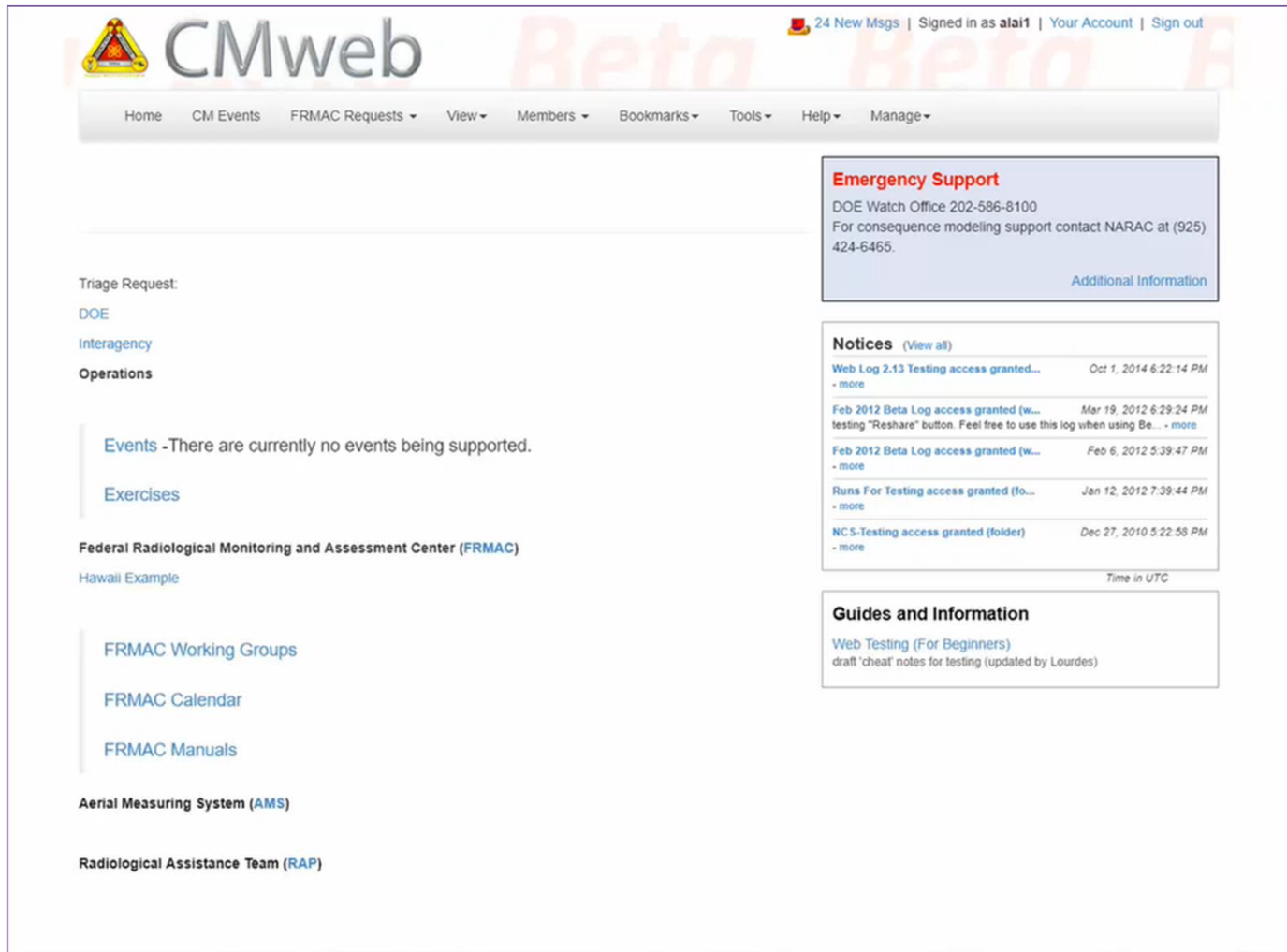
- Pre-calculated IND effects for 60 major cities
 - Accessible through web-based interface
 - 2 yields: 1 kT and 10 kT ground level detonations
 - Downtown business district location at daytime
 - 5 statistically predominant weather patterns
- Web GIS-based user interface to overlay weapon effects on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



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Co-funded by DHS S&T National Urban Security Technology Laboratory (NUSTL)

IND City Planner Resource DEMO



The screenshot displays the CMweb Beta Beta Beta website. At the top, there is a navigation bar with links: Home, CM Events, FRMAC Requests, View, Members, Bookmarks, Tools, Help, and Manage. A user is signed in as 'alal1' with 24 new messages. The main content area is divided into several sections. On the left, there is a 'Triage Request' section with links for DOE, Interagency, and Operations. Below this is an 'Events' section stating 'There are currently no events being supported.' and an 'Exercises' section. The 'Federal Radiological Monitoring and Assessment Center (FRMAC)' section includes a 'Hawaii Example' and links to 'FRMAC Working Groups', 'FRMAC Calendar', and 'FRMAC Manuals'. The 'Aerial Measuring System (AMS)' and 'Radiological Assistance Team (RAP)' sections are also visible. On the right, there is an 'Emergency Support' box with contact information for the DOE Watch Office and NARAC. Below this is a 'Notices' section with a list of recent events and their dates. At the bottom right, there is a 'Guides and Information' section with links to 'Web Testing (For Beginners)' and 'draft 'cheat' notes for testing (updated by Lourdes)'.

CMweb Beta Beta Beta

24 New Msgs | Signed in as alal1 | Your Account | Sign out

Home CM Events FRMAC Requests View Members Bookmarks Tools Help Manage

Emergency Support
DOE Watch Office 202-586-8100
For consequence modeling support contact NARAC at (925) 424-6465.
[Additional Information](#)

Triage Request:
[DOE](#)
[Interagency](#)
Operations

[Events](#) -There are currently no events being supported.
[Exercises](#)

Federal Radiological Monitoring and Assessment Center (FRMAC)
[Hawaii Example](#)
[FRMAC Working Groups](#)
[FRMAC Calendar](#)
[FRMAC Manuals](#)

Aerial Measuring System (AMS)
Radiological Assistance Team (RAP)

Notices [\(View all\)](#)
Web Log 2.13 Testing access granted... Oct 1, 2014 6:22:14 PM
- more
Feb 2012 Beta Log access granted (w... Mar 19, 2012 6:29:24 PM
testing "Reshare" button. Feel free to use this log when using Be... - more
Feb 2012 Beta Log access granted (w... Feb 6, 2012 5:39:47 PM
- more
Runs For Testing access granted (fo... Jan 12, 2012 7:39:44 PM
- more
NCS-Testing access granted (folder) Dec 27, 2010 5:22:58 PM
- more
Time in UTC

Guides and Information
[Web Testing \(For Beginners\)](#)
draft 'cheat' notes for testing (updated by Lourdes)



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

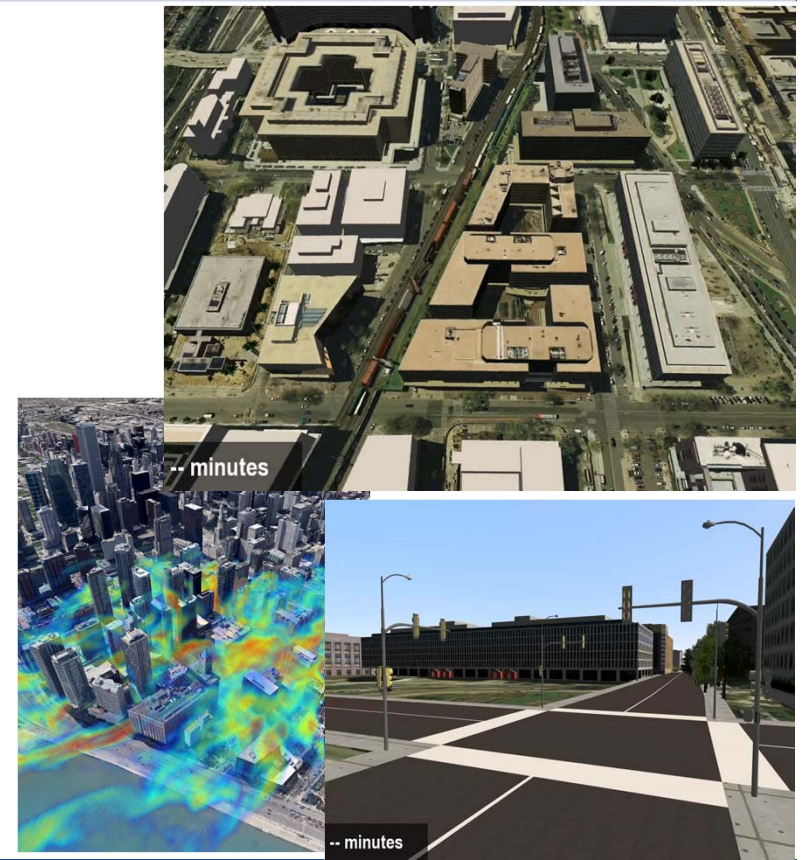


chemCPR: Another Tool in the Planner Toolbox



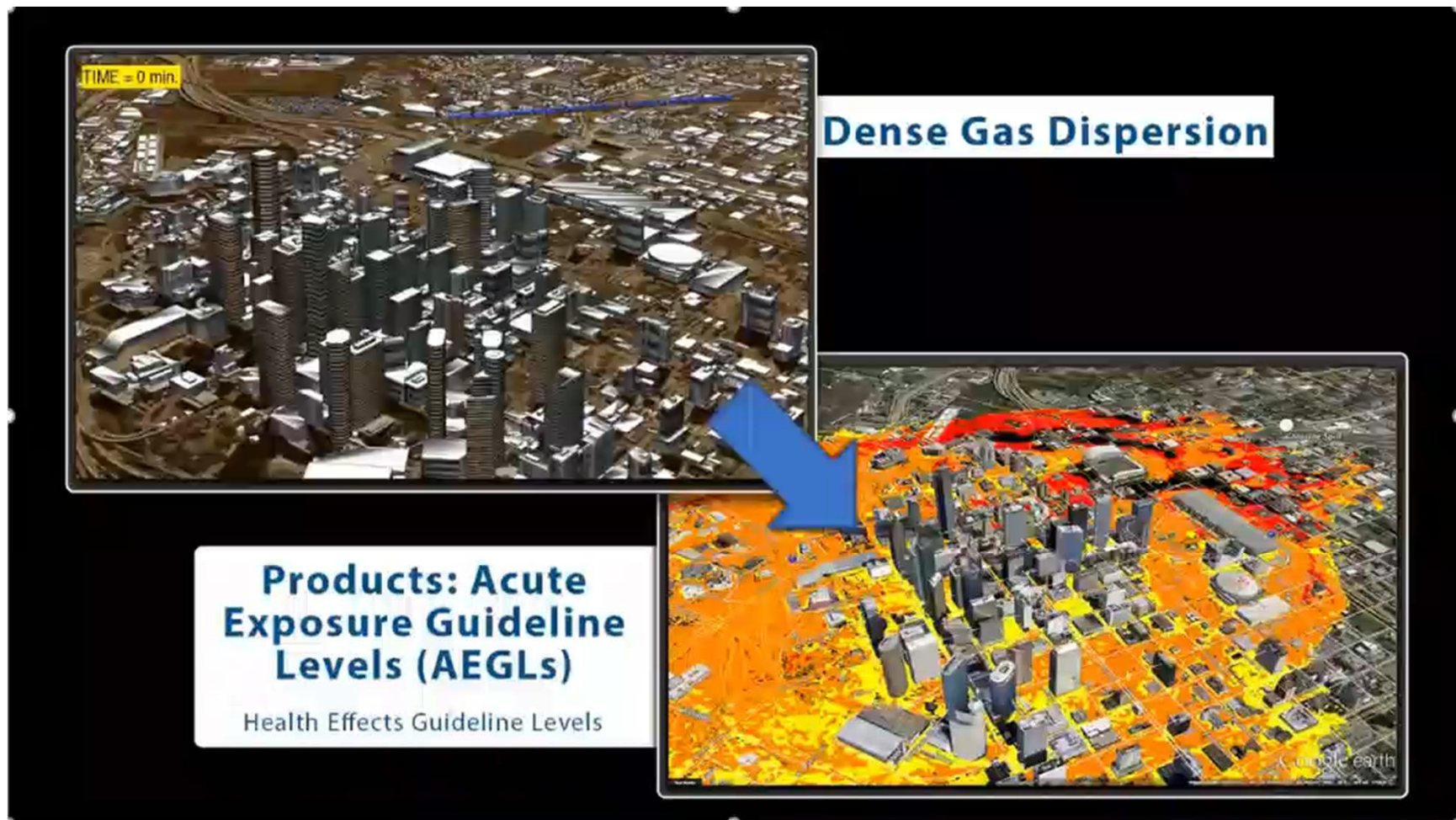
CPR focuses on providing detailed understanding and progression of a potential high consequence ACCIDENTAL event

- *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



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



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

Example Requirement

Material of Interest

Release Quantity/Yield

Release Location

Weather

Products

iCPR

Nuclear detonation

1kT and 10kT

60 cities
Downtown city center

5 Predominant Weather
Patterns: 4 seasons, all year

Infrastructure, prompt &
fallout casualties, applying
federal guidance...

chemCPR

Atmospheric release, ~2-3
chemicals TBD by region

“Catastrophic” amount*

TBD by region

- Process, storage facilities
- Transportation

Predominant Summer
Weather – day and night

TBD by SME and end user
engagement

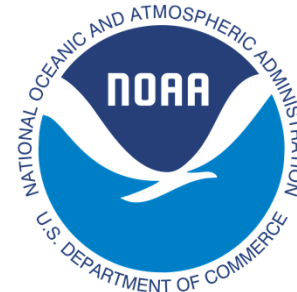
- CIKR impacts, health effects
- Impacted populations
- Federal guidance



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Key Priority: chemCPR to Complement CAMEO/ALOHA

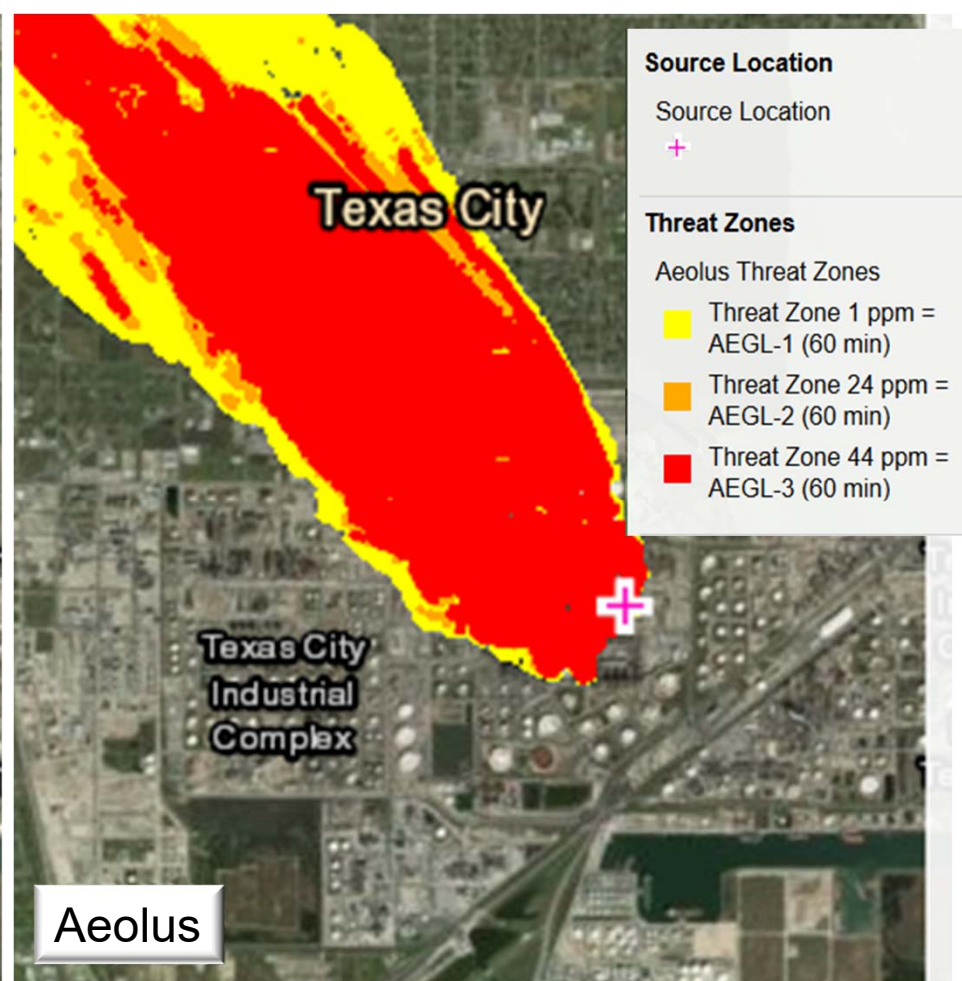
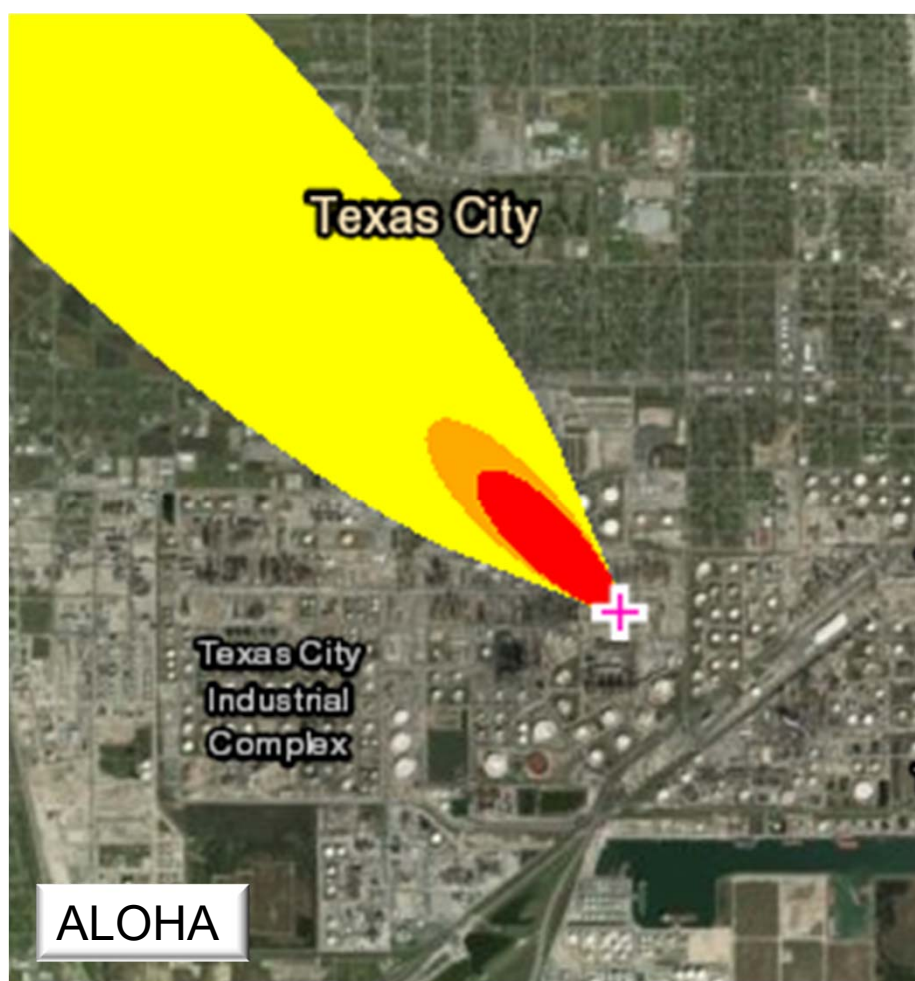
- CAMEO/ALOHA is well established chemical emergency response and planning tool for airborne releases
- ALOHA model has excellent source term generator models
- Plays a key role in releases/spills from small scale to large scale
- Resource for regulatory compliance



chemCPR and CAMEO/ALOHA Product Comparison

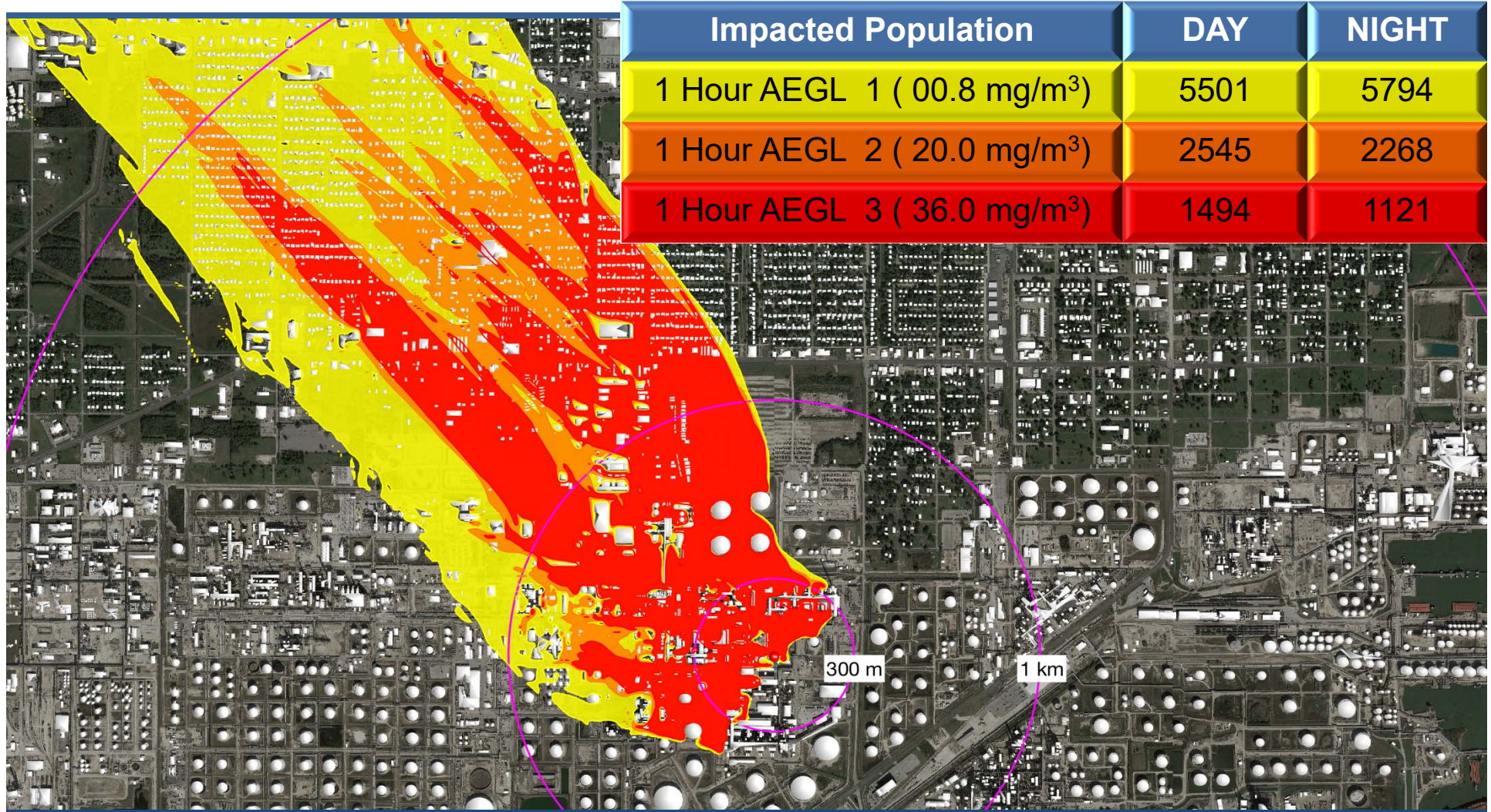
	CAMEO / ALOHA	chemCPR
Scenario Progression	<ul style="list-style-type: none"> • Scenario results shows final toxic threat zone and concentration at user defined locations • No urban canyon effects • Single meteorological time input • Limited to 6 kilometers and 1 hour 	<ul style="list-style-type: none"> • Visualize time progression of release and how concentrations change from flowing around buildings – customized to each city/location • Time and spatially varying winds • Distance may extend to 20km • Modeling duration out to at least 3 hours
Infrastructure impacts	<ul style="list-style-type: none"> • Key locations of concern can be added in MARPLOT • Can import to user's GIS system 	<ul style="list-style-type: none"> • Interactive • Uses HSIP Gold data • Can import to user's GIS system
Concentration Estimates	<ul style="list-style-type: none"> • Concentration estimates are always highest near source • Use averaged air concentrations • Estimate on indoor air concentrations at specific point for general building types 	<ul style="list-style-type: none"> • More realistic concentration estimates • High concentrations can occur far from source • High concentrations can linger after release has stopped due to accumulation around buildings • Outdoor only
Specific Planning Products	<ul style="list-style-type: none"> • Default 60 minute AEGLs/ERPGs/TEELs regardless of release duration – but can be customized by user • NIOSH IDLH levels – customized by user • Threat zone pictures, threats at specific locations, and source strength graphs • Export kmz/kml/shapefiles 	<ul style="list-style-type: none"> • AEGLs/ERPGs/TEELs for optimal duration of release • NIOSH IDLH levels • How to apply federal guidance and how a federal response unfolds • Export kmz/kml/shapefiles
Result production	<ul style="list-style-type: none"> • Can be used in real-time for response 	<ul style="list-style-type: none"> • Detailed scenarios run in advance for planning, not for real time modeling

chemCPR and CAMEO/ALOHA: Dense Gas Release: ALOHA and Aeolus



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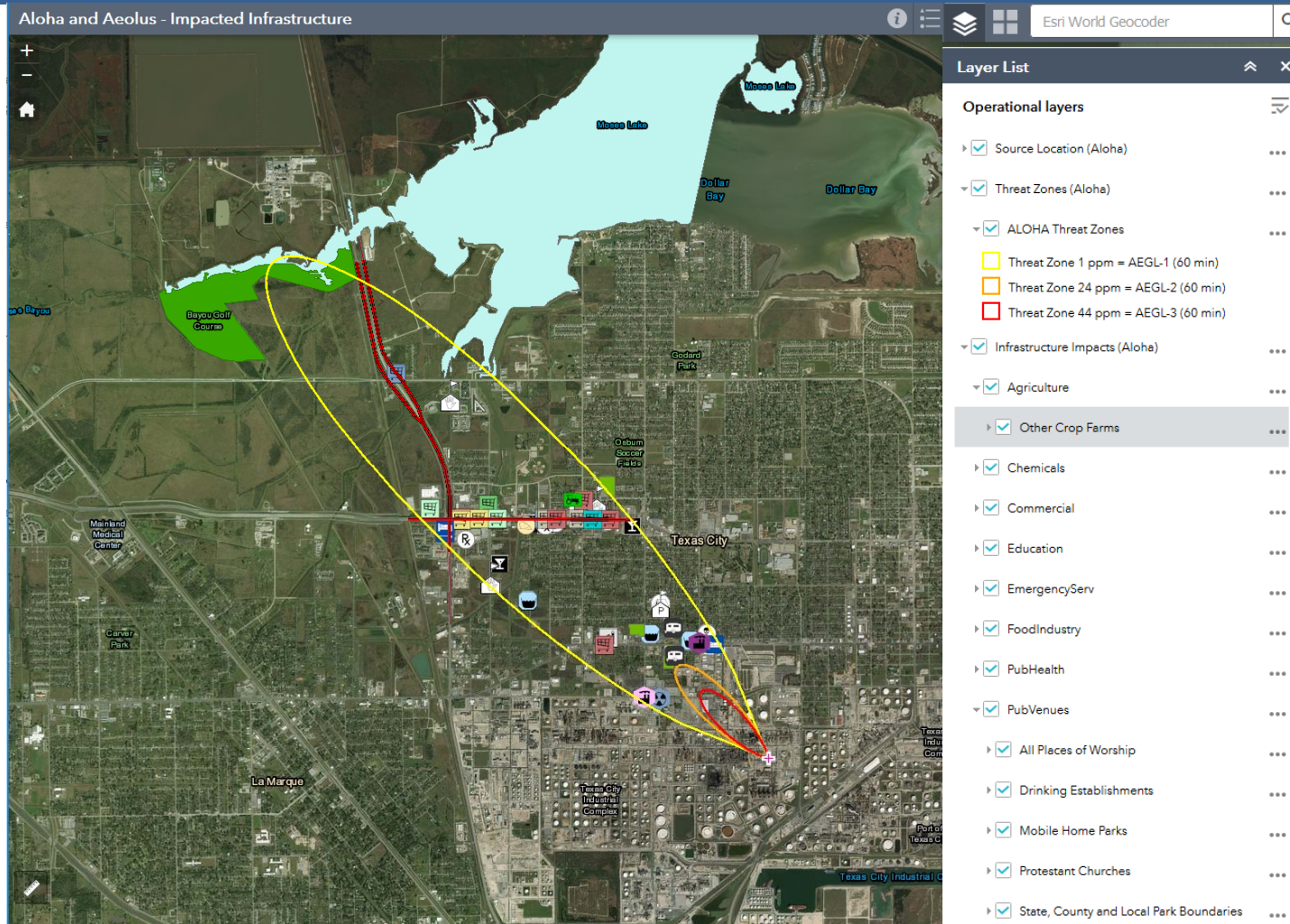
Possible chemCPR Product: Example Output - Aeolus



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Integration of CAMEO/ALOHA Products with chemCPR Being Assessed

Example Output, Dense Gas Release – ALOHA, CIKR impacts



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FY18 chemCPR Requirements Development: FSLTT Engagement



- >150 stakeholders from >100 agencies participated in outreach webinars
- dozens provided online, email, and verbal input



Key FSLTT feedback areas:

- Chemicals of interest
- Release duration
- Time of day
- Location
- Product & resource ideas

FSLTT Stakeholder input on tool products still being solicited

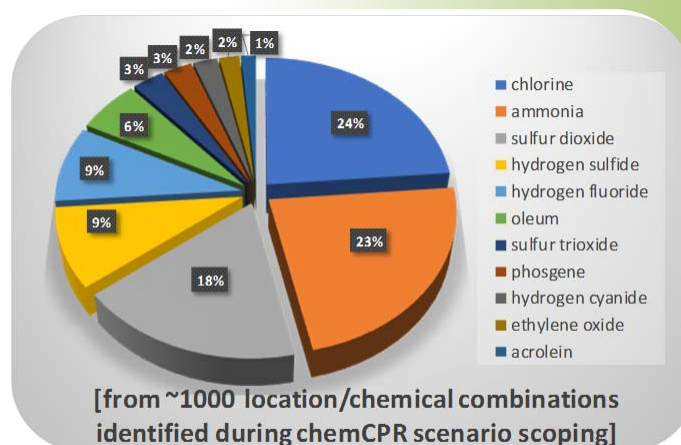


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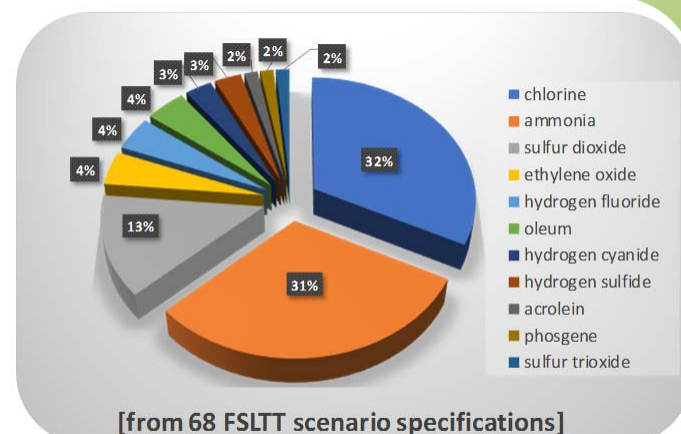
FSLTT feedback & regional inventory/transportation routes used to hone Chemicals of Interest list to aid simulation efficiency



Initial chemCPR Chemicals of Interest	
Chemicals of Interest	CAS#
Acrolein (2-Popenal, C ₃ H ₄ O)	75-07-0
Ammonia, anhydrous (NH ₃)	7664-41-7
Chlorine (Cl)	7782-50-5
Ethylene oxide (C ₂ H ₄ O)	75-21-8
Hydrogen cyanide, anhydrous ("prussic acid," HCN)	74-90-8
Hydrogen fluoride (HF)	7664-39-3
Hydrogen sulfide (H ₂ S)	7783-06-4
Oleum ("fuming sulfuric acid," H ₂ O ₇ S ₂)	8014-95-7
Phosgene ("Carbonyl Chloride" or "Carbonyl Dichloride," COCl ₂)	75-44-5
Sulfur dioxide (liquid, SO ₂)	7446-09-5
Sulfur trioxide ("Sulfuric Anhydride," SO ₃)	7446-11-9



Chemicals of Interest - Relative Amounts, US Wide



FSLTT Chemicals of Interest

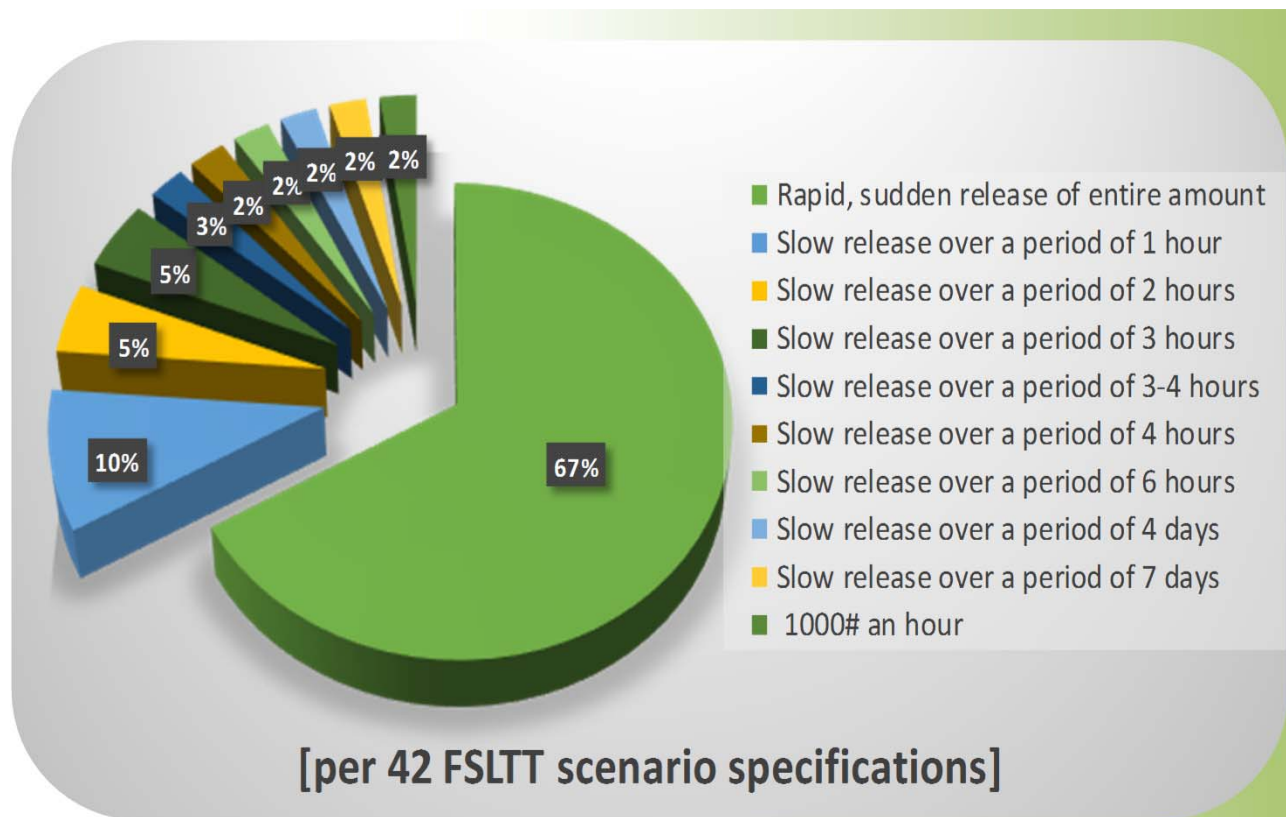
Top Four Chemicals

Chemicals of Interest	CAS#
Ammonia, anhydrous (NH ₃)	7664-41-7
Chlorine (Cl)	7782-50-5
Hydrogen fluoride (HF)	7664-39-3
Sulfur dioxide (SO ₂)	7446-09-5



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Wide Variety of FSLTT Duration Priorities, Strong Interest in Day & Night Time Impacts



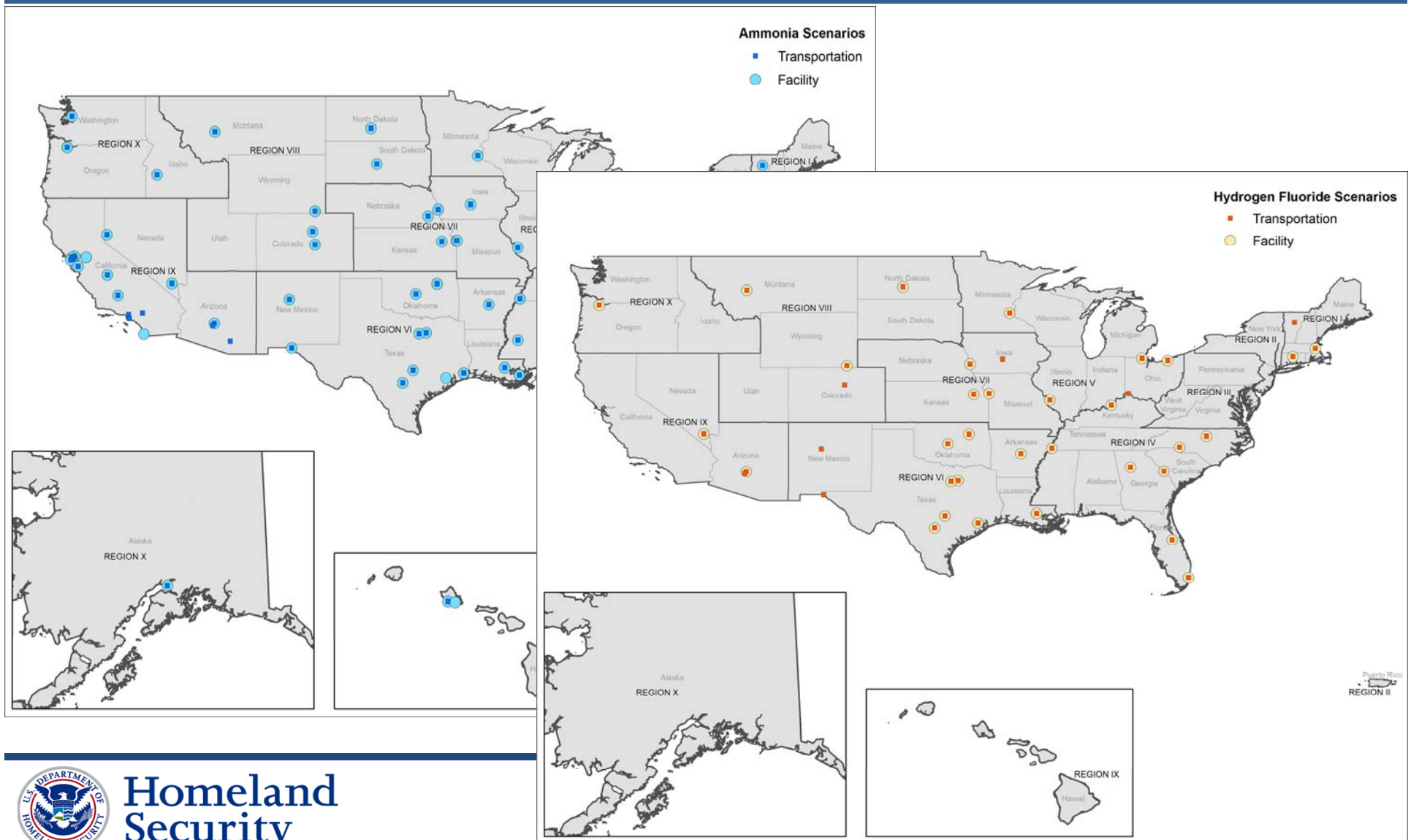
FSLTT Release Duration Feedback

Two Release Durations *May* be Modeled:

- 1. Shorter**
(e.g. 10-15 minutes)
- 2. Longer**
(e.g. 4-8 hours)



FSLTT Feedback helped inform initial chemCPR Hypothetical Release Locations



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Integrating priorities: Regions with FSLTT input, vs Regions without

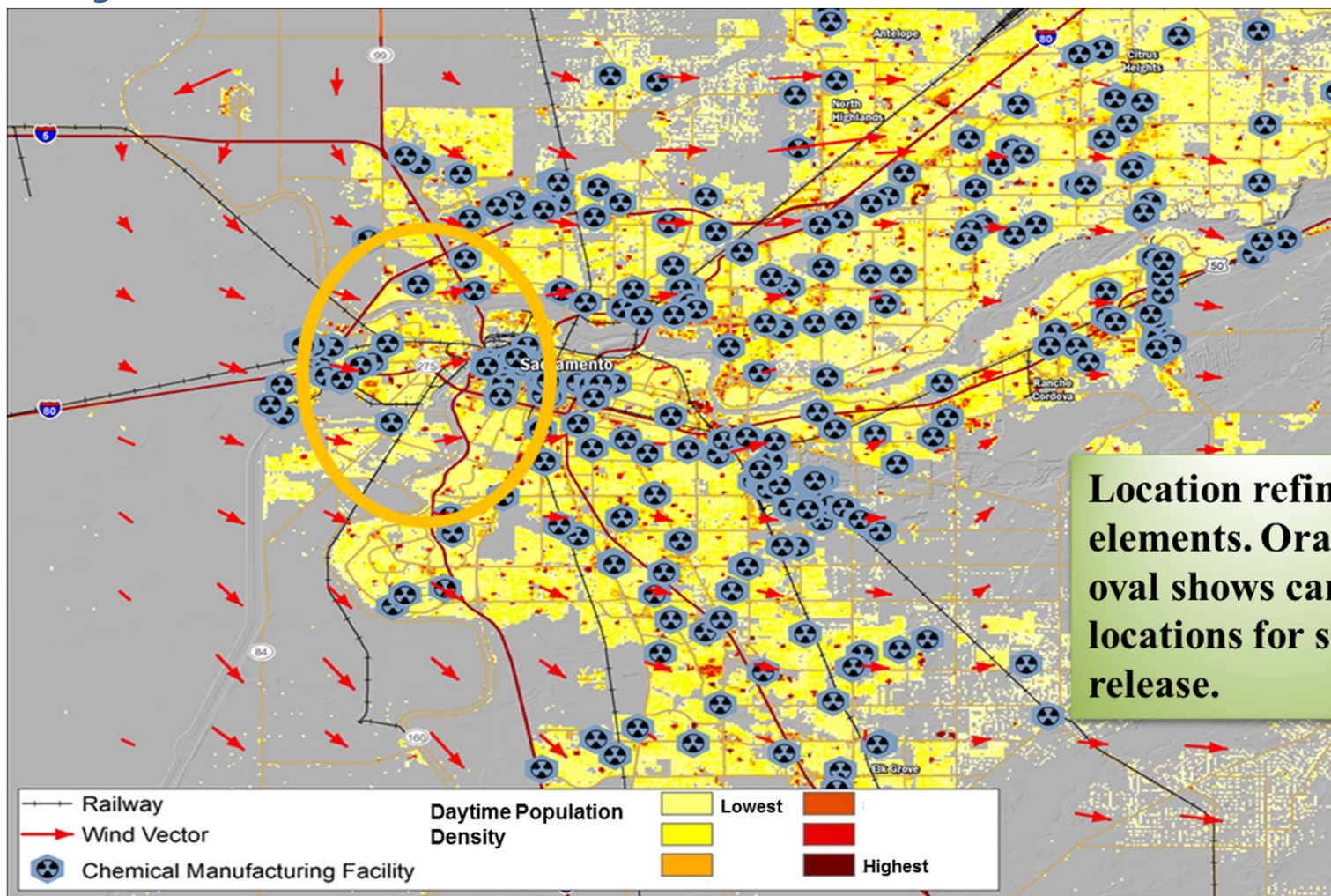


State	Release City	Building file avail	Chemicals of significant quantities	Modeling Priority	Container	Input Resource	Stakeholder State/ Regional Priority	Location Specifics
AK	Anchorage	y	ammonia	1	Rail Car or Truck	chemCPR review		
AK	Anchorage	y	ammonia	1	User Facility	chemCPR review		
AK	Anchorage	y	chlorine	1	Rail Car or Truck	chemCPR review		
AK	Anchorage	y	chlorine	1	User Facility	chemCPR review		
AK	Kodiak	n	ammonia	3	Rail Car or Truck	chemCPR review		
AK	Kodiak	n	ammonia	3	Storage Facility	chemCPR review		
AK	Kodiak	n	chlorine	3	Rail Car or Truck	chemCPR review		
AK	Kodiak	n	chlorine	3	User Facility	chemCPR review		
AL	Birmingham	y	ammonia	1	Rail Car	Stakeholder	1	Near Huntsville Avenue, an industrial park, or near a tourist attraction such as the Space & Rocket Center
AL	Birmingham	y	ammonia	1	User Facility	Stakeholder	1	
AL	Mobile	y	ammonia	1	Rail Car or Truck	chemCPR review		
AL	Mobile	y	ammonia	1	User Facility	chemCPR review		
AL	Mobile	y	chlorine	1	Facility	Stakeholder	1	Near Jarvis Road, or near the Port of Mobile.
AL	Mobile	y	chlorine	1	Truck	chemCPR review		
AL	Mobile	y	sulfur dioxide	1	Storage Facility	chemCPR review		
AL	Mobile	y	sulfur dioxide	1	Truck	Stakeholder	1	Intersection of Airport and University Blvd
AL	Montgomery	y	ammonia	1	Rail Car or Truck	chemCPR review		
AL	Montgomery	y	ammonia	1	User Facility	chemCPR review		
AL	Montgomery	y	chlorine	1	Rail Car or Truck	chemCPR review		
AL	Montgomery	y	chlorine	1	User Facility	chemCPR review		
AL	Montgomery	y	oleum	2	Facility	Stakeholder	1	Near Hunter Loop Road, an industrial park near downtown Montgomery or near the Riverwalk Amphitheater.
AL	Theodore	?	hydrogen sulfide	2	Facility	Stakeholder	1	



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Exact release location selection strategy for regions with no (or few) FSLTT priorities specified



Location refinement elements. Orange oval shows candidate locations for scenario release.



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FSLTT Product & Resource Interests – Everyone Interested in Everything!

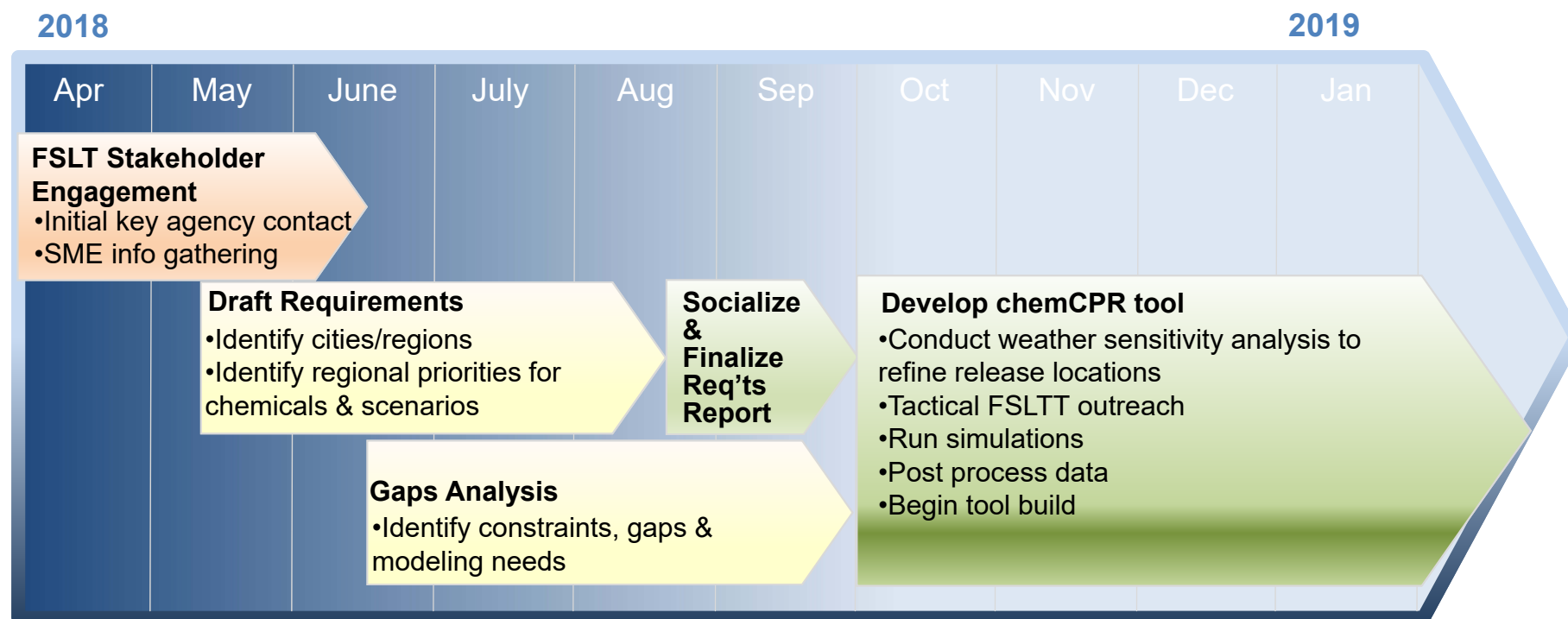


- **Animated visualization** of chemical progression through populated/built up areas
- Interactive **GIS** component to query and view the **infrastructure** in the scenario area
- Tribal territory and FEMA **region GIS layers**
- **Contamination** zone maps
- **Health impact reports** for each scenario based on Protective Action Criteria (PAC) which includes, as appropriate for the chemical, Acute Exposure Guideline Levels (AEGL), Emergency Response Planning Guidelines (ERPG), Temporary Emergency Exposure Limits (TEEL), and Immediately Dangerous to Life or Health (IDLH)
- **Chemical specific information** such as environmental persistence, shelter and evacuation considerations and guidance, medical countermeasures, etc.
- **IMAAC** products
- **Reference material** such as links to Toxicology Data Network (TOXNET), Hazardous Substances Data Bank (HSDB), etc.
- **Links** to the CAMEO Chemical Material Safety Data Sheet (MSDS) data compilation, Emergency Response Guidebook (ERG), Agency for Toxic Substances and Disease Registry (ATSDR) Medical Management Guidelines for Chemical Agents, Emergency Response Cards, Occupational Safety and Health Administration (OSHA) Health Hazard Summaries, and other federal guidance documents
- **Additional resources** for chemical-specific protective actions, controls, personal protection equipment, early medical recommendations, decontamination, documentation and disposal to aid in the development of planning documents
- **Integration** of CAMEO output products to leverage the critical infrastructure impacts





chemCPR Development Timeline



- Late 2019-2020: Draft & finalize products and begin final tool buildout



CPR Next Steps, 2019 Plans

- iCPR¹:
 - Release to FEMA approved users via the National Nuclear Security Administration (NNSA) CMweb
 - Expand the tool with additional yields and detonation heights and rebrand as the nucCPR

- bioCPR²: Confirm scope & requirements
 - Initiate FSLTT outreach to identify the biological agents and release scenarios of most concern
 - Confirm scope and requirements

bioCPR *Advance biological incident response*
Objective: *planning capabilities via higher fidelity modeling and assessment products that target planning elements of interest*

The ***bioCPR*** will provide biological effects data and products to Planners that will:

- Provide technically and scientifically based consequence information to support biological planning efforts
- Identify potentially impacted critical infrastructure (CIKR)
- Identify potential health effects to the effected population

¹*Co-funded by DHS Science and Technology Directorate
National Urban Security Technology Laboratory (NUSTL)*

²*Funded by DHS Science and Technology Directorate,
DHS IA 70RSAT18KPM000083*



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THANK YOU for
Your Time,
Ideas and Support!



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