



# Climate Resiliency & Chemicals Management

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# Agenda

## Background

- Climate hazards and risks
- Emergency preparedness planning and chemical safety
- Mapping and assessment tools

## Case Study

- Hypothetical polyurethane foam manufacturer
- Small group break out
- Large group discussion



Focus on TUR opportunities as a strategy to improve chemical safety & climate resiliency

# Office of Technical Assistance (OTA)

- **Non-regulatory** agency
- Provides **free, confidential** technical and compliance assistance to MA businesses that use toxic substances
- Gives **concrete recommendations** for toxics reduction and resource conservation

OTA has conducted 3,500 site visits at 1,500 facilities, reducing **millions of pounds** of toxic chemicals and **millions of dollars** in operating costs.

# Extreme weather and industrial accidents

- Arkema Chemical Plant
- Hurricane caused loss of power and refrigeration, leading to explosion
  - Risk to workers
  - Risk to neighbors
  - Injured first responders



# PREVENTING "DOUBLE DISASTERS"


How the U.S. Environmental Protection Agency  
can protect the public from hazardous  
chemical releases worsened  
by natural disasters

JULY 2021



A joint policy brief of the  
Center for Progressive Reform, Earthjustice,  
and the Union of Concerned Scientists







## GAO Highlights

Highlights of GAO-22-104494, a report to congressional requestors

### Why GAO Did This Study

Over 11,000 RMP facilities across the nation have extremely hazardous chemicals in amounts that could harm people, property, or the environment if accidentally released. Risks to these facilities include those posed by natural hazards, which may damage the facilities and potentially release the chemicals into surrounding communities. Climate change may make some natural hazards more frequent or intense, according to the Fourth National Climate Assessment.

GAO was asked to review climate change risks at RMP facilities. This report examines, among other things, (1) what available federal data indicate about RMP facilities in areas with natural hazards that may be exacerbated by climate change; and (2) challenges RMP facilities face in managing risks from natural hazards and climate change, and opportunities for EPA to address these challenges. GAO analyzed federal data on RMP facilities and four natural hazards that may be exacerbated by climate change, reviewed agency documents, and interviewed agency officials and stakeholders, such as industry representatives.

### What GAO Recommends

GAO is making six recommendations, including that EPA issue regulations, guidance, or both to clarify requirements and provide direction to facilities on incorporating natural hazards and climate change into risk management programs. EPA agreed with our recommendations.

February 2022

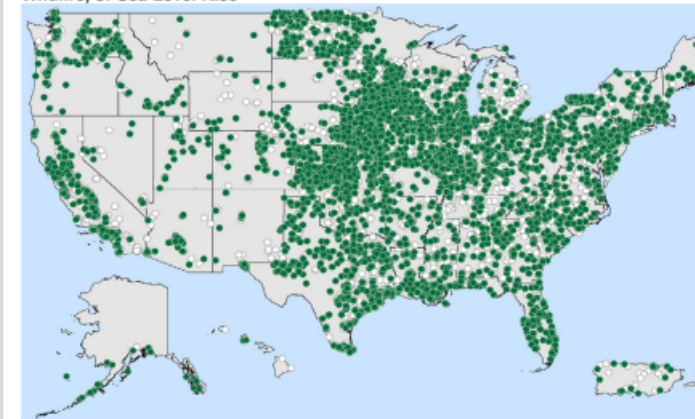
## CHEMICAL ACCIDENT PREVENTION

### EPA Should Ensure Regulated Facilities Consider Risks from Climate Change

#### What GAO Found

The Environmental Protection Agency's Risk Management Plan (RMP) Rule requires certain facilities that make, use, handle, or store hazardous substances (chemicals) to develop and implement a risk management program to detect and prevent or minimize the consequences of an accidental release. These facilities, known as RMP facilities, include chemical manufacturers and water treatment plants. Federal data on flooding, storm surge, wildfire, and sea level rise—natural hazards that may be exacerbated by climate change—indicate that over 3,200 of the 10,420 facilities we analyzed, or about 31 percent, are located in areas with these natural hazards (see figure). View the full results of GAO's analysis [here](#).

**RMP Facilities Located in Areas That May Be Impacted by Flooding, Storm Surge, Wildfire, or Sea Level Rise**



Risk Management Plan (RMP) facilities that GAO analyzed (10,420)

- Located in an area with one or more of these natural hazards (3,219)
- Located in an area without one or more of these natural hazards or where hazards are unknown (7,201)

Sources: GAO analysis of Environmental Protection Agency, Federal Emergency Management Agency, National Oceanic and Atmospheric Administration, and U.S. Forest Service data, U.S. Census Bureau (map) | GAO-22-104494

Notes: This map does not include one RMP facility in each of Guam and the U.S. Virgin Islands. Storm surge data are not available for the West Coast and Pacific islands other than Hawaii, and sea level rise data are not available for Alaska.

RMP facilities face several challenges, including insufficient information and direction, in managing risks from natural hazards and climate change, according to some EPA officials and stakeholders. By issuing regulations, guidance, or both to clarify requirements and provide direction on how to incorporate these risks into risk management programs, EPA can better ensure that facilities are

# Regulations relevant to emergency preparedness

- Emergency Planning & Community Right to Know Act (EPCRA)
- Resource Conservation & Recovery Act (RCRA)
- Spill Prevention Control & Countermeasure Rule (SPCC) & Facility Response Plan (FRP) – Clean Water Act (CWA) Oil Pollution Prevention Regulation
- Chemical Facility Anti-Terrorism Standard (CFATS)
- Clean Air Act (CAA) Risk Management Plan (RMP)
- OSHA Process Safety Management Standard
- Massachusetts Hazardous Materials Processing regulation

## Floods

- Chemical releases and spills
- Emergency shutdowns

## Extreme Heat

- Explosion risks
- Drought (cooling; fire suppression)

## Climate Change & Chemical Releases

## Extreme Cold

- Power outages
- HVAC failure
- Frozen pipes

## Storms

- Power outages
- HVAC failure
- Infrastructure failure

# Vulnerability Assessment

## Exposure:

- Elevation from Sea Level at High Tide
- Shore Length
- Location in Protected Flood Zone

## Sensitivity:

- Infrastructure condition
- Chemicals on Site
- Chemical Storage
- Building Condition

## Ability to Cope:

- Predicted Property Damage
- Net Worth of Business
- Emergency Plans
- Community assets

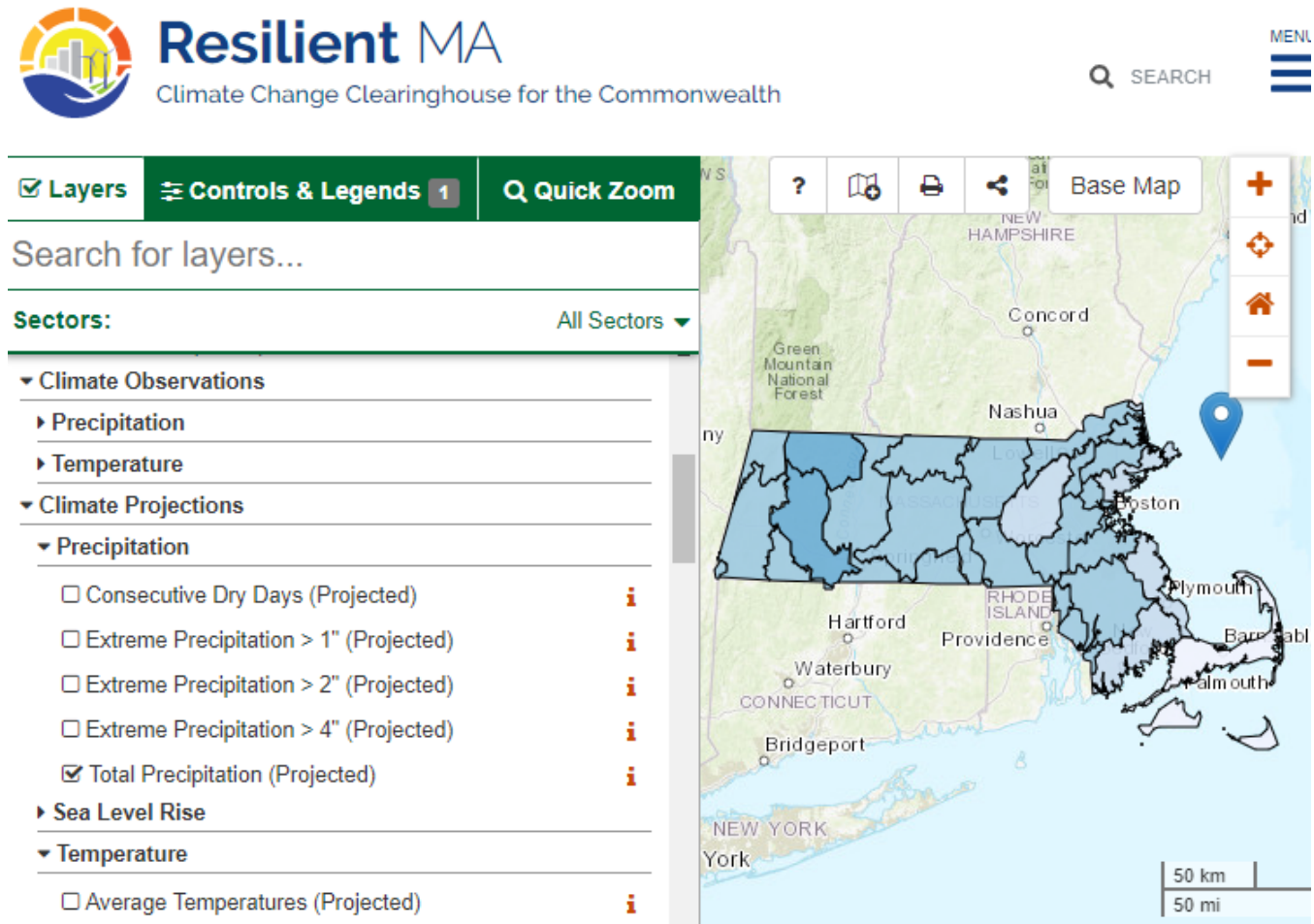




# Polling Question #1

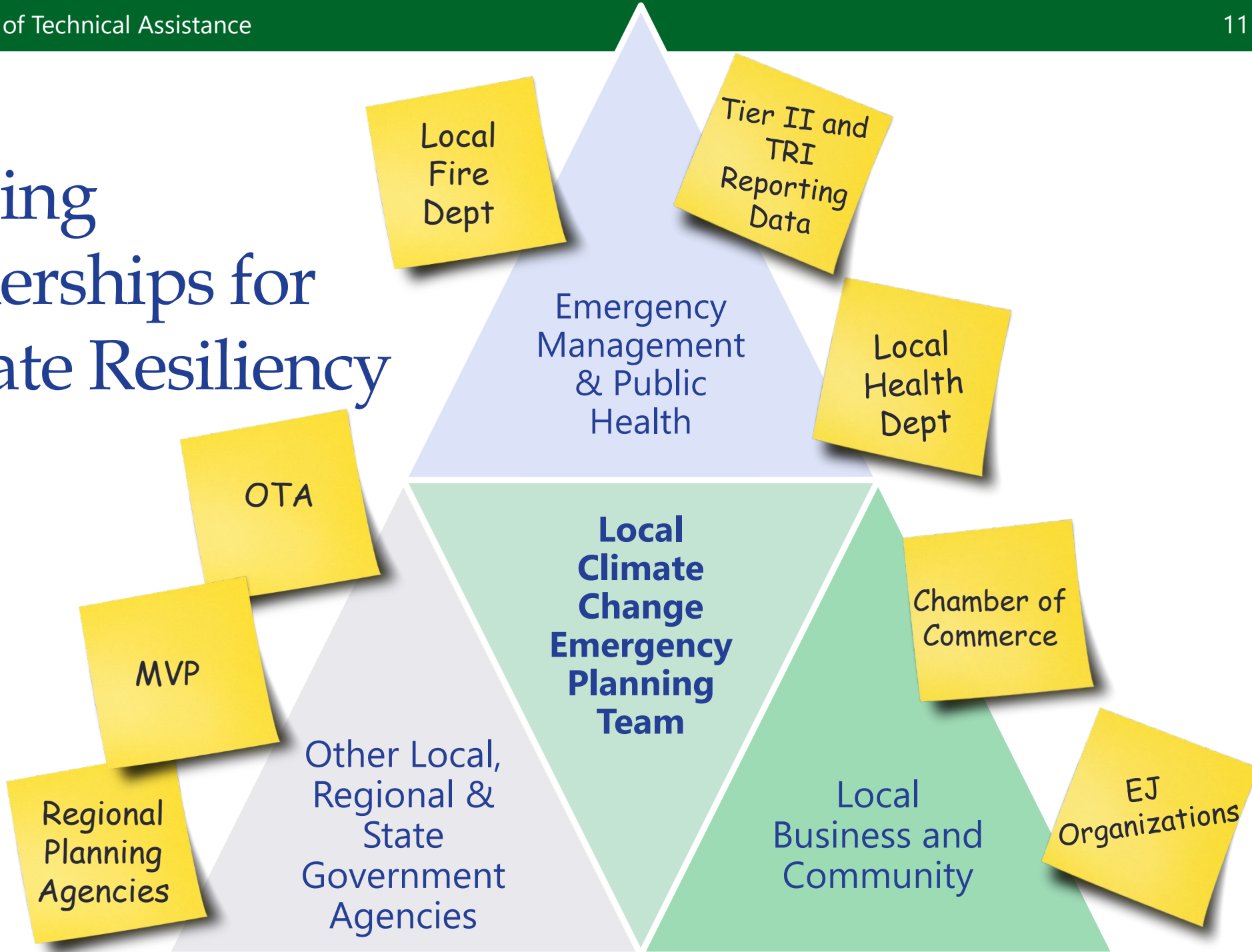
# Evaluating Risks

- Existing data, e.g., FEMA flood maps, based on historical patterns
- Future projections for precipitation, sea level rise, and temperature based on modeling of GHG emission scenarios (RCP 4.5 & 8.5)



<https://resilientma.mass.gov/map/>

# Building Partnerships for Climate Resiliency



# Chemical Safety & Climate Resiliency Survey

- WPI interns worked with OTA to survey TURA filers
- 362 TURA filers were reached by email with survey link
- Survey closed September 30, 2022
- 56 responses received



## Chemical Safety and Climate Change Resiliency



### An Interactive Qualifying Project Report

Submitted to the Faculty of  
WORCESTER POLYTECHNIC INSTITUTE  
in partial fulfillment of the requirements for the Degree of Bachelor of Science

Submitted by:  
Joel Brunzell  
Wassim Faker  
Alex Marrinan  
Jada Smith

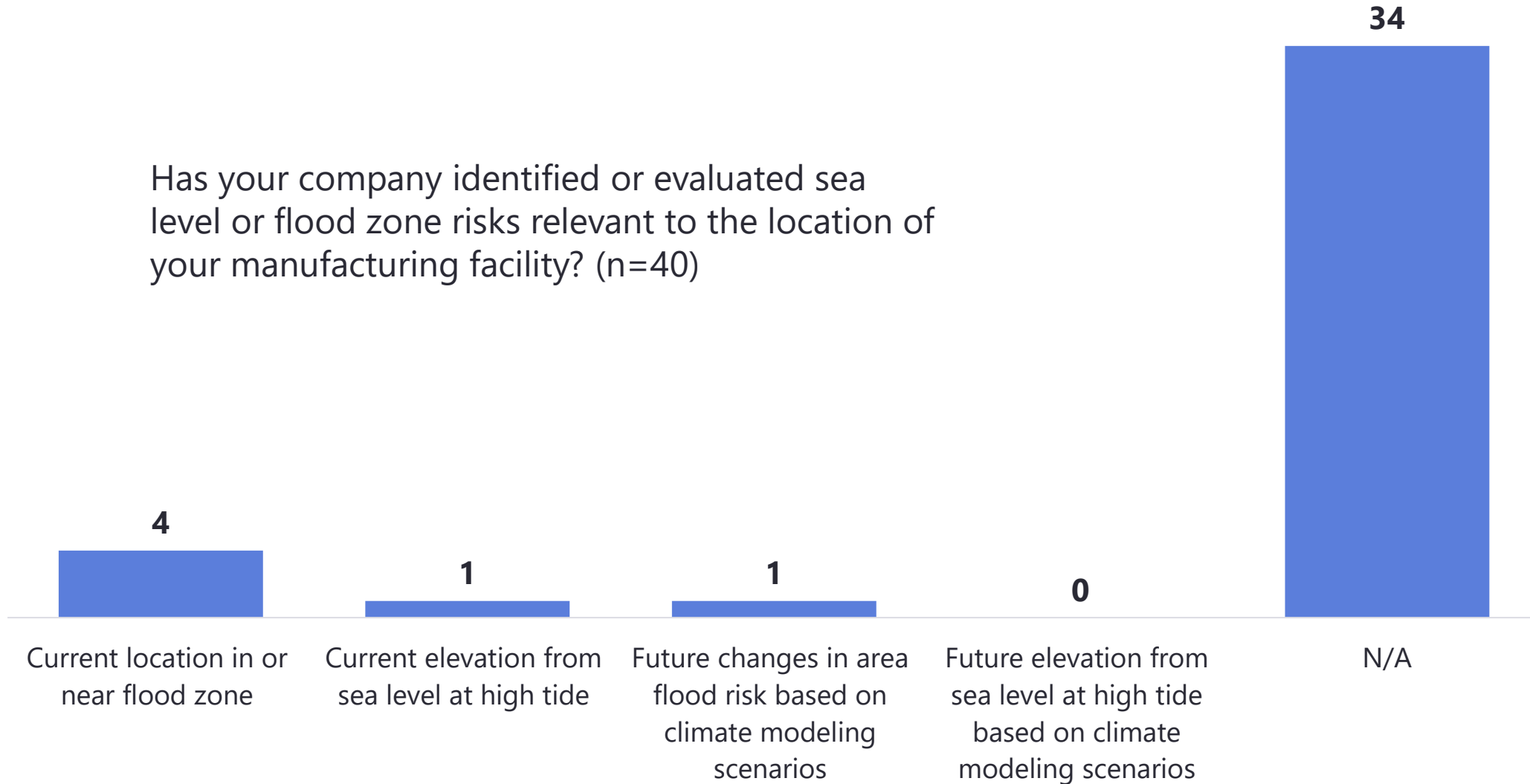
Date Submitted:  
October 13, 2022

Sponsoring Agency:  
Massachusetts Office of Technical Assistance & Technology

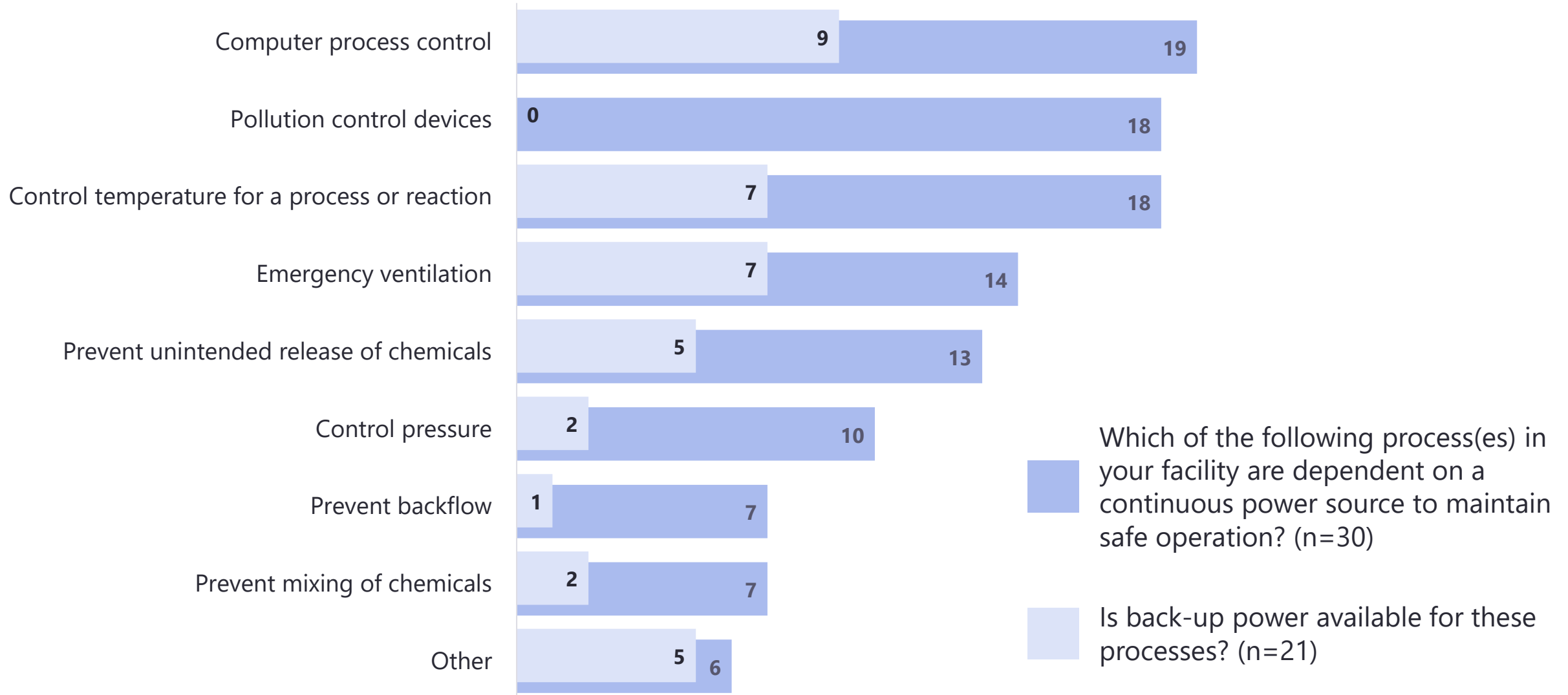
Project Faculty Advisors:  
Blake Currier  
Corey Dehner

# Chemical Safety & Climate Resiliency: Results

Has your company identified or evaluated sea level or flood zone risks relevant to the location of your manufacturing facility? (n=40)



# Chemical Safety & Climate Resiliency: Results





# Polling Question #2

# Facility Emergency Checklist & Plans

- Cover page with summary information
  - Facility emergency contacts & special hazards
  - Y/N questions: Explosion risk; Respiratory hazards to workers or responders; OK to shut off power, gas, and/or water during an event
- Planning inventory (chemicals of concern, CAS#, volume, storage location, containment & safety precautions)
- Process control & shut off locations (e.g., gas, water, electric)
- Community notifications & sensitive populations (e.g., hospitals, daycares, schools, municipal buildings, EJ neighborhoods)



# Evaluating Risks



## Chemical Properties

Toxicity  
Flammability  
Combustibility



## Weather Risks

Flood  
Hurricane  
Freezing  
Heat



## Chemical Storage

Secondary containment  
Compatibility

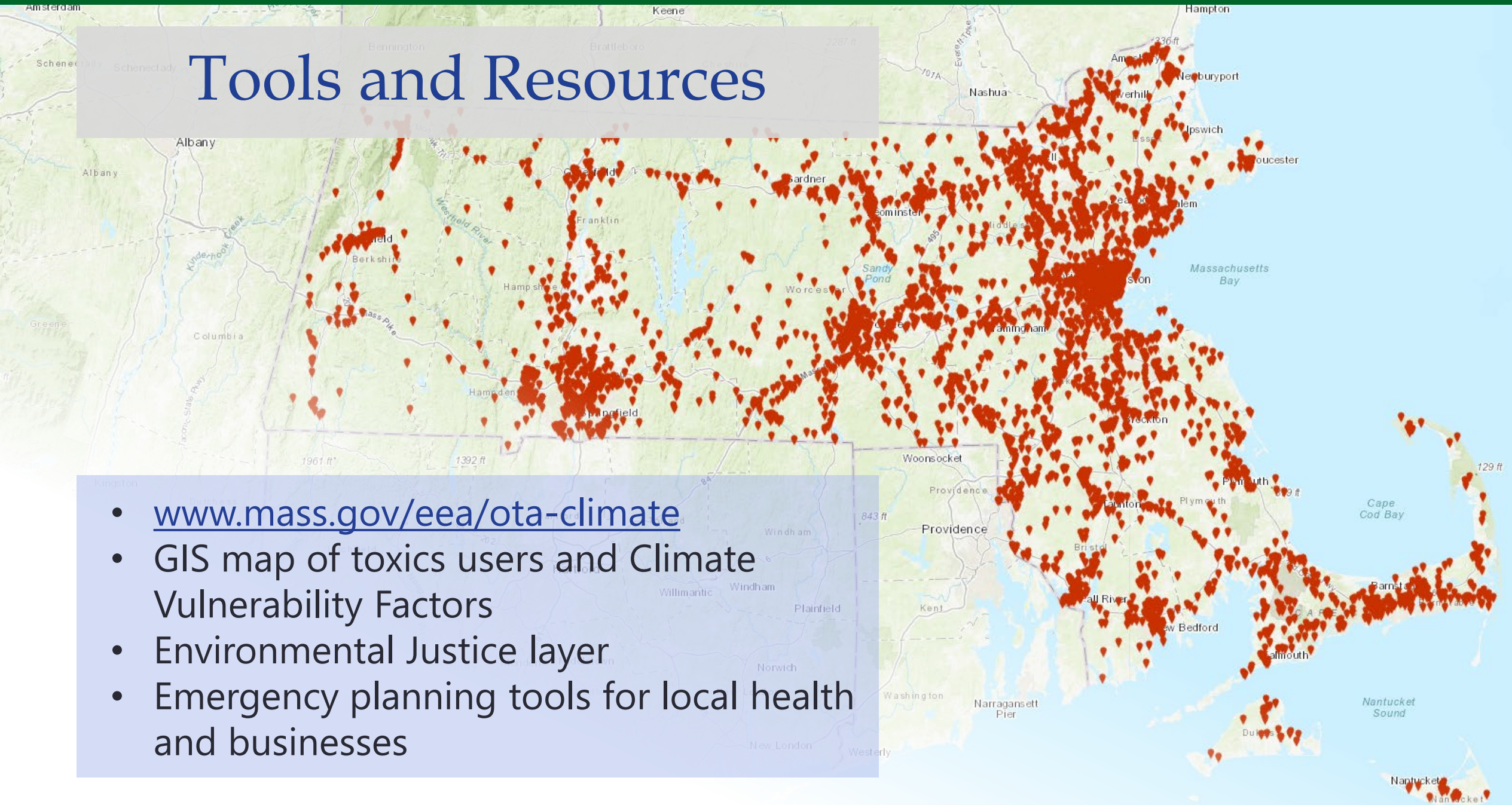


## Toxics Use Reduction

Substitution  
Inventory reduction  
Engineering

# Tools and Resources

- [www.mass.gov/eea/ota-climate](http://www.mass.gov/eea/ota-climate)
- GIS map of toxics users and Climate Vulnerability Factors
- Environmental Justice layer
- Emergency planning tools for local health and businesses

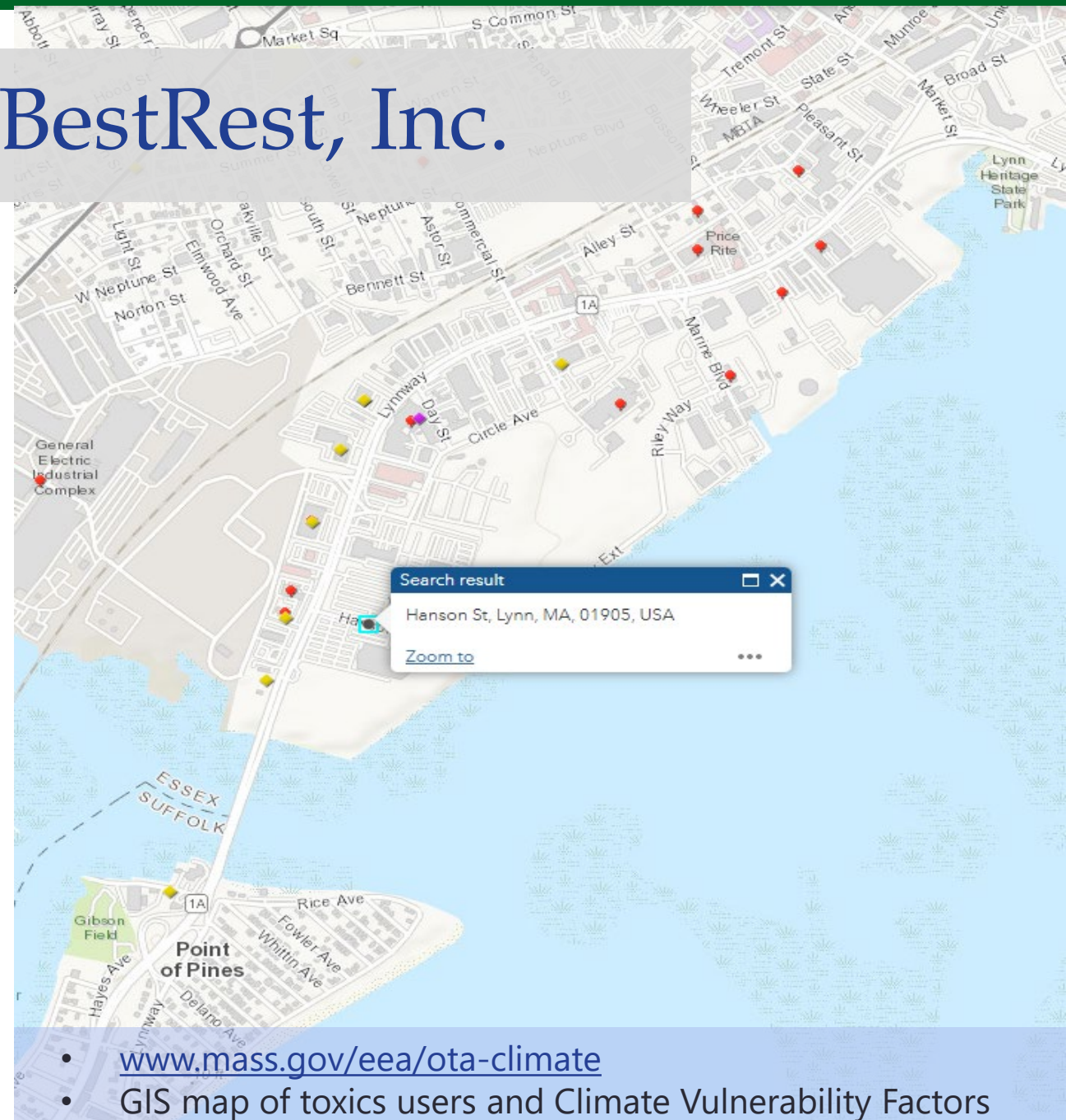




# Polling Question #3

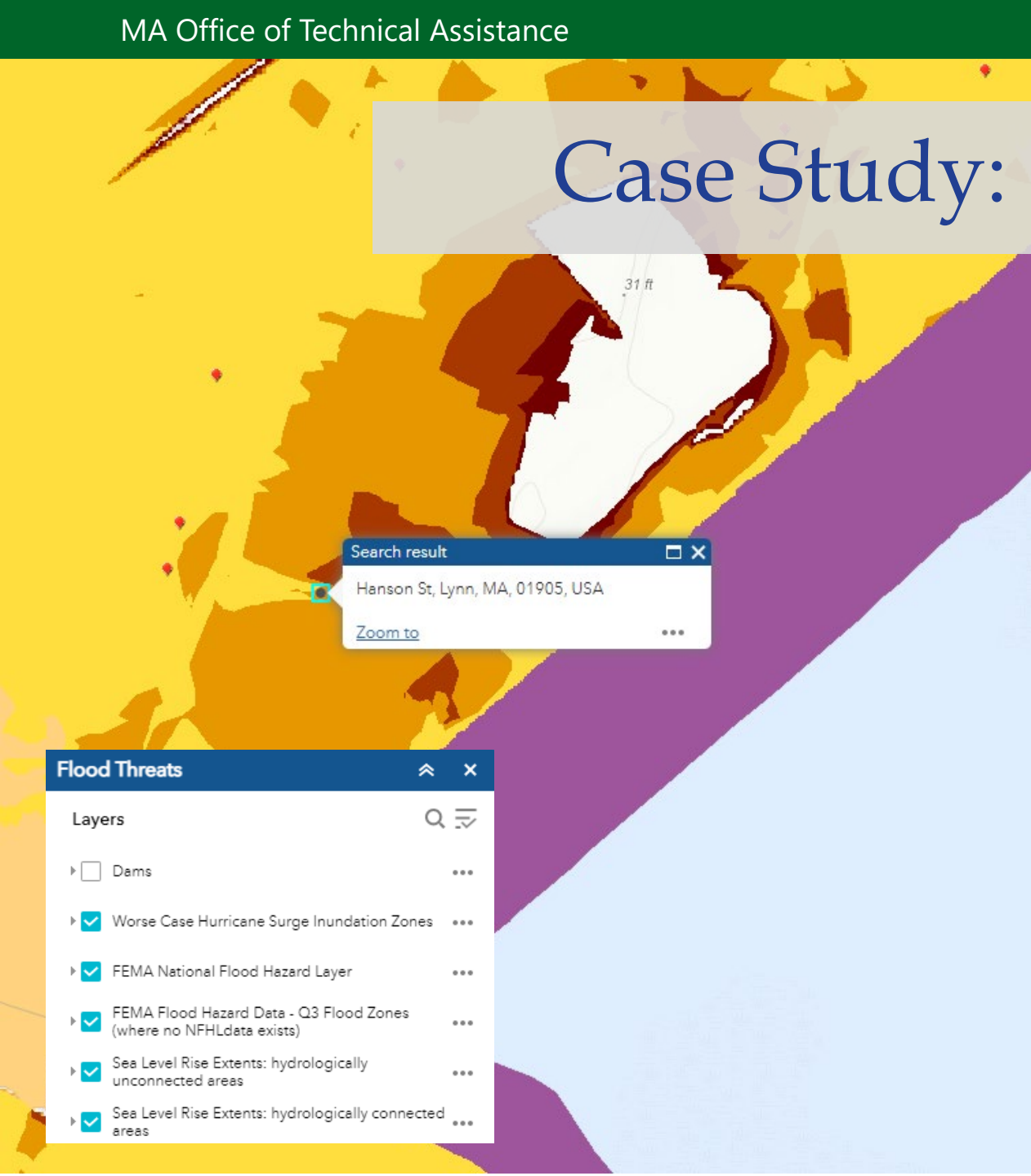
# Case Study: BestRest, Inc.

- Hypothetical polyurethane foam manufacturer
- Hanson St., Lynn, MA
- Single story facility with basement
- Uses 2,4-toluene diisocyanate, polyether polyol, and other chemicals
- Anhydrous ammonia to cool and solidify product



# Case Study: BestRest, Inc.

- The facility operates in a single-story building with a basement.
- The production zone is located on the first level of the facility.
- Chemical storage on the first level, adjacent to the loading dock and outside loading entrance.
- The mechanical room is located on the basement level and contains boilers and a machinery room with compressors for the anhydrous ammonia system.
- Ammonia detection sensors are located in the basement as are manual emergency ventilation switches.



Search result

Hanson St, Lynn, MA, 01905, USA

[Zoom to](#)

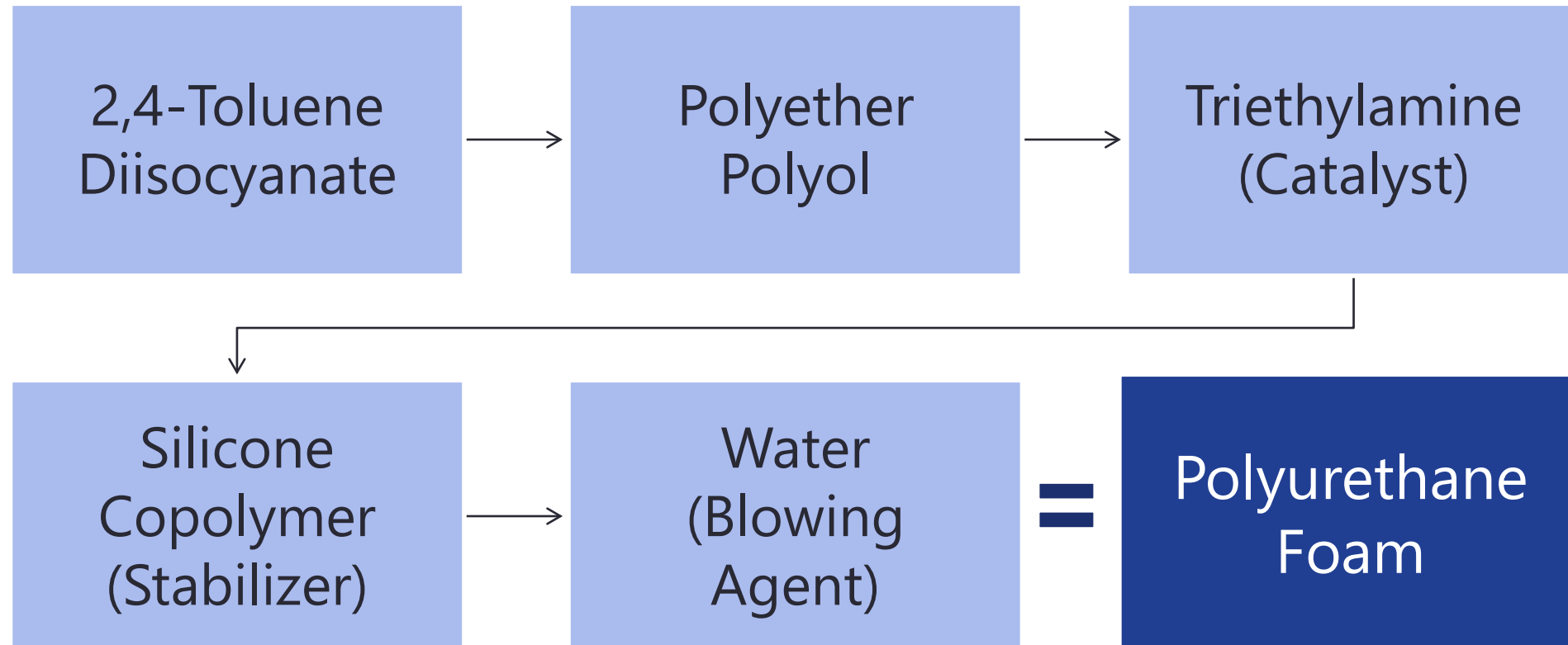
31 ft

**Flood Threats**

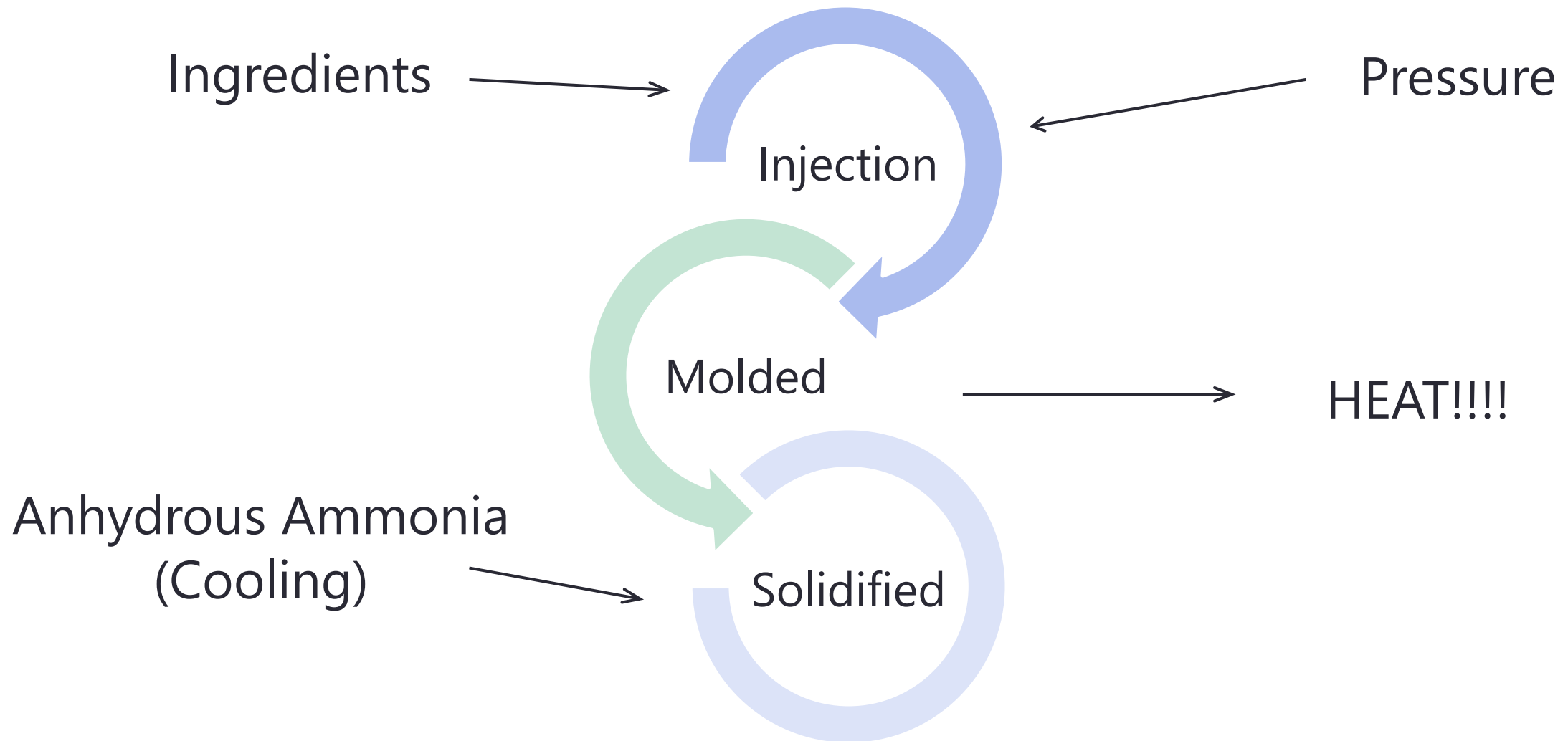
Layers

- Dams
- Worse Case Hurricane Surge Inundation Zones
- FEMA National Flood Hazard Layer
- FEMA Flood Hazard Data - Q3 Flood Zones (where no NFHLdata exists)
- Sea Level Rise Extents: hydrologically unconnected areas
- Sea Level Rise Extents: hydrologically connected areas

# Case Study, Hypothetical Company: BestRest, Inc.



# Case Study, Hypothetical Company: BestRest, Inc.



# Case Study Process – Small Group Breakout

Identify a timekeeper and a person to report out

Review handout and work on questions together as a group

- Step 1: Identify TURA Chemicals
- Step 2: Identify Potential Chemical Hazards and Risks
- Step 3: Identify Climate Hazards and Risks
- Step 4: Identify Risks Related to Chemical Storage
- Step 5: Identify Toxics Use Reduction Opportunities

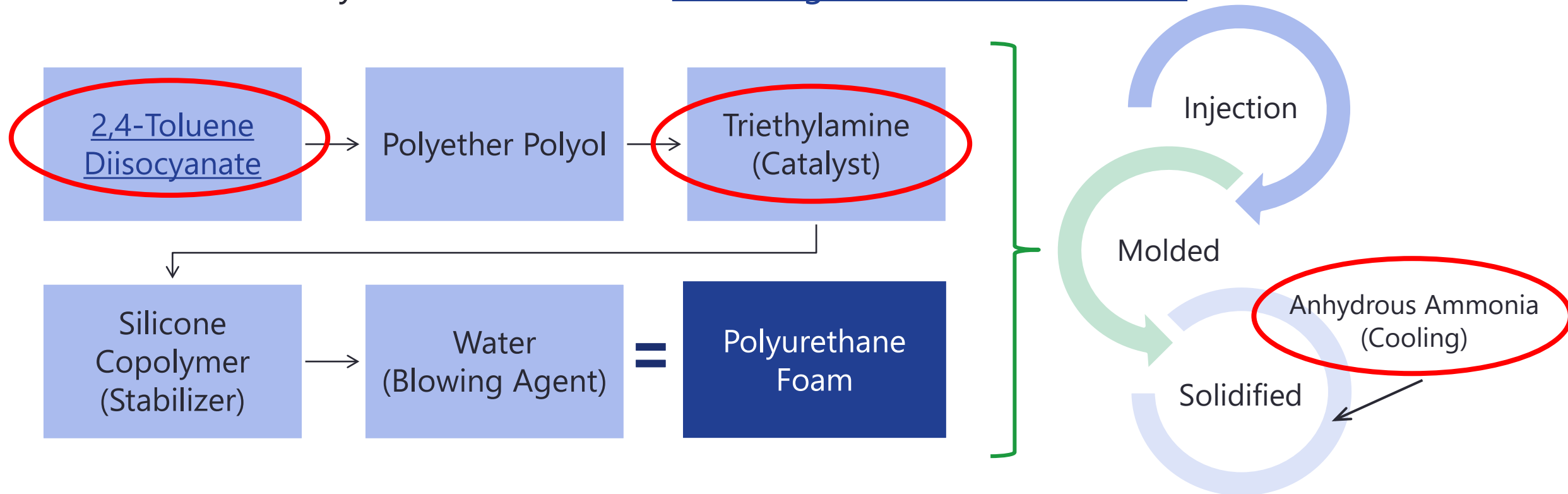
Bring back for large group discussion



# Case Study, Hypothetical Company: BestRest, Inc.

Step 1: Identify TURA Chemicals (use [this link](#) to download list)

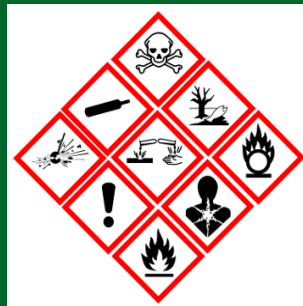
- What are the listed TURA chemicals that BestRest, Inc. uses?
- Are there any chemicals that are [TURA higher hazard substances](#)?



# Case Study, Hypothetical Company: BestRest, Inc.

## Step 2: Identify Potential Chemical Hazards and Risks

- What are the physical hazards associated with these chemicals?
- Is there potential for unintended chemical reactions?
- What are the potential health risks of exposure to these chemicals?



### Chemical Properties

Toxicity  
Flammability  
Combustibility

### Exposure Risks

Health Impacts  
Community Impacts  
Environmental  
Impacts

# Case Study, Hypothetical Company: BestRest, Inc.

## Step 3: Identify Climate Hazards and Risks

- Flooding: Check map for 100- and 500-year flood zones, potential for sea level rise, and hurricane threats.
- Power loss: What impacts could power loss have on this facility?



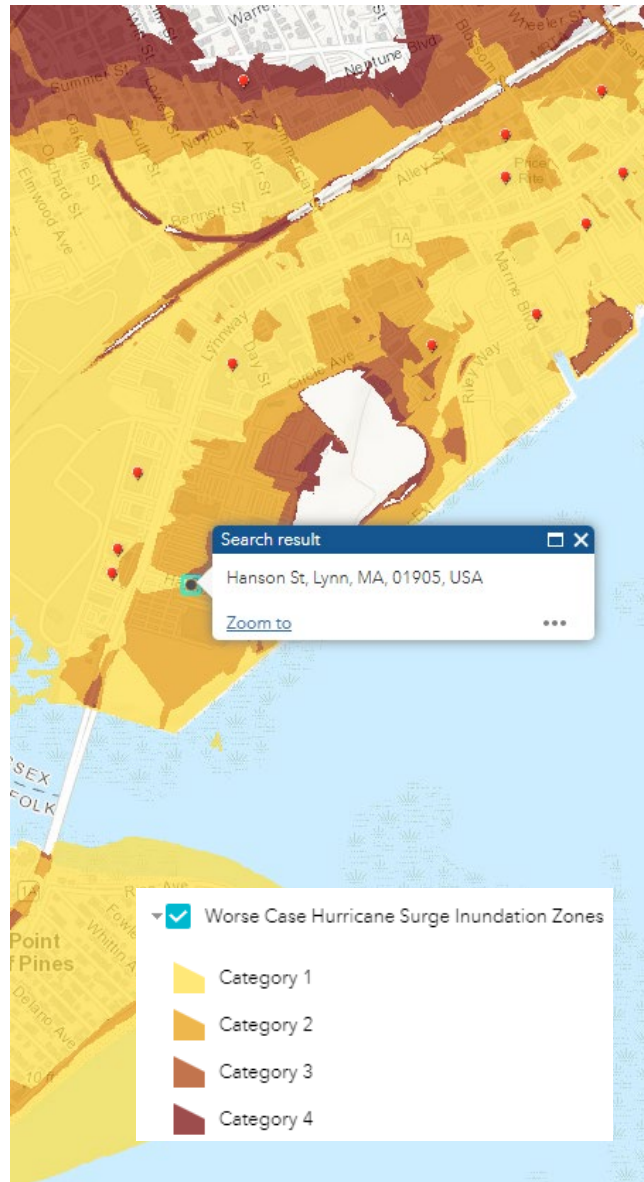
### **Weather Risks**

Flood  
Hurricane  
Freezing  
Heat  
Power Loss

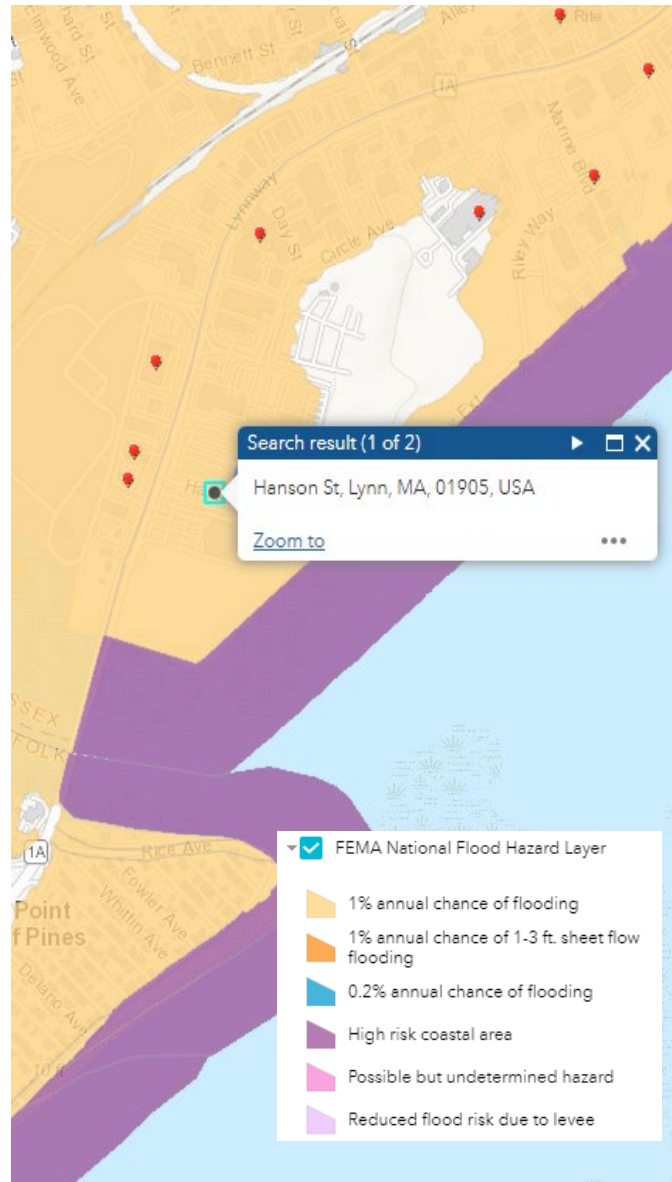
### **Community Risks**

Environmental Justice  
Vulnerable  
Populations  
Sensitivity, Ability to  
Cope

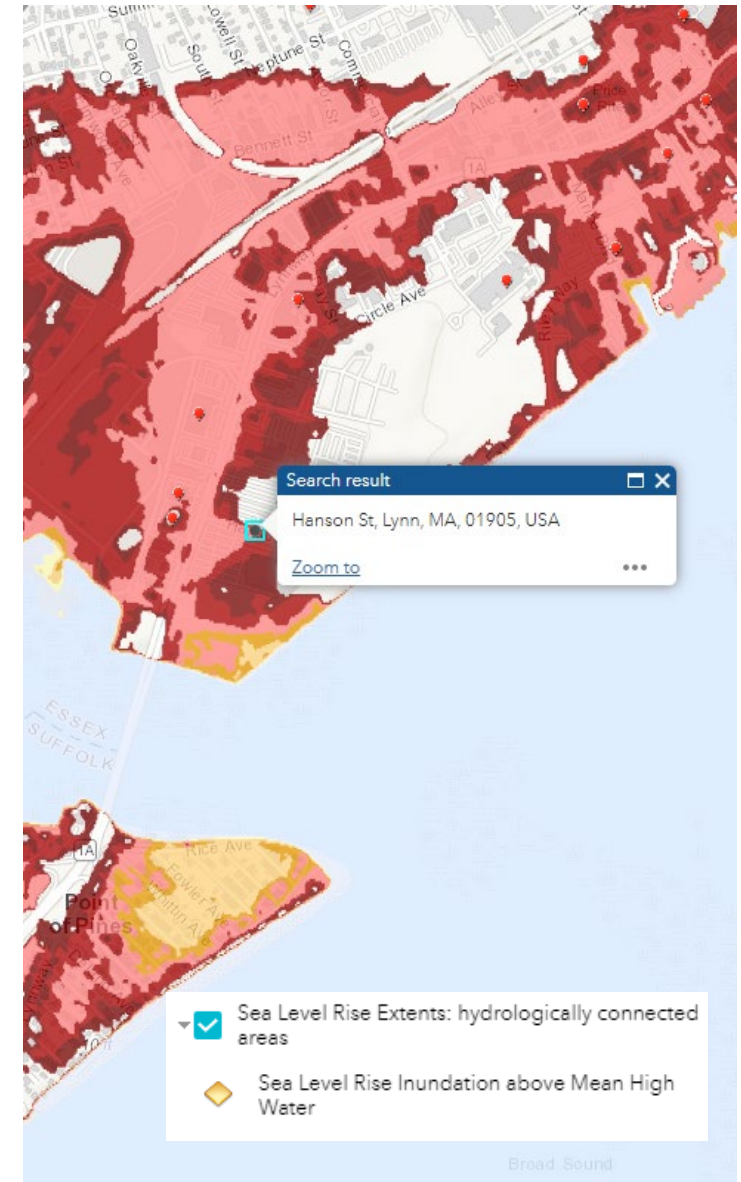
### Step 3: Hurricane Surge



### Flood Layers



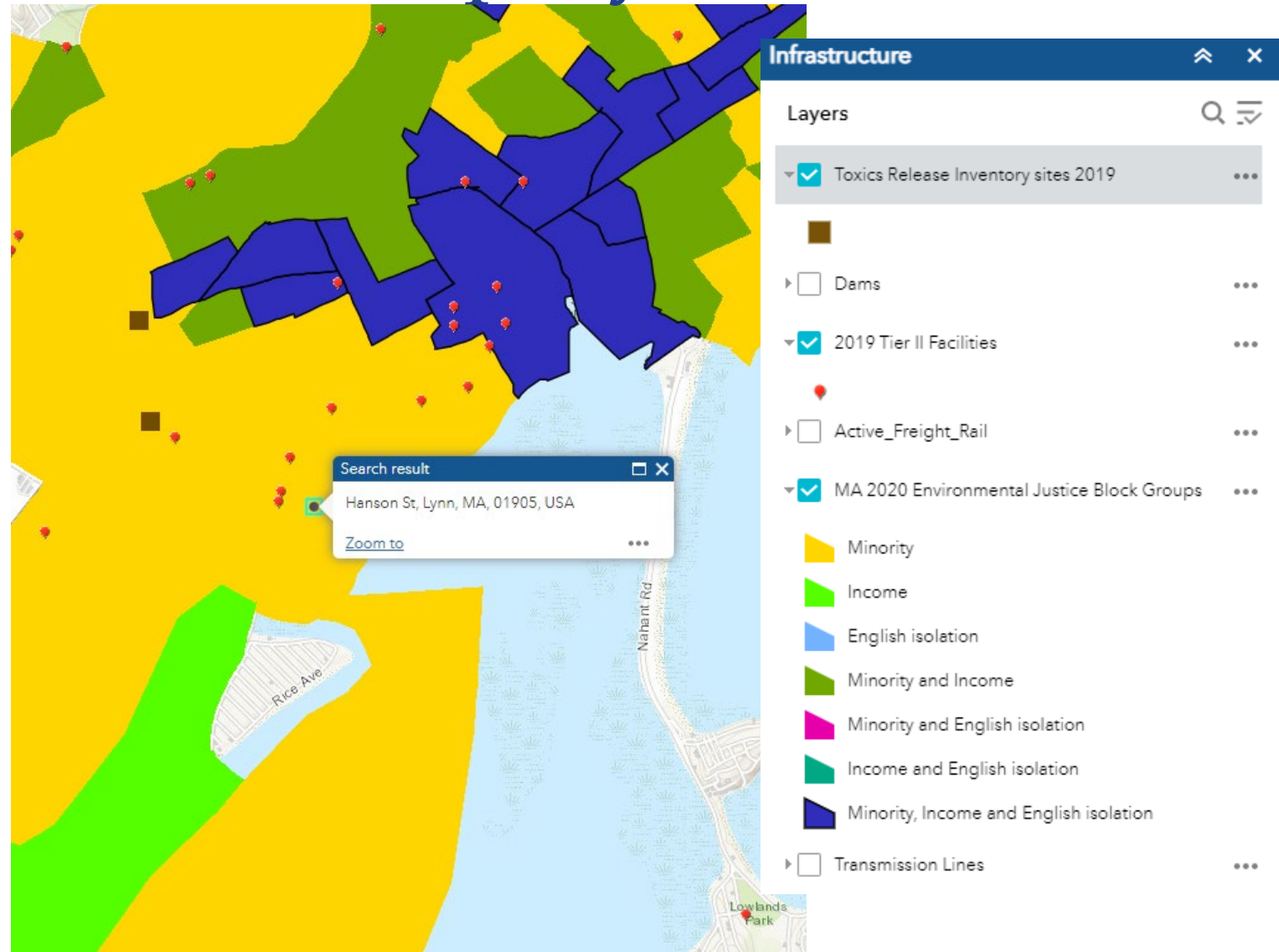
### Sea Level Rise



# Case Study, Hypothetical Company: BestRest, Inc.

## Step 3: Identify Climate Hazards and Risks

- Is the location in a designated environmental justice census block group?
- What are risks to the surrounding community in an extreme weather event?



# Case Study, Hypothetical Company: BestRest, Inc.

## Step 4: Identify Risks Related to Chemical Storage

- What concerns are there regarding chemical storage at this facility?
- Is there potential for a toxic chemical release in extreme weather?
- Are there any concerns regarding location of equipment and operation of controls?



### **Chemical Storage**

Location

Elevation

Potential for release

### **Equipment**

Location

Operation

Power needs

# Case Study, Hypothetical Company: BestRest, Inc.

## Step 5: Identify Toxics Use Reduction Opportunities

- Are there options for input substitution or product reformulation?
- Are there opportunities for production unit changes such as redesign, modification or modernization?
- What recommendations do you have for improved operations & maintenance?



### Toxics Use Reduction Options

Input Substitution  
Product Reformulation  
Production Unit  
Redesign/Modification


Production Unit  
Modernization  
Improved Operations  
& Maintenance  
Integral Recycling

# OTA Staff

- Chemists, engineers, and public health professionals
- Hands-on manufacturing experience



## OTA understands:

- Health and safety
  - The bottom line
  - Regulatory requirements
  - How to implement change
- 



# Contact Us

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