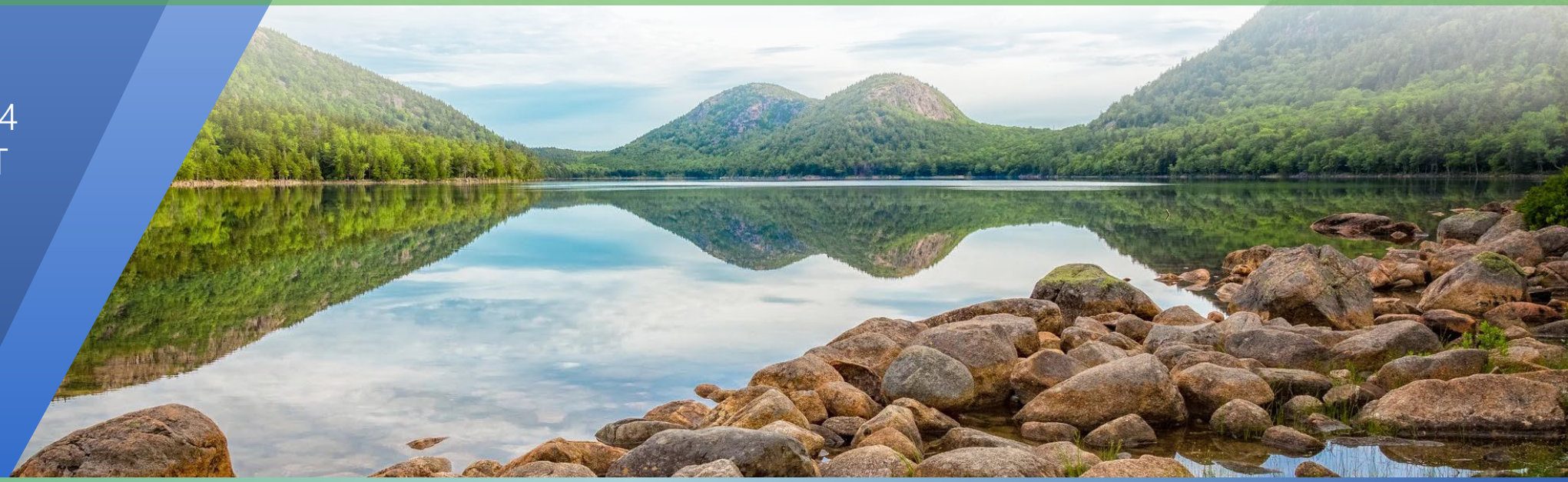
EPA Office of Resource Conservation and Recovery

Regional Climate and Disaster Resilience Training for RCRA Permitting and Hazardous Waste Cleanup: Northeast/Mid-Atlantic

December 10, 2024
1:30 – 3:30pm EST



Purpose

This training will…

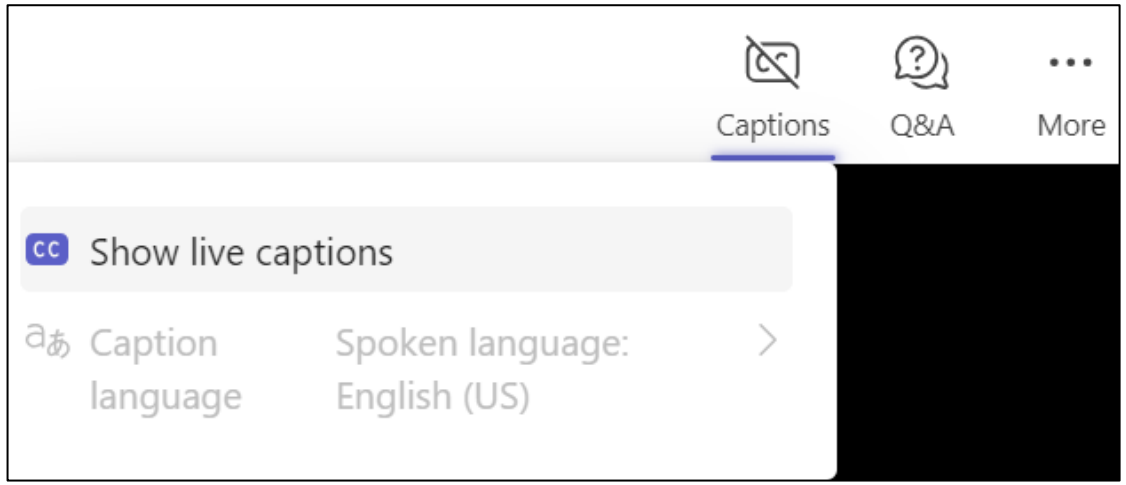
- Outline the statutory basis authorizing states and facilities to address climate related concerns
- Advance understanding of regional climate and natural disaster risks to facilities subject to RCRA permitting and hazardous waste cleanup requirements
- Explore how to conduct climate and disaster vulnerability screenings and assessments
- Identify resilience strategies appropriate to RCRA permitting and hazardous waste cleanup
- Share available resources and case study examples

Agenda

Introduction	15 min
Importance of Considering Climate Resilience	20 min
How to Assess Climate Vulnerabilities	25 min
Case Study: Climate Vulnerability Assessments	10 min
Climate & Disaster Resilience Strategies	25 min
Case Studies: Climate & Disaster Resilience	20 min
Closing Remarks	5 min

Housekeeping Rules

- To ask a question, type into the Q&A box or use Menti
- Technical issues with Teams or Menti?
  - Type into Q&A or email Rob Langston, robert.langston@emsus.com
- Turn on live captions if desired →
- Training will be recorded



Slides will be shared after the training!

Introductions

EPA Team

Carolyn Hoskinson, Director, Office of Resource Conservation and Recovery

Scott Palmer, Senior Economist, Office of Resource Conservation and Recovery

Lisa McArthur, RCRA and Tanks Branch Manager, Region 10

ICF Team

Amanda Vargo, Climate Resilience Managing Consultant

Sean DuBois, Manager, Environmental Scientist

Introductions

- Organization and role
- What types of climate vulnerabilities are you seeing or are you concerned about?
- What are you hoping to take away from this training?

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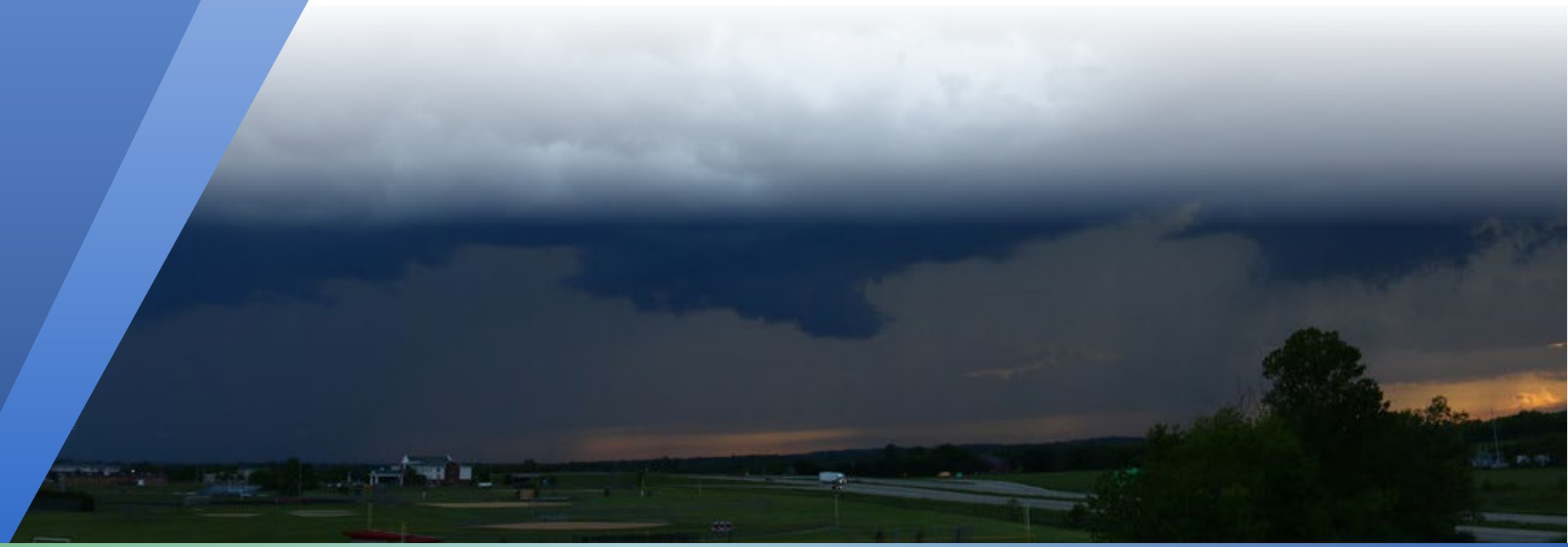
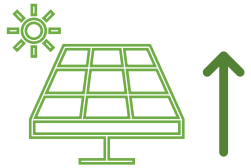
Importance of Considering Climate and Disaster Resilience



EPA Climate Relevant Definitions (for purposes of this Webinar)

Climate adaptation means taking action to prepare for and adjust to both the current and projected impacts of climate change.

Climate mitigation refers to actions limiting the magnitude and rate of future climate change by reducing greenhouse gas emissions and/or advancing nature-based solutions.



Definitions from EPA, https://www.epa.gov/climate-adaptation/climate-adaptation-and-epas-role

Communicating About Climate & Disaster Resilience

Discuss:

- Lived experiences from past extreme events (e.g., floods, droughts)
- Benefits and "business-case" for resilience investments

RCRA Facilities and Climate Resilience

Climate change can pose a significant risk to RCRA facilities.

For example, increased frequency and severity of climate hazards like storms, flooding, and sea-level rise can lead to the release of hazardous substances from RCRA facilities, potentially impacting nearby communities.

Considering climate change throughout the permitting and cleanup processes is essential to reduce climate impacts and support climate resilience.

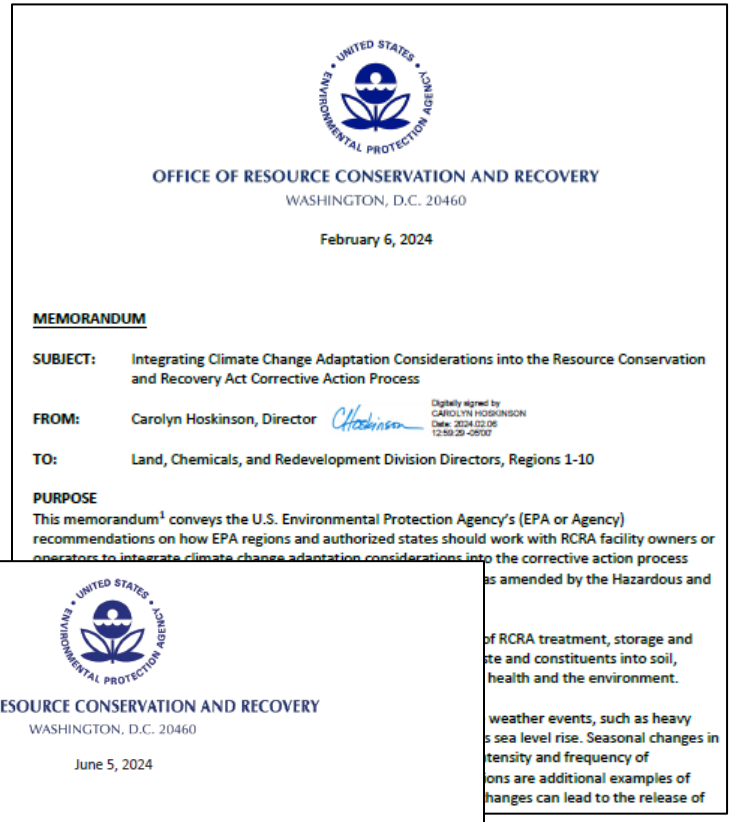
The first step is identifying potential climate impacts to a facility.

ORCR Climate Resilience Memos

In 2024, ORCR issued two memorandums providing guidance on when and how to consider potential adverse climate change impacts in the hazardous waste permitting process and recommendations on integrating climate adaptation into the hazardous waste cleanup process.

These two memos covered:

- Key concepts of climate change relevant to RCRA
- How the memo fits into the broader EPA focus on climate change adaptation
- Recommendation of climate vulnerability screening and, if necessary, climate vulnerability assessment
- Regulatory authorities and guidance that support the consideration of climate change impacts on hazardous waste management and cleanup activities



OFFICE OF RESOURCE CONSERVATION AND RECOVERY
WASHINGTON, D.C. 20460

February 6, 2024

MEMORANDUM

SUBJECT: Integrating Climate Change Adaptation Considerations into the Resource Conservation and Recovery Act Corrective Action Process

FROM: Carolyn Hoskinson, Director

TO: Land, Chemicals, and Redevelopment Division Directors, Regions 1-10

PURPOSE

This memorandum[1] conveys the U.S. Environmental Protection Agency's (EPA or Agency) recommendations on how EPA regions and authorized states should work with RCRA facility owners or operators to integrate climate change adaptation considerations into the corrective action process

as amended by the Hazardous and

of RCRA treatment, storage and
te and constituents into soil,
health and the environment.

weather events, such as heavy
s sea level rise. Seasonal changes in
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ons are additional examples of
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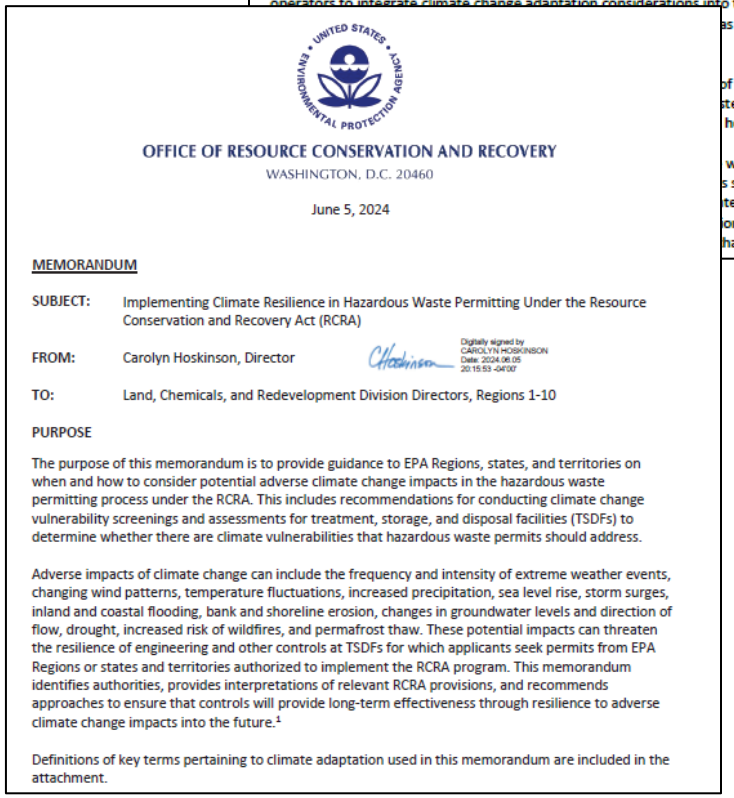


OFFICE OF RESOURCE CONSERVATION AND RECOVERY
WASHINGTON, D.C. 20460

June 5, 2024

MEMORANDUM

SUBJECT: Implementing Climate Resilience in Hazardous Waste Permitting Under the Resource Conservation and Recovery Act (RCRA)

FROM: Carolyn Hoskinson, Director

TO: Land, Chemicals, and Redevelopment Division Directors, Regions 1-10

PURPOSE

The purpose of this memorandum is to provide guidance to EPA Regions, states, and territories on when and how to consider potential adverse climate change impacts in the hazardous waste permitting process under the RCRA. This includes recommendations for conducting climate change vulnerability screenings and assessments for treatment, storage, and disposal facilities (TSDFs) to determine whether there are climate vulnerabilities that hazardous waste permits should address.

Adverse impacts of climate change can include the frequency and intensity of extreme weather events, changing wind patterns, temperature fluctuations, increased precipitation, sea level rise, storm surges, inland and coastal flooding, bank and shoreline erosion, changes in groundwater levels and direction of flow, drought, increased risk of wildfires, and permafrost thaw. These potential impacts can threaten the resilience of engineering and other controls at TSDFs for which applicants seek permits from EPA Regions or states and territories authorized to implement the RCRA program. This memorandum identifies authorities, provides interpretations of relevant RCRA provisions, and recommends approaches to ensure that controls will provide long-term effectiveness through resilience to adverse climate change impacts into the future.[1]

Definitions of key terms pertaining to climate adaptation used in this memorandum are included in the attachment.

Authorities Supporting Climate Resilience Considerations in Hazardous Waste Permitting

Facility Design and Operation [§ 264.31]

- Facilities must be designed, constructed, maintained, and operated to minimize the possibility of a release
- Climate change impacts should be considered to ensure this standard is satisfied

Facility Location Standards [§ 264.18(b)]

- Facilities located within a 100-year floodplain to be designed, constructed, operated and maintained to prevent washout, should there be a flood
- Future floodplains should be considered to ensure long-term protection

Contingency Plans [§ 264.50 – 264.56]

- Facilities are required have contingency plans designed to minimize hazards to human health or the environment
- Plans should be developed or revised to consider climate change impacts

Authorities Supporting Climate Resilience Considerations in Hazardous Waste Cleanup

EPA, or authorized states, are empowered to impose cleanup requirements that will be protective of human health and the environment, taking into account potential climate impacts on the effectiveness of cleanups over time.

Remedy Selection

- Based on the climate vulnerability assessment, the adaptive capacity of the remedial options to potential climate change impacts should be considered.

Existing Remedies

- Remedies should be evaluated and adjusted over time, if necessary, based on updated climate-related information.

Long-term Stewardship

- Long-term stewardship reviews can provide opportunities to assess the adaptive capacity of the remedy.

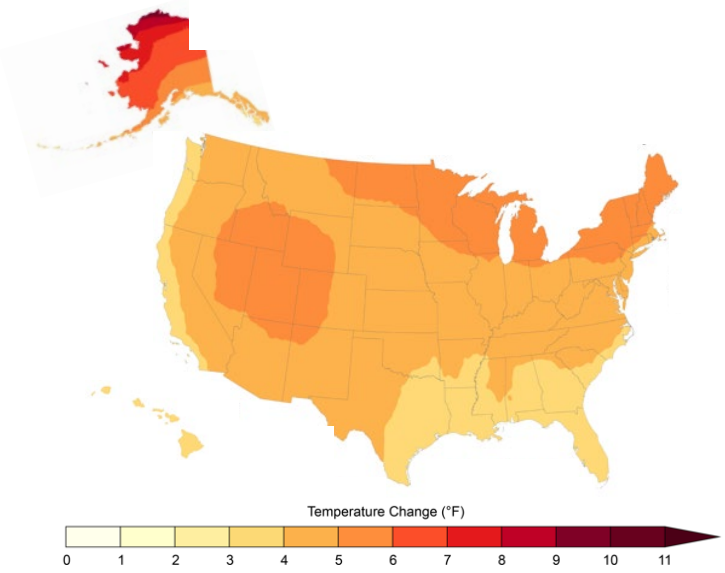
The Cost of Inaction

- Climate impacts can leave RCRA facilities susceptible to increased and repeated damage, which will reduce the long-term protectiveness of hazardous waste management and cleanup activities.

- For example, if resilience measures are not considered during permitting and remedy selection, a facility may be faced with a costlier cleanup after a release due to a climate impact.

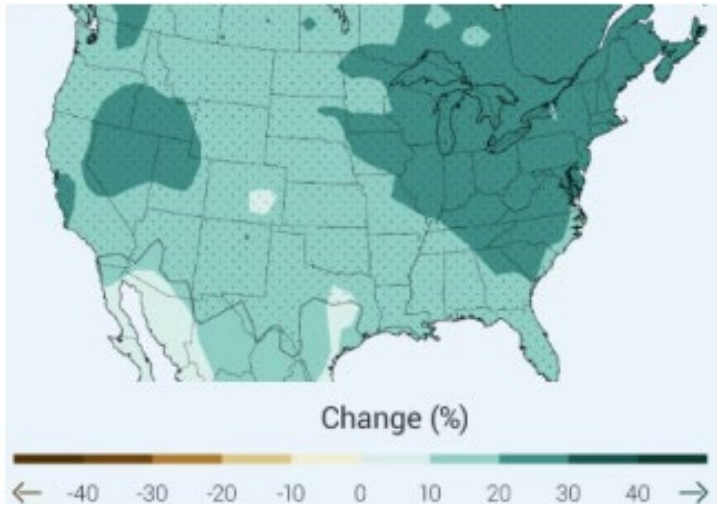
How is the climate changing?

More extreme heat waves and higher average temperatures



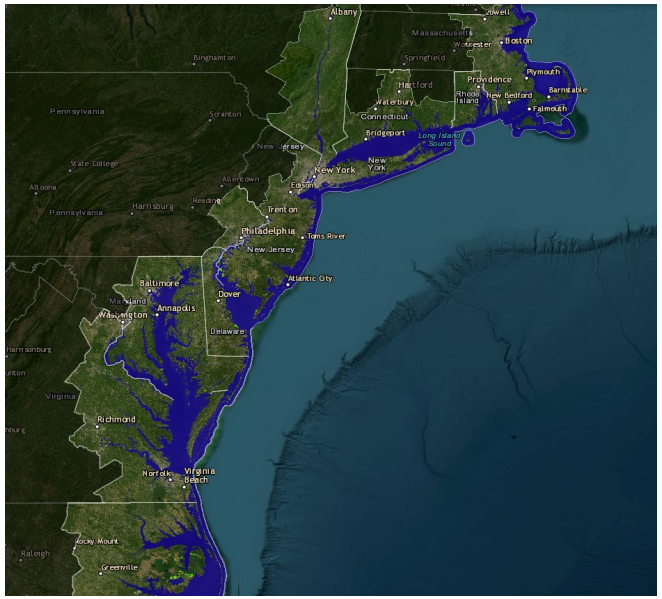
Projected Change in Annual Average Temperature under 2.0°C of Global Warming relative to 1851-1900
Source: USGCRP 2023

More intense precipitation events



Simulated changes in the average amount of precipitation falling on the wettest day of the year for 2070-2099 compared to 1971-2000 under RCP 8.5 (continued emissions increases). (Figure source: NOAA NCDC / CICS-NC).

Continued sea level rise and increased coastal flooding



Projected flooding at 5ft of sea level rise
Source: NOAA SLR Viewer

Potential Climate & Natural Hazards of Concern to RCRA Facilities in the Northeast

Precipitation

Flooding

Sea Level Rise

Extreme Heat

Drought

Wildfire

Groundwater Levels

Extreme Weather Events

Storm Surge

Extreme Cold

Landsides

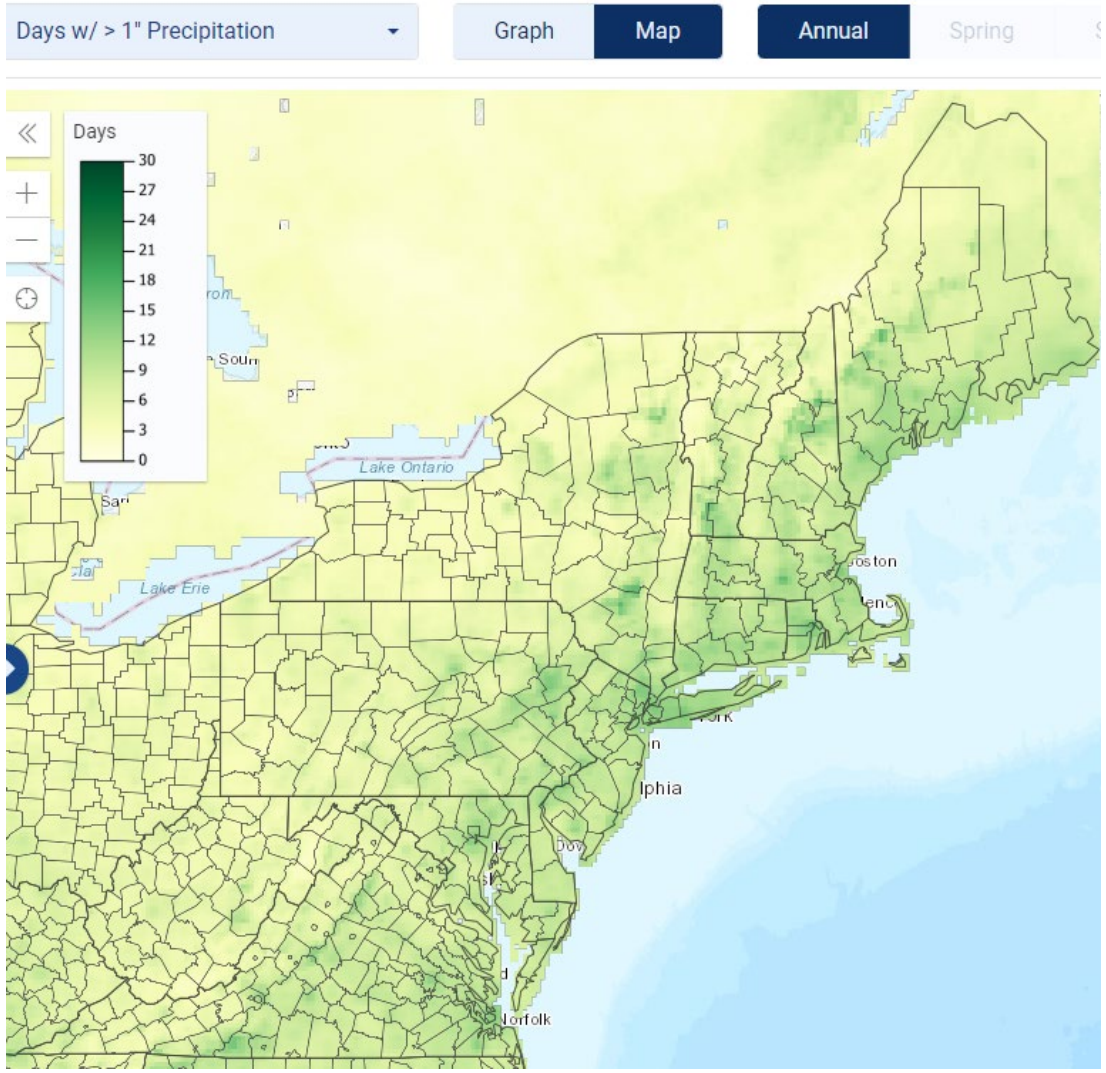
Saltwater Intrusion

Examples of Climate Related Impacts to RCRA Facilities and Communities

- Physical damage to infrastructure or engineered solutions
- Release of contamination to the natural environment
- Power supply disruptions
- Reduced access to sites
- Interruption of facility operations

Precipitation & Flooding

- Extreme precipitation events are increasing in frequency and intensity.
- Precipitation patterns are also becoming more variable (e.g., longer dry periods between heavy rainfall events)
- The severity of Nor'easters and tropical storms is projected to increase
  - Record-breaking Nor'easters and tropical storms in recent years (in terms of intensity)
- Heavy rainfall events can cause flood damages

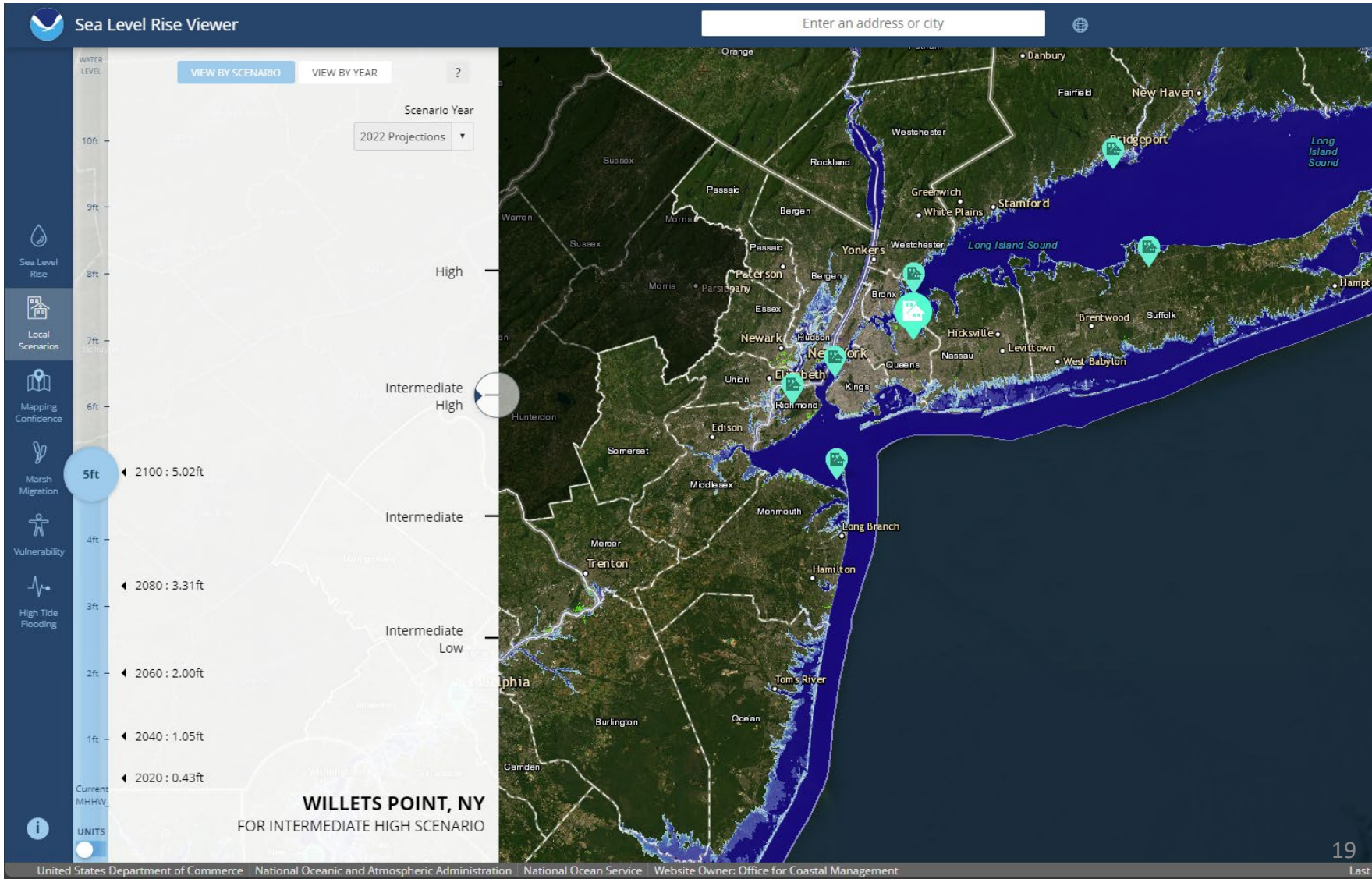


Projected change in number of days per year with >1 inch of precipitation through late century under a high emissions scenario, compared to the 1961-1990 average.

Source: Climate Explorer

Coastal Flooding

- Sea level rise is increasing across the Northeast coastline.
- Warmer ocean temperatures are leading to more intense tropical storms and hurricanes.
- Wind speeds, rainfall rates, and storm surge heights are projected to increase.

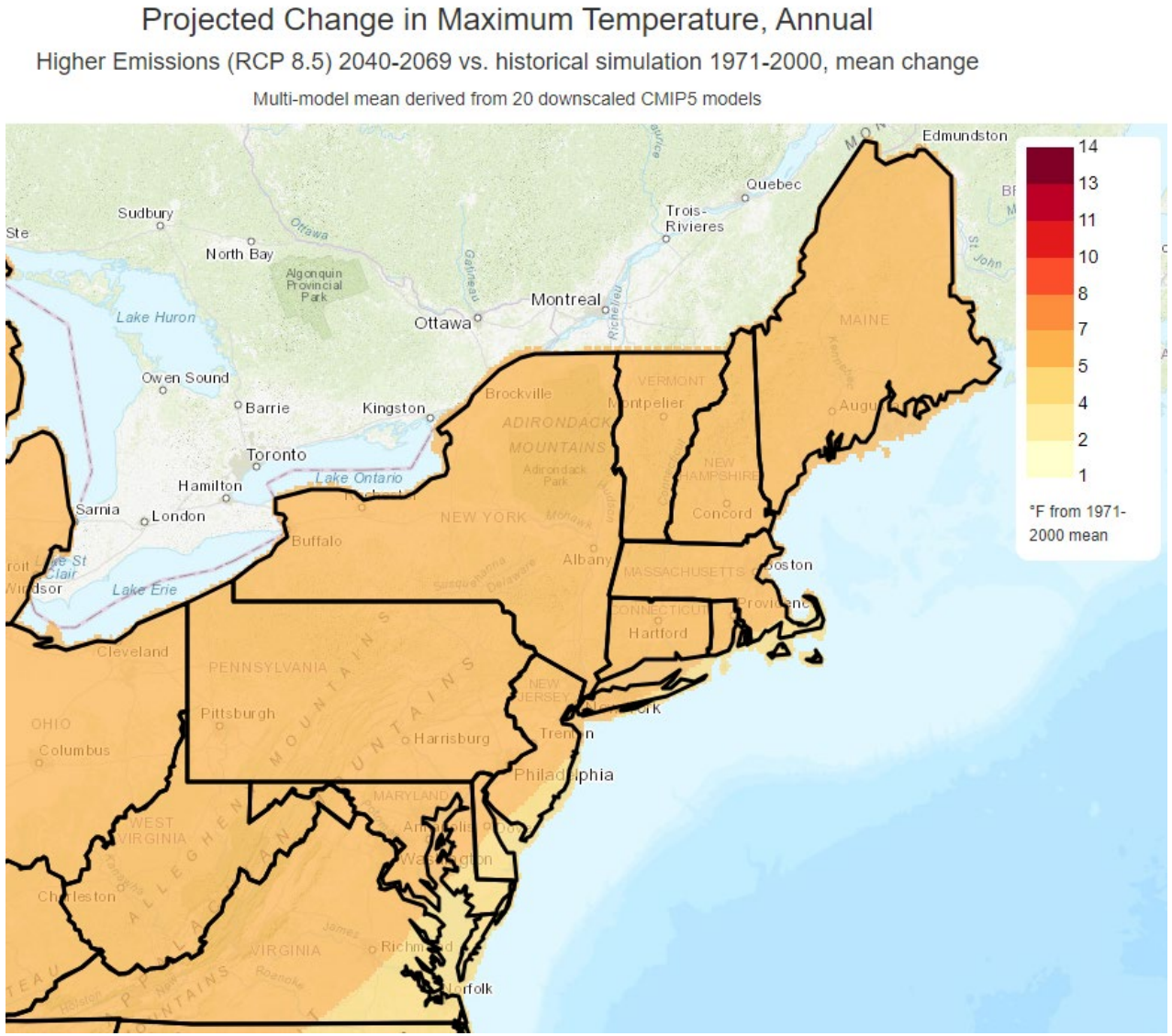


Water depth and extent under Intermediate-High sea level rise scenario for 2100.

Source: [NOAA Sea Level Rise Viewer]

Extreme Heat

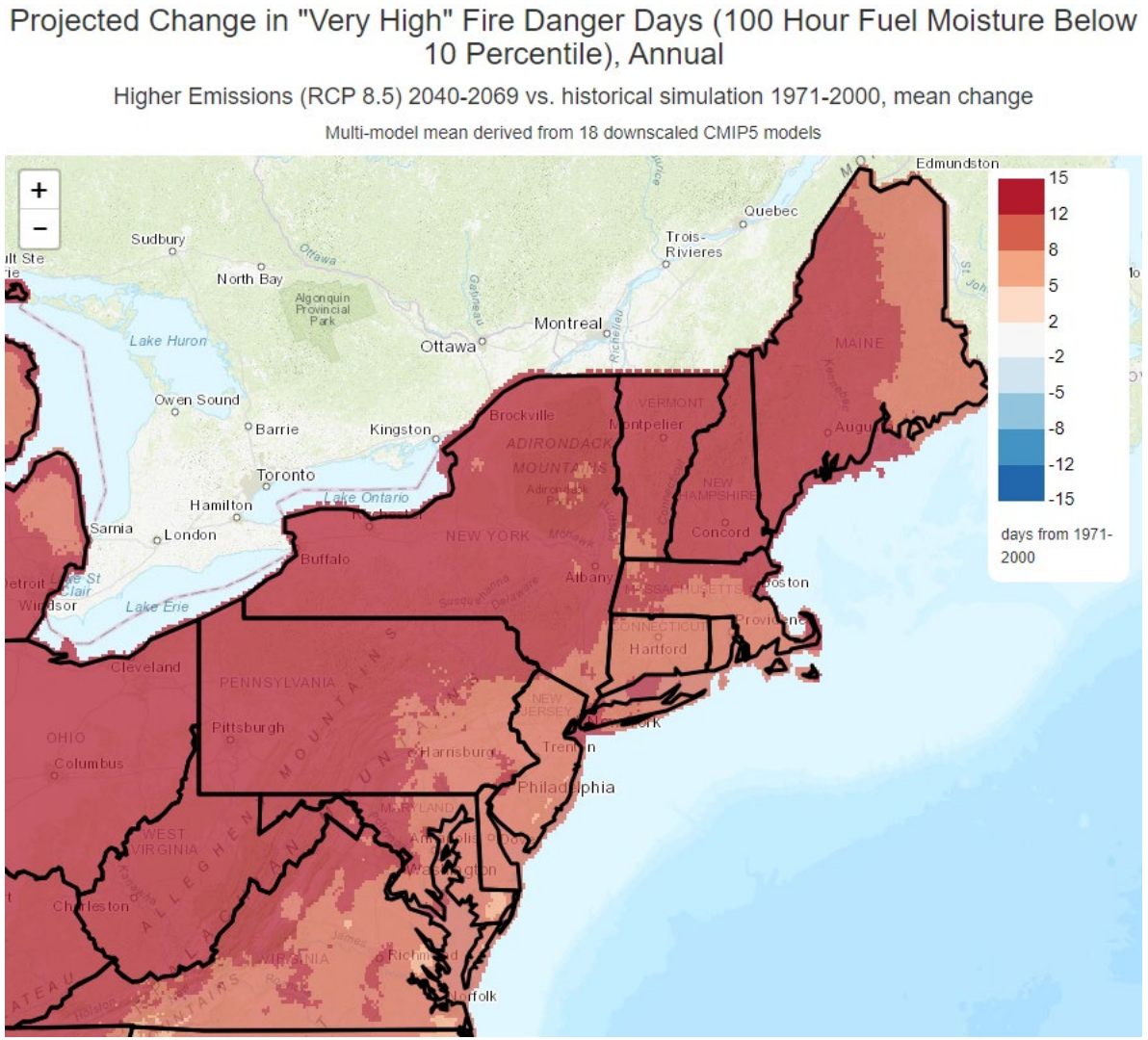
- Heat waves are increasing in length and severity
- By midcentury, projections indicate a threefold increase in days over 100°F under an intermediate scenario
- Extreme heat events can worsen the urban heat island (UHI) effect
- Extreme heat can pose various health and safety risks to workers



Projected change in annual maximum temperatures by mid-century compared to baseline under a high emissions scenario.
Source: Climate Mapper (Climate Maps)

Wildfire

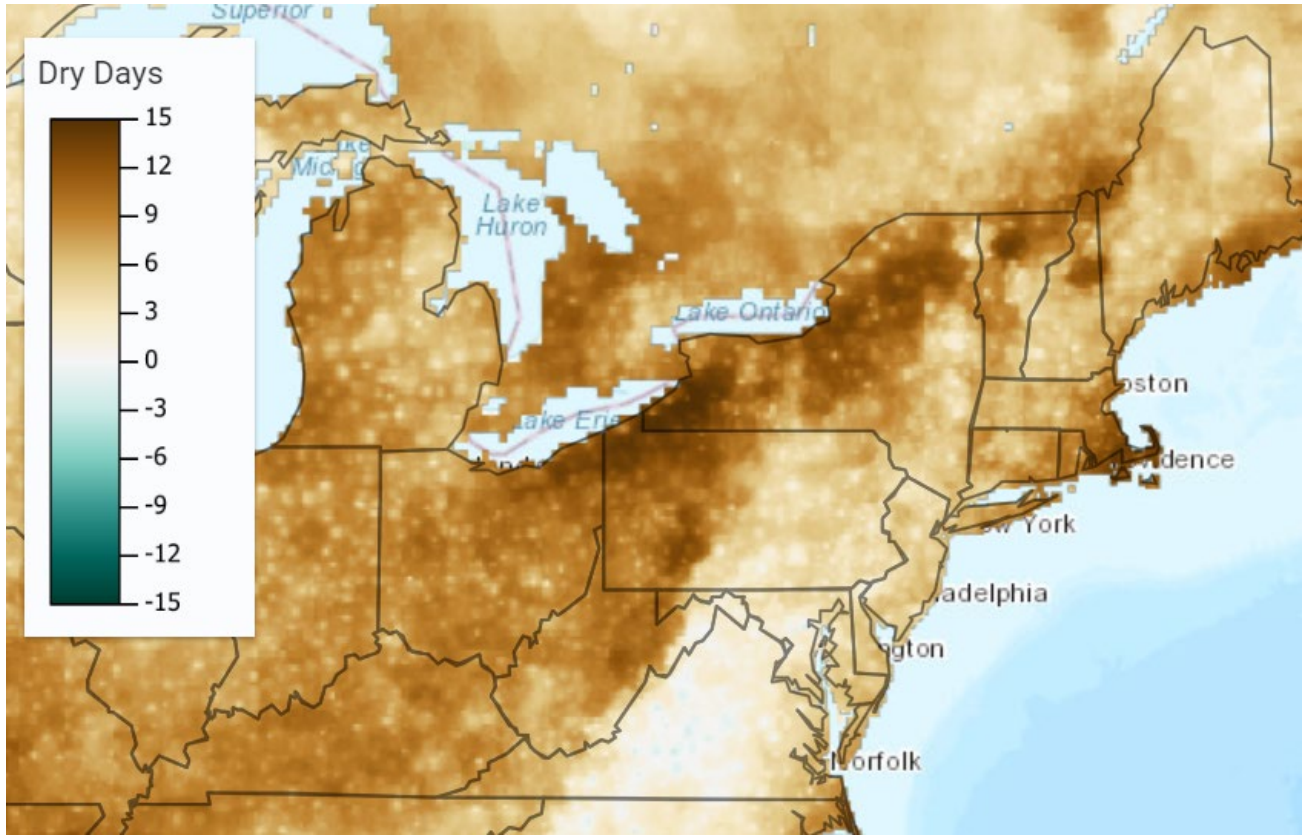
- Wildfires are becoming more frequent, with longer seasons and larger burned areas due to higher temperatures, decreased summer precipitation, and drier vegetation
- In recent years, New York and New Jersey have seen an increase in wildfire event outbreaks
- By late-century, the length of extreme wildfire season is projected to be prolonged by over 10 days for the Northeast.



Projected change in "Very High" fire danger days through mid-century under a high emissions scenario.
Source: Climate Mapper (Climate Maps)

Drought

- Higher temperatures have increased the occurrence of drought
- Droughts are projected to increase in severity and frequency
- Flash droughts are also projected to increase
- Drought can increase available fuel for wildfires



Projected change in the number of dry days by 2090 compared to baseline under a high emissions scenario.
Source: Climate Explorer

How to Assess Climate Related Vulnerabilities

RCRA Climate Memos Call to Action: Assess Vulnerabilities

- EPA regions and states should work with owners and operators of RCRA permitted and hazardous waste cleanup facilities to screen for vulnerabilities to any potential climate change impacts (climate vulnerability screening).

- If there are climate change impacts that could impact permitted facility operations or hazardous waste cleanup, regions and states may require the facility owners or operators to conduct a climate vulnerability assessment.

Importance of Identifying Climate Vulnerabilities

Vulnerability:
The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes; it is a function of the character, magnitude, and rate of climate variation to which a system is exposed; its sensitivity; and its adaptive capacity.

Exposure
Whether and to what degree a facility could experience a climate hazard or extreme weather event.

Sensitivity
Whether and to what degree a facility would experience impacts from an exposure.

Adaptive Capacity
The ability of a human or natural system to adjust to climate change (including climate variability and extremes) by moderating potential damages, taking advantage of opportunities, or coping with the consequences.

Screening vs. Assessment

Climate Vulnerability Screening

- Focused on **exposure**
- Often uses publicly available federal or state data sources
- Often completed first to identify potential vulnerabilities and need for any further analysis

Climate Vulnerability Assessment

- More detailed evaluation of: **exposure**, **sensitivity**, and **adaptive capacity**
- Uses local and/or site-level data and modeling
- Site-specific resilience measures identified

Conducting a Climate Vulnerability Screening:
Step 1: Identify Climate Hazards of Interest

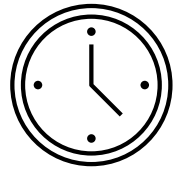
- Identify climate hazards by site location (e.g. flooding, precipitation, drought, extreme heat, sea level rise, wildfire, extreme cold)
- Consider:

  What climate hazards have affected the site in the past?

  What climate hazards may be of concern under future climate conditions?

  Are there any data limitations on including a particular climate hazard?

Conducting a Climate Vulnerability Screening:
Step 2: Select a Future Time Period



- Climate projections are typically provided for:
  - Mid-century (e.g., 2040-2059) and
  - Late-century (e.g., 2080-2099) time periods

  and can be compared to a historical baseline (e.g., 1985-2014)

- Choosing an appropriate timeframe depends on factors such as:
  - Specific conditions and remedies at the facility
  - Decision making needs

Conducting a Climate Vulnerability Screening: Step 3: Identify the "Worst-case" Scenario

- **Climate scenarios** represent a range of possible climate futures based on simulations of long-term shifts in temperature or weather patterns from both natural and human-caused forcings
- Dependent on adoption of policies to reduce global greenhouse gas emissions
- May be labeled as:
  - Emissions scenario
  - Representative concentration pathway (RCP)
  - Shared socio-economic pathway (SSP)
- Screening should use climate projections for the **"worst-case" climate scenario** to conservatively screen for all potential climate risks to the facility

Conducting a Climate Vulnerability Screening:
Step 4: Collect Climate Data

- Use available state or federal data to collect climate data for:
  - Appropriate climate hazards
  - Time period
  - Worst-case scenario

} Previous Steps

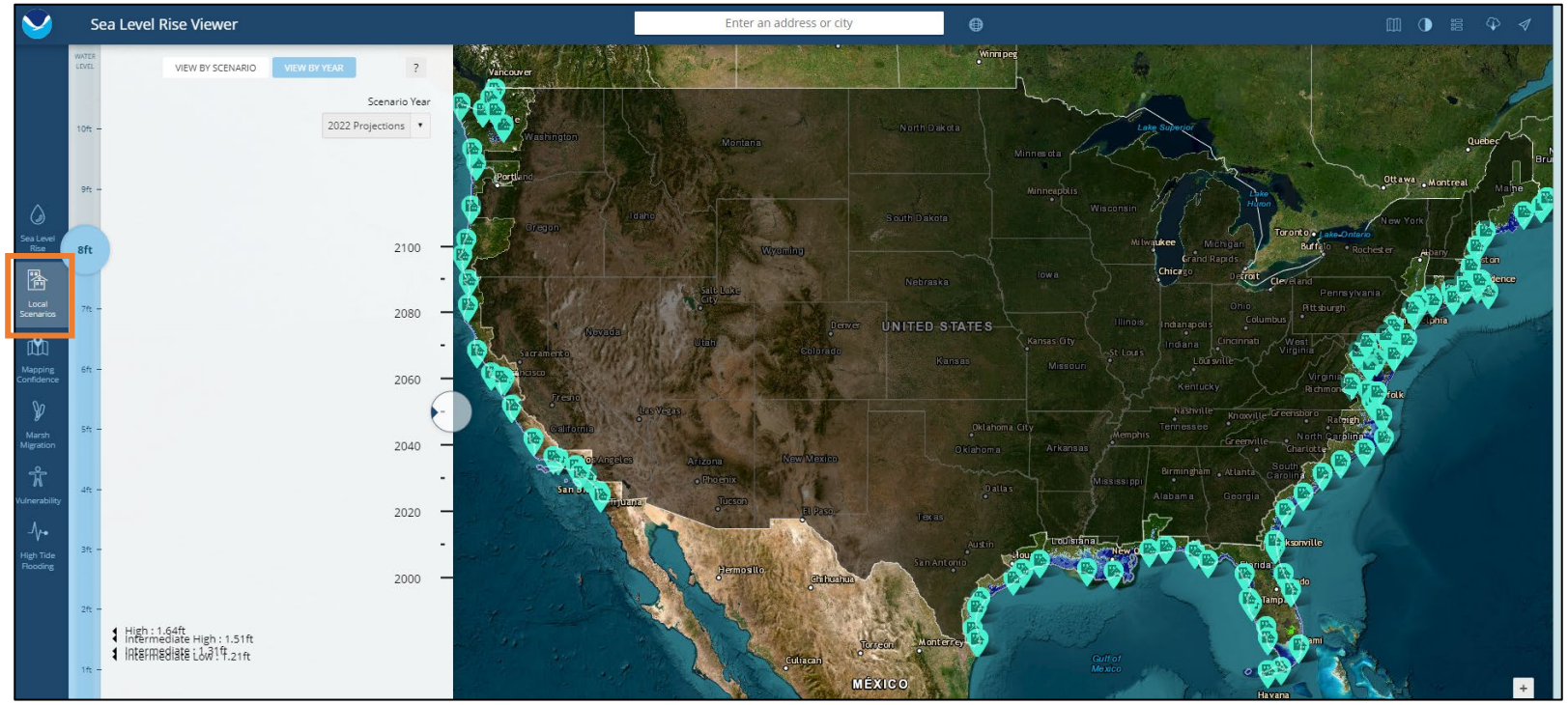
- Recommended Screening Tools:

Tool	Climate Hazards
National RCRA and PCB Climate Hazard Screening Tool	*[Anticipated tool release in 2025]*
Climate Mapping for Resilience and Adaptation (CMRA) Assessment Tool	Flooding, storm surge, precipitation, drought, extreme heat, wildfire
U.S. Climate Resilience Toolkit Climate Explorer	Storm surge, sea level rise, precipitation, extreme heat
NOAA Sea Level Rise Viewer	Sea level rise

NOAA Sea Level Rise Viewer

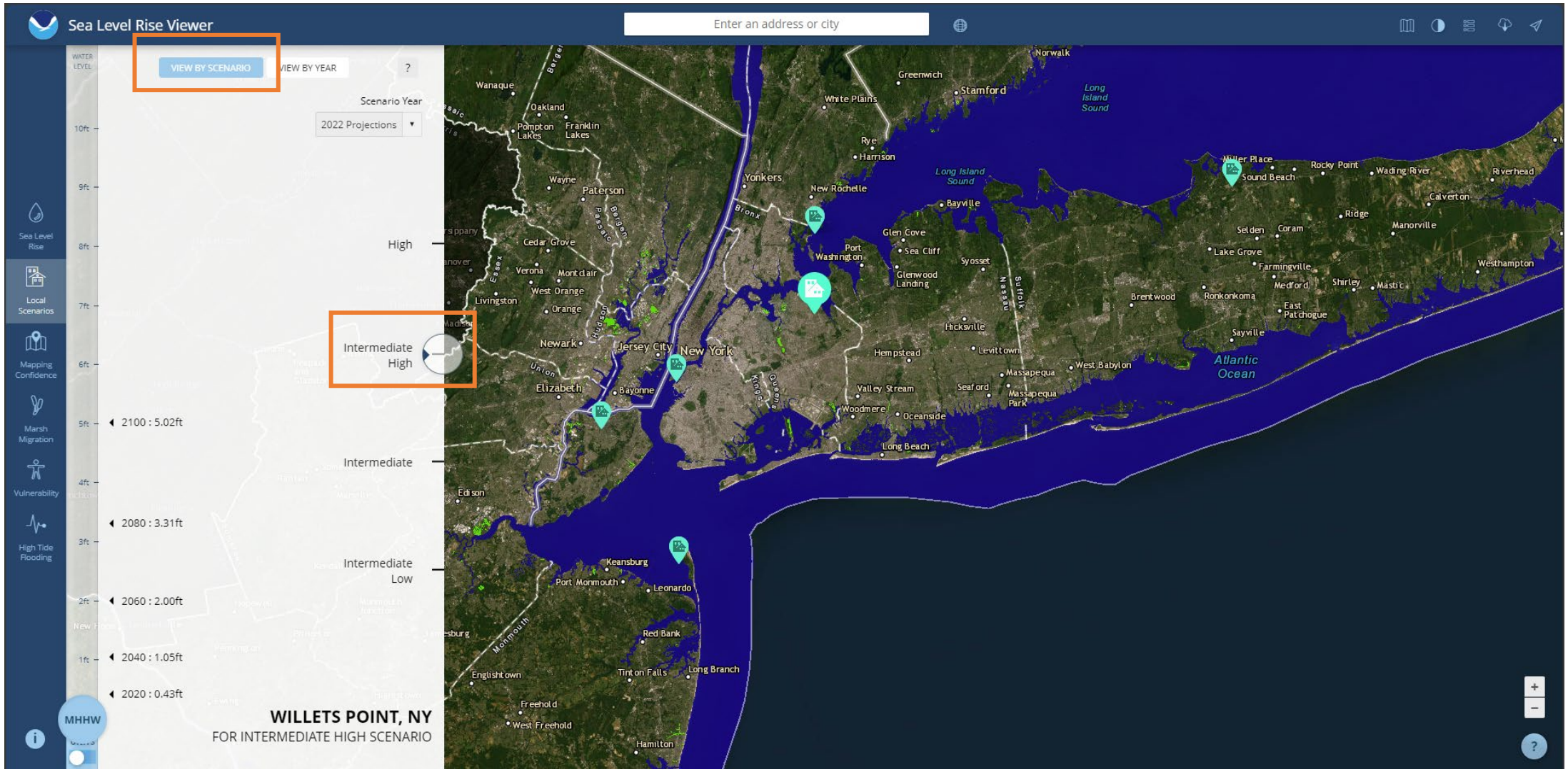
Web mapping tool that shows community-level impacts from coastal flooding or sea level rise, with a Local Scenarios option that allows users to see SLR projections at specific future years.

1. Access maps through address search bar or zoom in to area of interest



NOAA Sea Level Rise Viewer

2 Users can view relative sea level rise for different scenarios or years.



NOAA Sea Level Rise Viewer

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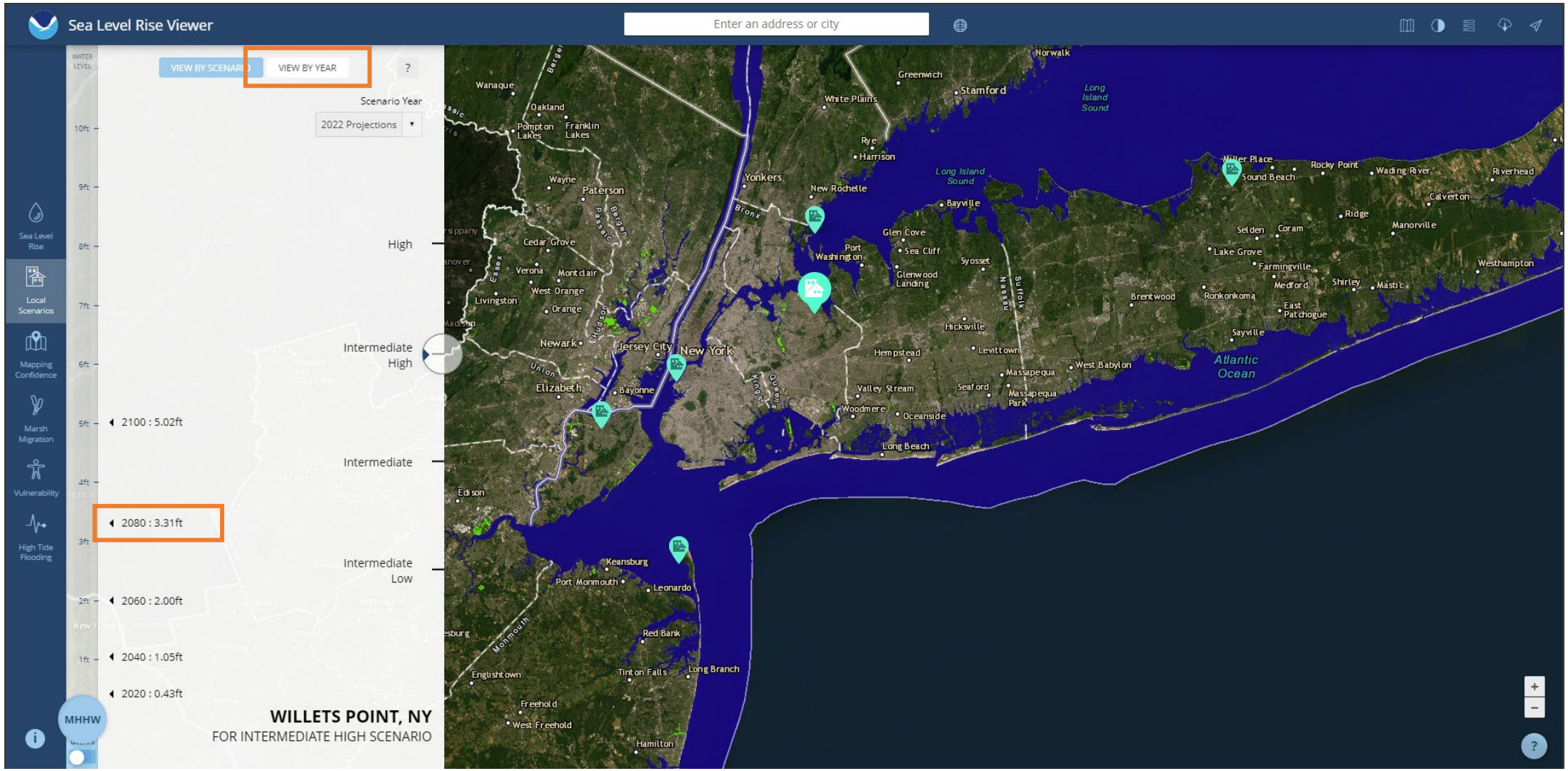
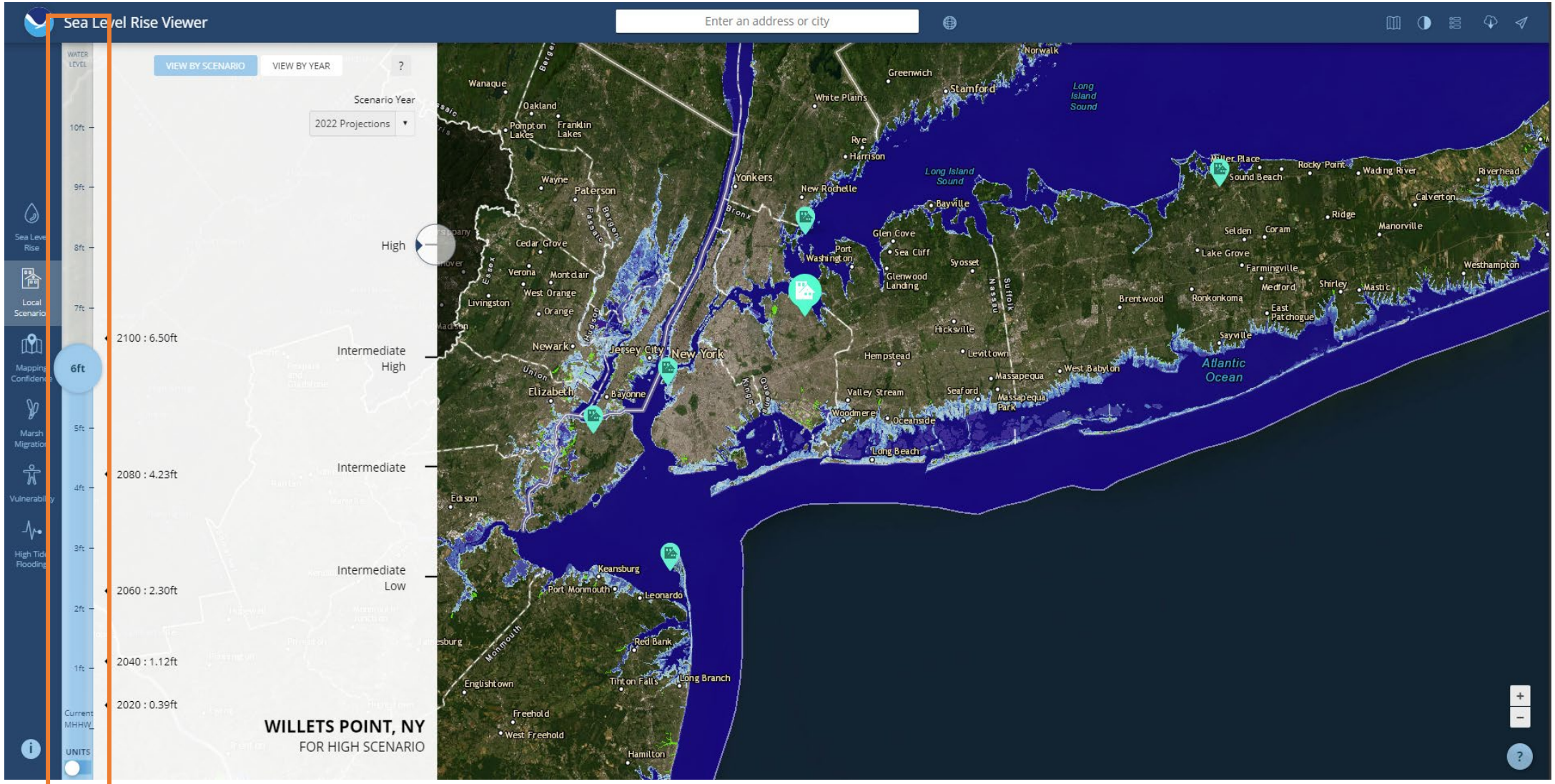


NOAA Sea Level Rise Viewer

3 Slide the water level bar to visualize the different sea level rise amounts.



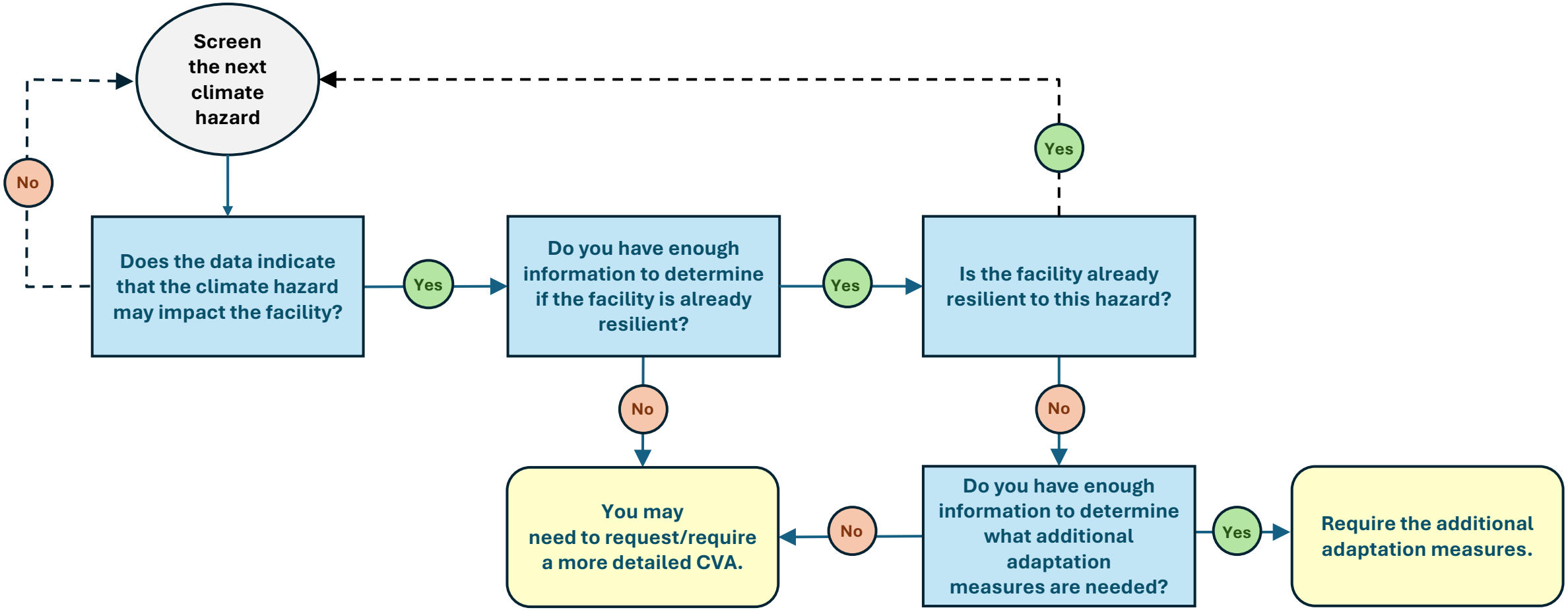
Conducting a Climate Vulnerability Screening:

Step 5: Assess Exposure *final step!*

- **Document all findings** from the screening including:
  - Current and future projections
  - Climate hazards of concern to the facility

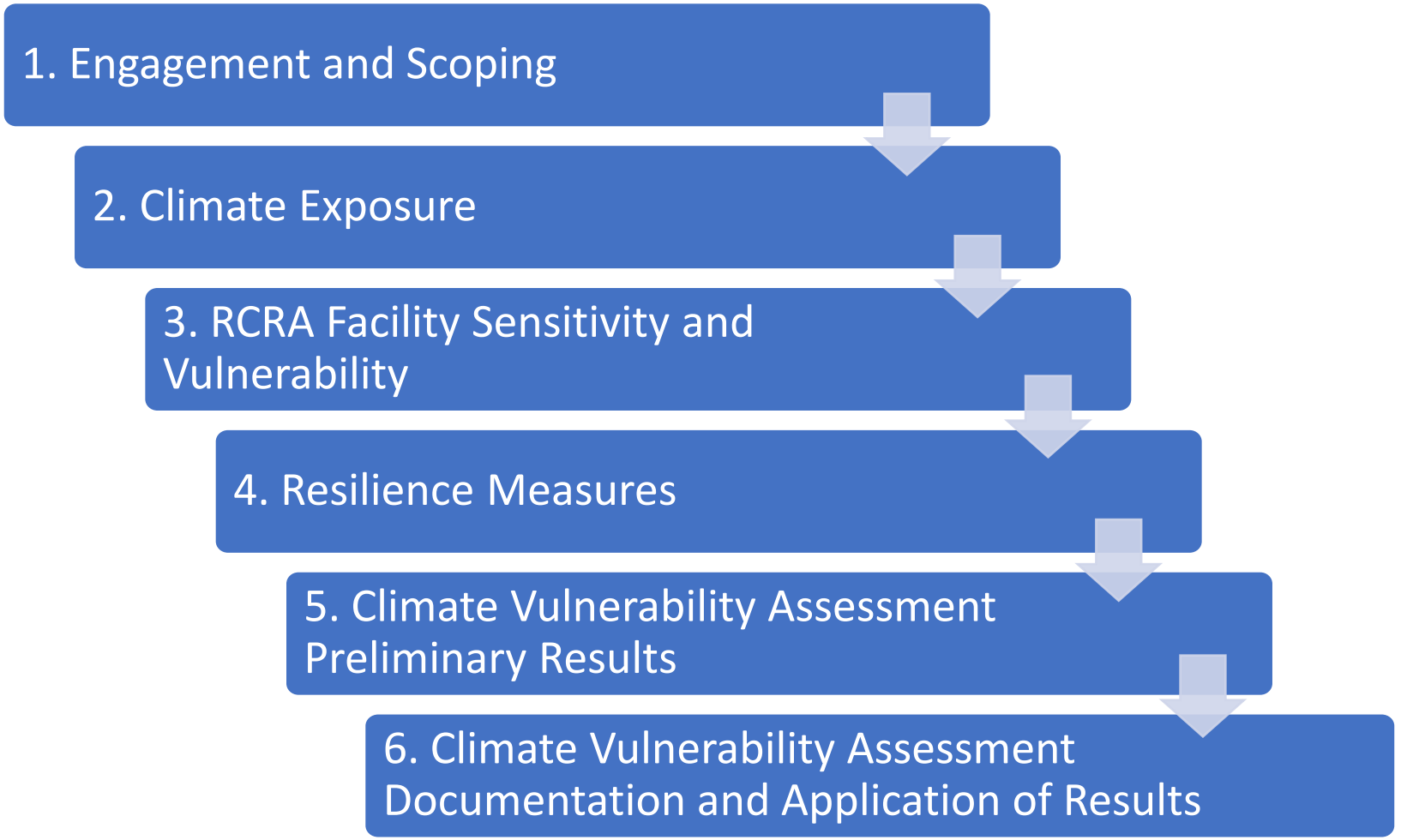
- For each potential climate hazard, proceed through the **decision tree** (next slide)

Decision Tree for Climate & Natural Disaster Screening

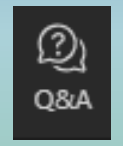


Climate Vulnerability Assessment (CVA)

A deeper dive into the vulnerability to climate hazards



Any Questions?

Use the Q&A button in Teams 

Or Menti:

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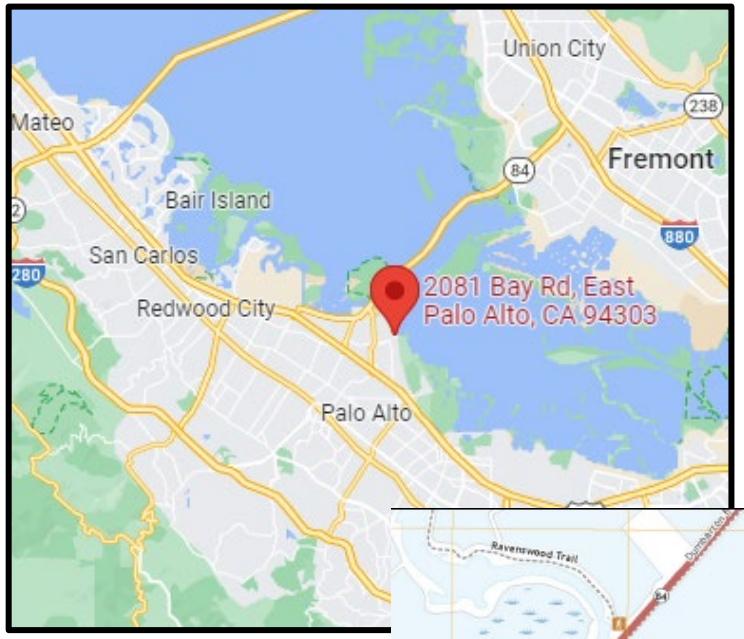
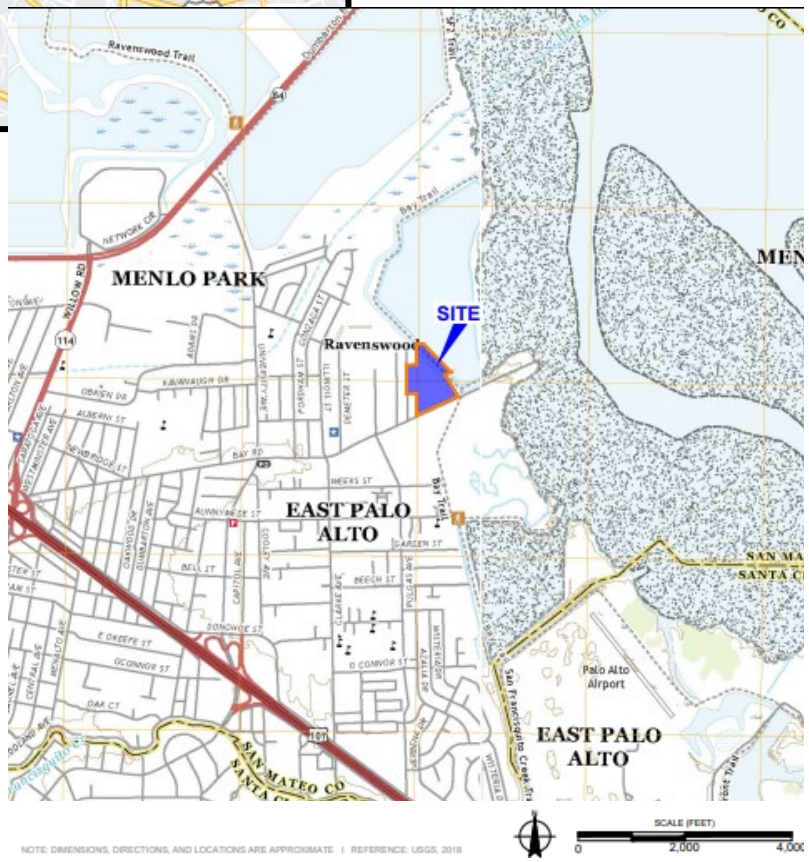
Bay Road Holdings CVA Case Study

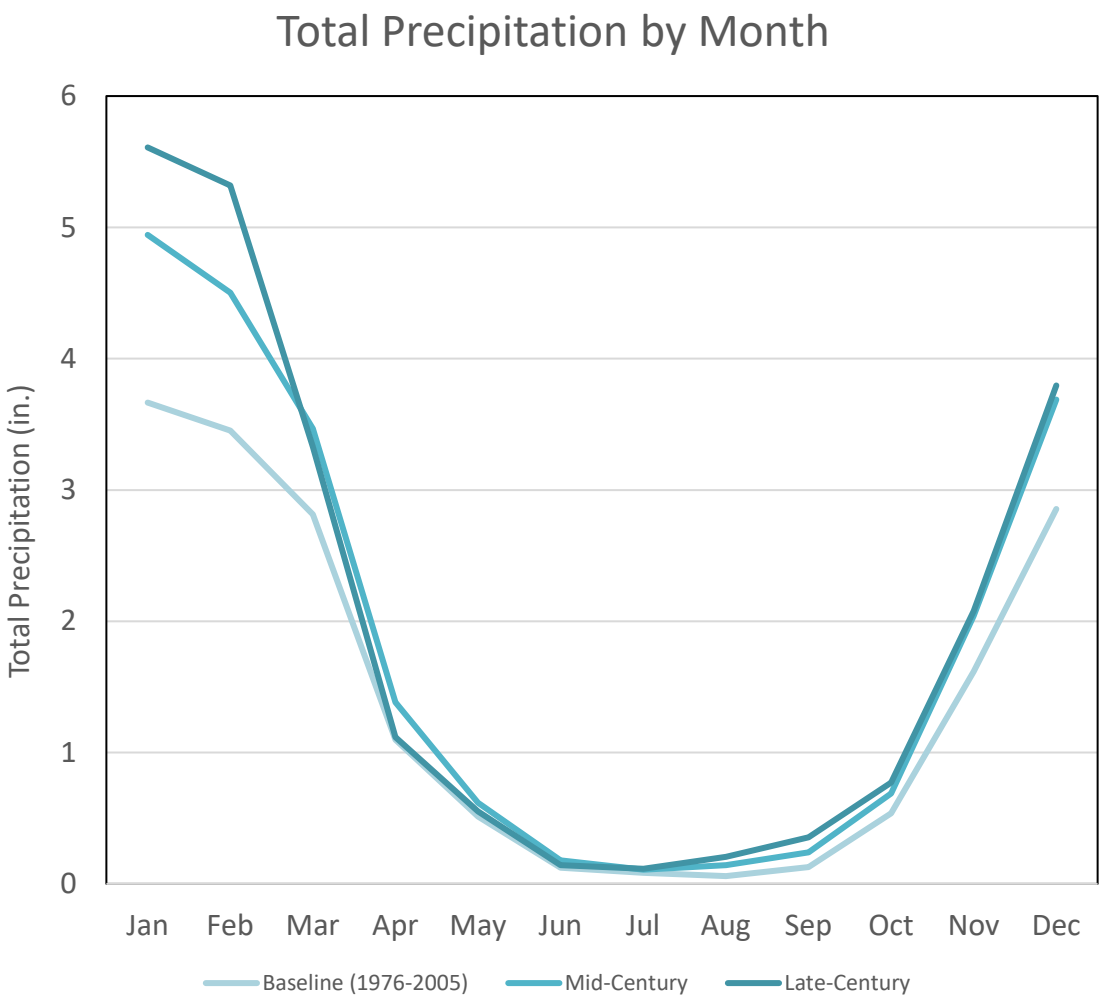
Facility Overview

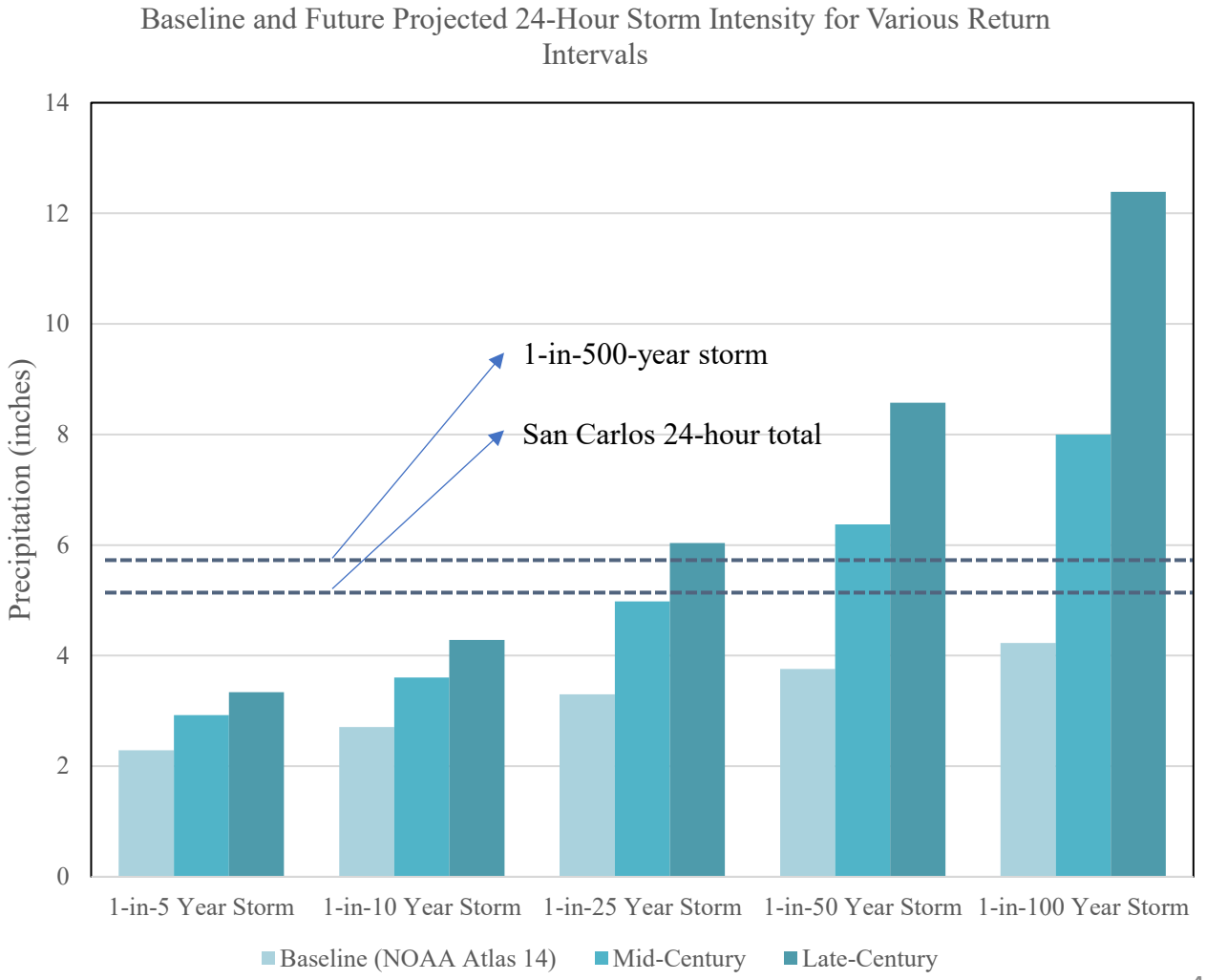
- Bay Road Holdings LLC (formerly Romic Environmental Technologies Corporation) is in East Palo Alto, CA
- The site was a hazardous waste management facility from 1964 to 2007
- Primary contaminants are VOCs





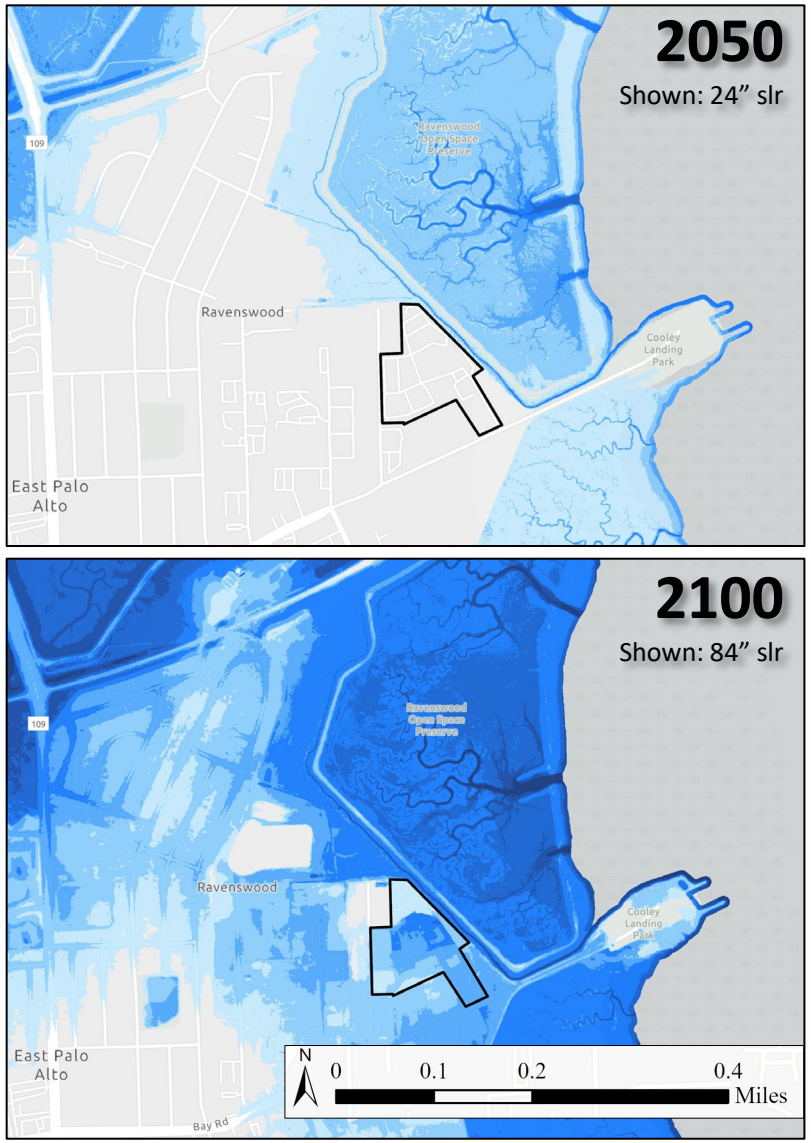
Climate & Natural Hazard Exposure: Precipitation





Climate & Natural Hazard Exposure: Coastal Flooding

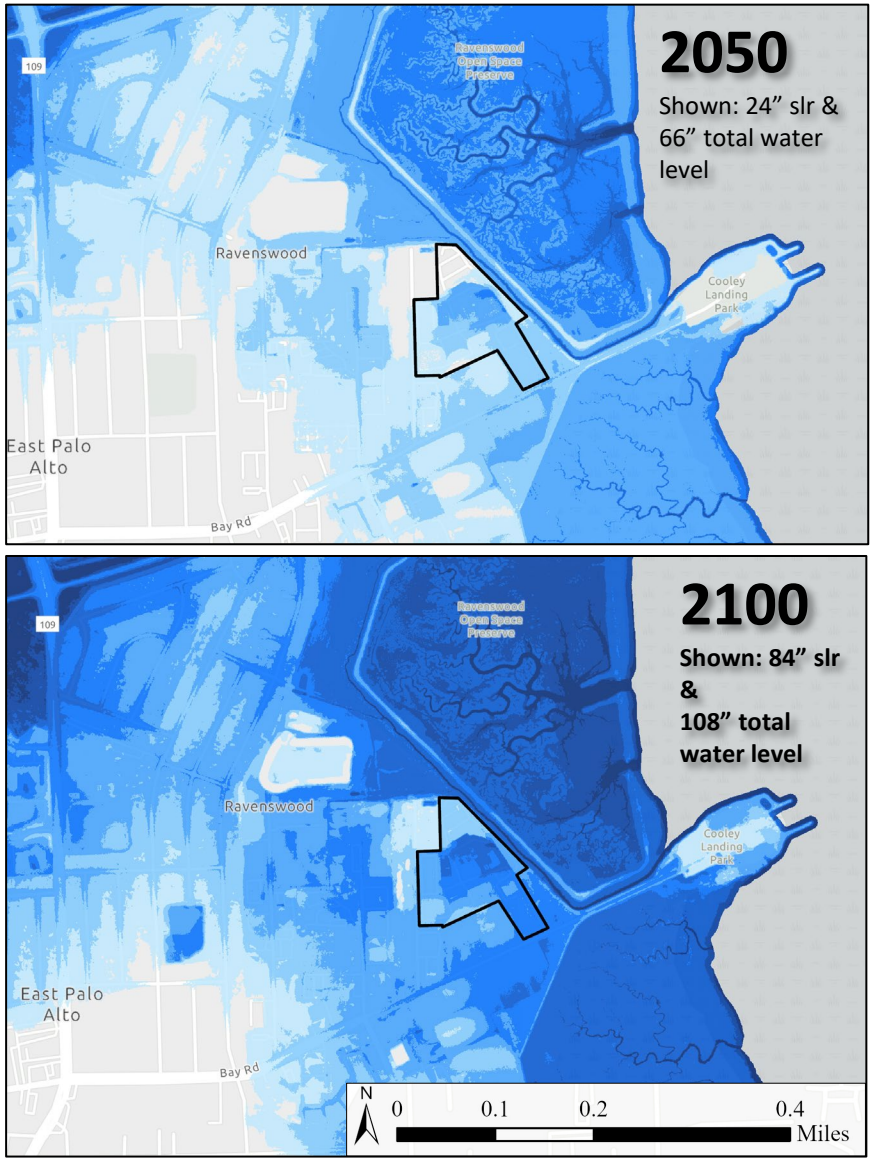
Sea level rise (SLR)



Depth of flooding (ft)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- > 12

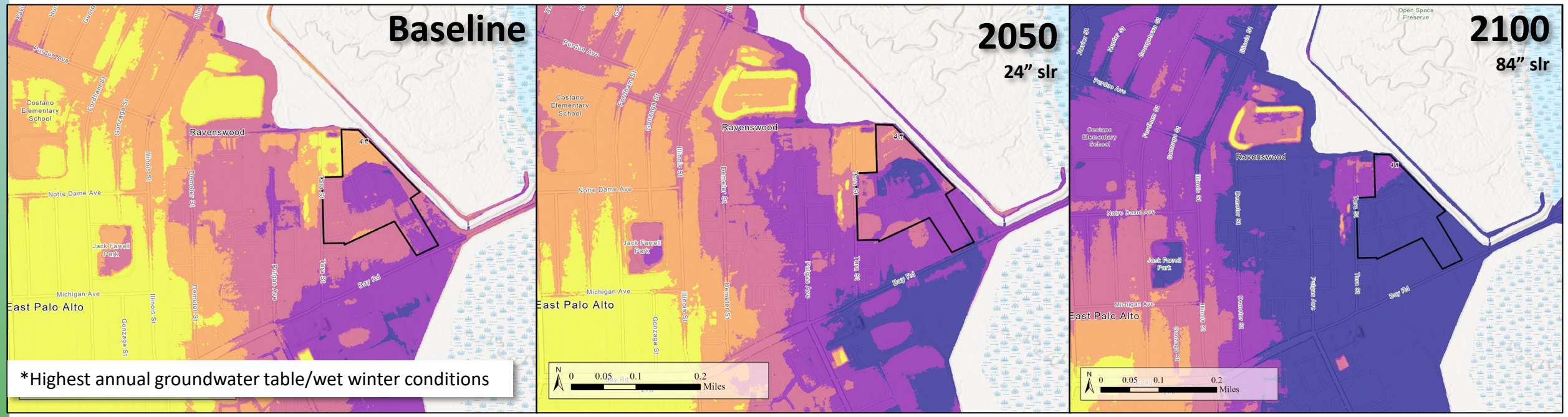
Storm Surge with SLR



Climate & Natural Hazard Exposure: Groundwater

- Sea level rise is expected to increase groundwater shoaling and emergence, pushing water closer to the surface.

Depth to Water (ft)
- < 0 (Emergent)
- 0 - 3
- 3 - 6
- 6 - 9
- > 9



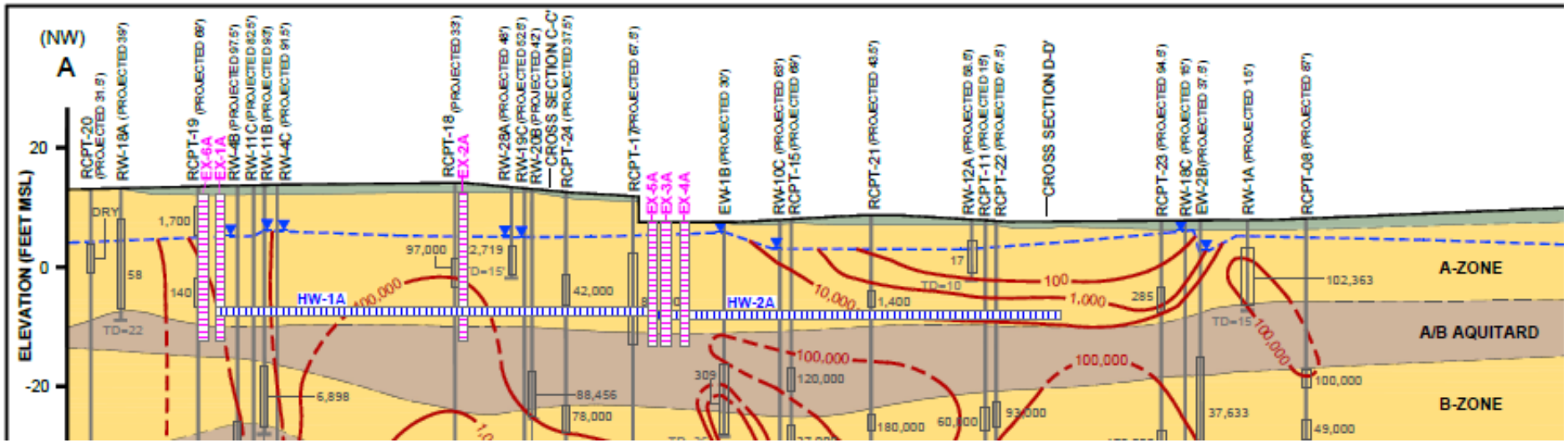
*Highest annual groundwater table/wet winter conditions

Current Cleanup

- Site-wide concrete cap
- Source removal - LNAPL removal and soil excavation
- Groundwater treatment
- BioBarrier
- Monitored Natural Attenuation (MNA)
- Long-term monitoring
- Administrative Controls

Vulnerabilities and Adaptation Measures

- Groundwater Remedy
  - Vulnerabilities: Saltwater intrusion due to SLR; increased salinity and sulfate concentrations may impact biological treatment of chlorinated solvents
  - Adaptation measures:
    - Maintain robust groundwater monitoring to identify changing conditions
    - Consider aggressive remedial approach to cleanup site before site conditions change



Vulnerabilities and Adaptation Measures

- Existing Cap
  - Vulnerabilities:
    - Flooding from SLR and increases in extreme precipitation events
    - Rising groundwater levels
  - Adaptation measures:
    - San Francisco Bay floodwall
    - Stormwater drainage
- Site Reuse
  - Vulnerabilities: SLR, rising groundwater (if LNAPL remains)
  - Adaptation measures: San Francisco Bay floodwall, Vapor Intrusion mitigation (if LNAPL remains)

Next Steps for Climate Adaptation

- CVA report shared with the site's responsible party
- Initiated third party Optimization
  - 3DVA of groundwater plume
  - Evaluation of current remedy
  - Concluded that the current system is unlikely to result in cleanup goals achieved in reasonable timeframe
- CVA and Optimization results have spurred additional action; responsible party exploring new remedial alternatives

Climate Resilience Strategies

Strategies for Addressing Climate & Natural Hazard Vulnerabilities

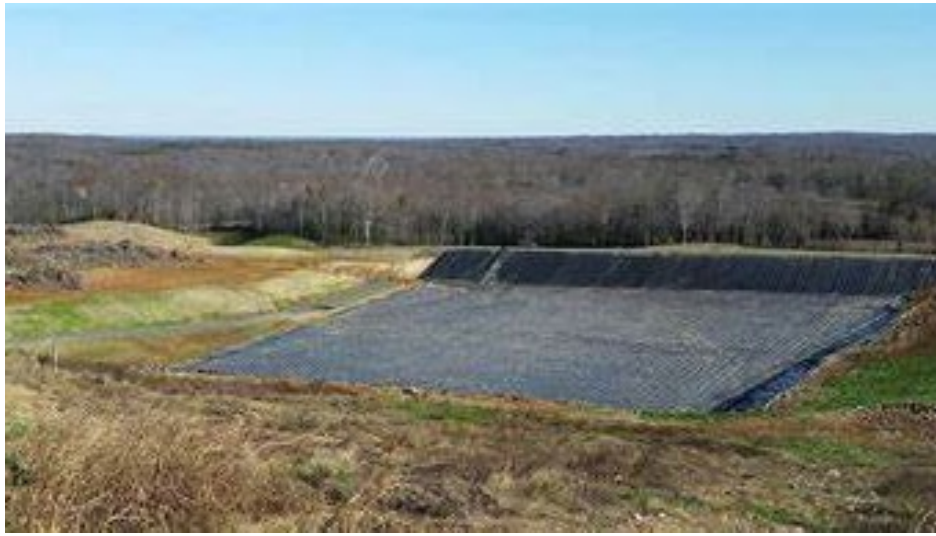
- RCRA permitted facilities and hazardous waste cleanups are designed to be resilient to existing climate conditions and extreme weather events.
- Existing measures incorporated into permits or remedies may already provide sufficient adaptive capacity to the identified vulnerabilities.
- A CVA should identify existing resilience measures and provide considerations to improve adaptive capacity as necessary for the identified vulnerabilities.

Strategies to Address Vulnerabilities of a Facility or Remedy: Groundwater Systems

- Expand modeling techniques to understand how future climate change may alter groundwater flow.
- Implement drainage layers and stormwater controls that can collect/remove excess water following extreme precipitation events and prevent additional infiltration.
- Relocate or fortify critical components of groundwater treatment systems away from highly vulnerable areas
- Implement flexible and adaptive monitoring programs approaches to accommodate changing site conditions.
- Develop preparedness plans for extreme weather events and implement remote shutoff capabilities for treatment system components.

Strategies to Address Vulnerabilities of a Facility or Remedy: Hazardous Waste Containment

- Use native species for vegetative layers on top of covers/caps that are resilient to extreme temperatures and precipitation and develop monitoring/maintenance plans for vegetation.
- Consider projected groundwater table rise when designing new subterranean containment systems or monitoring of existing landfills.
- Construct or move vulnerable containment units outside of future floodplains.
- For remedies or units near the coast, implement hard or nature-based armoring techniques to reduce erosion.
- Construct retaining walls to stabilize areas with steep slopes.
- Implement stormwater controls that can reduce surface runoff following extreme precipitation events, such as vegetated swales, dams, or pervious pavement.



Strategies to Address Vulnerabilities of a Facility or Remedy: Contaminated Sediment

- For remedies on the coast, implement armoring around caps to reduce flooding and storm surge impacts, such as scouring.
- Expand modeling techniques to consider how future extreme events may increase the potential for resuspension of contaminated material.
- Implement gray and nature-based techniques along banks/shorelines and in floodplains to reduce both coastal and inland flooding.
- Implement stormwater controls to help collect and divert floodwater
- Develop plans that require the inspection of subaqueous caps after a storm surge event.

Activity

Develop a list of strategies to reduce flooding and storm impacts.

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Safety-Kleen, Climate Resiliency and Other Disasters Case Study

By Mark Dennen and Yan Li

RIDEM/ Office of Land Revitalization and Sustainable Materials Management

Safety-Kleen Facility

- Operated under several names since the 1970s
- TSDF located in Cranston, RI
- Permitted for trans-shipment of solvent waste, paint and other wastes
- Oil filter crushing and recycling
- Recycling of antifreeze
- Stabilization of non-hazardous contaminated soils

Overview of Facility

Flood of 2010

- 500-year flood
- Pawtuxet River rose to flood Interstate 95, malls and many businesses
- Many heating oil tanks, product tanks and septage systems flooded
- Safety-Kleen Facility was flooded

Facility Action Prior to Flood

- Based on reports, Facility contacted us in advance to:
  - Close Facility to incoming waste
  - Ship out as much as possible
  - Move waste from Building A and B to another building that was not permitted to that volume and type of waste
- We allowed this temporary storage as a variance due to the anticipated emergency

Building A and B during normal conditions

T packs stacked 2 high

Waste stored 3 drums high

During Flood

- Building A was extensively flooded
- No waste was released from Safety-Kleen facility
- 30+ years of manifests were destroyed
- No structural damage to building

Actions Taken as a Result of Flood

- Contingency plan contained the following flood mitigation measures:
  - Put sandbags around building, doors
  - Tied down tanks to prevent them from being lifted

- Contingency Plan modified:
  - Move waste out of Building A and C to building on higher ground if floods are immanent

E-Waste Fire of 2022

Timeline of Events November 2022

- Tuesday 11/1/2022: Trailer 6287 arrives at SK Facility
- Contains:
  - Flammable liquids
  - Flammable solids
  - Alkali liquids
  - Toxic liquids, pyridine, chlorobenzotrifluorides, ammonia
  - Acids
  - Oil filters
  - Aerosols
  - **Non RCRA Waste Electronics (e-waste) from retail collection**
  - Paint

Timeline continued

- 6:00 AM: Facility personnel identify fire during inspection
- 6:10 AM: Emergency Coordinator called
- 6:24 AM: Cranston Fire Dept arrives on-scene, DEM notified
- 7:00 AM: Stormwater inlet closed to prevent runoff
- 7:10 AM: Trailer moved to central area to isolate
- 9:05 AM: Deployment of non-PFAS fire fighting foam (part of a green foam program by DEM)
- 10:00 AM: Deployment of additional booms to prevent runoff
- 12:56 PM: Fire is Extinguished


C.T.H.W.112
1263
NJDEPE07259
NJDEPE16666
MA172
RI387
DE-HW-330
DE-SW-330
TNH-0014
NYMA006

Cleanup

- 3 roll-offs of charred debris, metal and PPE
- 2 Vac Trucks
- November 4: normal operations resumed
- No damage to operations and equipment within the building

Facility Permit Review

- Fire happened just after close of public comment period for facility renewal of permit
- Significant public comment prior to event about concerns with contingency planning
- Most public concern about flooding in 2010 although Department review found no releases from facility
- The timing of permit review meant the Dept. needed to carefully review incident and contingency planning

What Went Right

- Immediate Notification and Activation of Contingency Plan
- Emergency Coordinator lived nearby and was there within a few minutes
- Storm water shutoff enabled runoff to be contained and treated
- Moving trailer prevented other trailers from becoming involved
- Additional deployment of berms also protected surface water

Permit Changes Related to Fire

Onsite meeting 1/11/23 with RIDEM, Fire Dept. and Facility to improve contingency plan

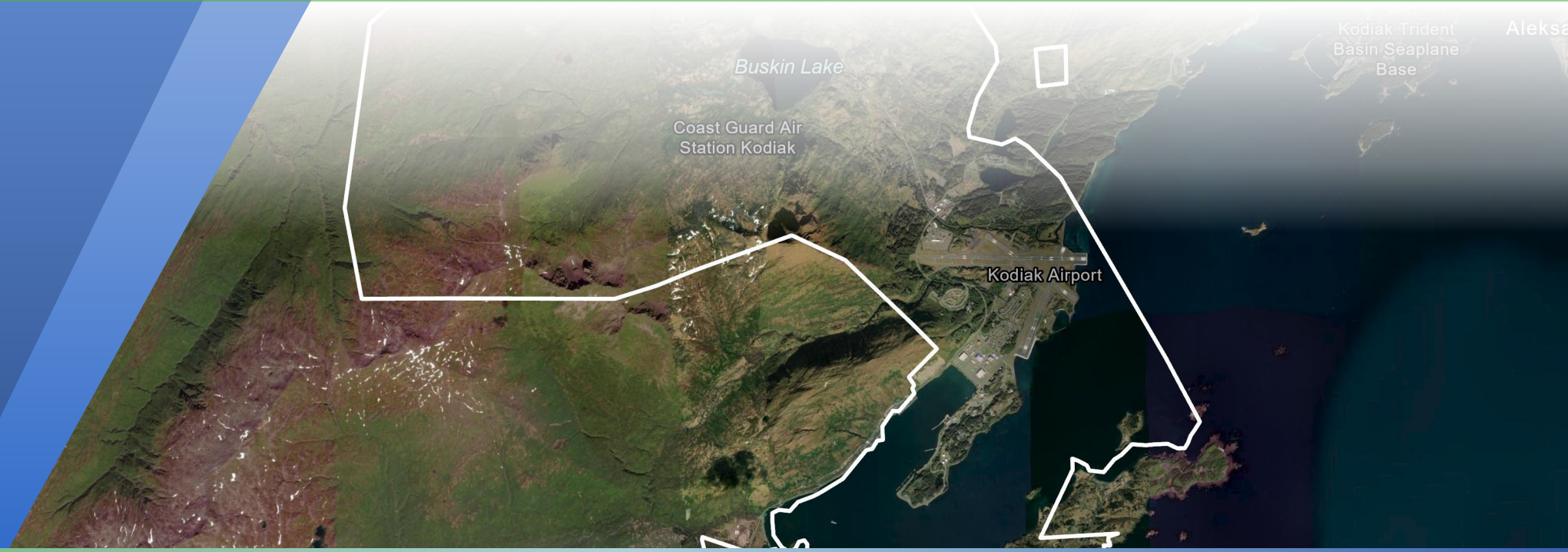
- Met with Fire Department onsite in Jan. 2023
- Need to expand and increase the existing asphalt containment berm to provide more protection against runoff to the river in the event of a fire. Plans were required with permit, construction within 4 months of permit issuance.
- E-waste trailers needs to be stored at locations that allow easier access for in the event of emergency. This modification was required within four months of receiving this permit.

Contingency Plans are Great But….

Contingency Does Not Prevent Poor Waste Handling

- Uncovered roll-offs containing crushed waste oil filters
- Traced back due to oil sheen in river
- Resulted in enforcement action

BSU Kodiak CVA Case Study

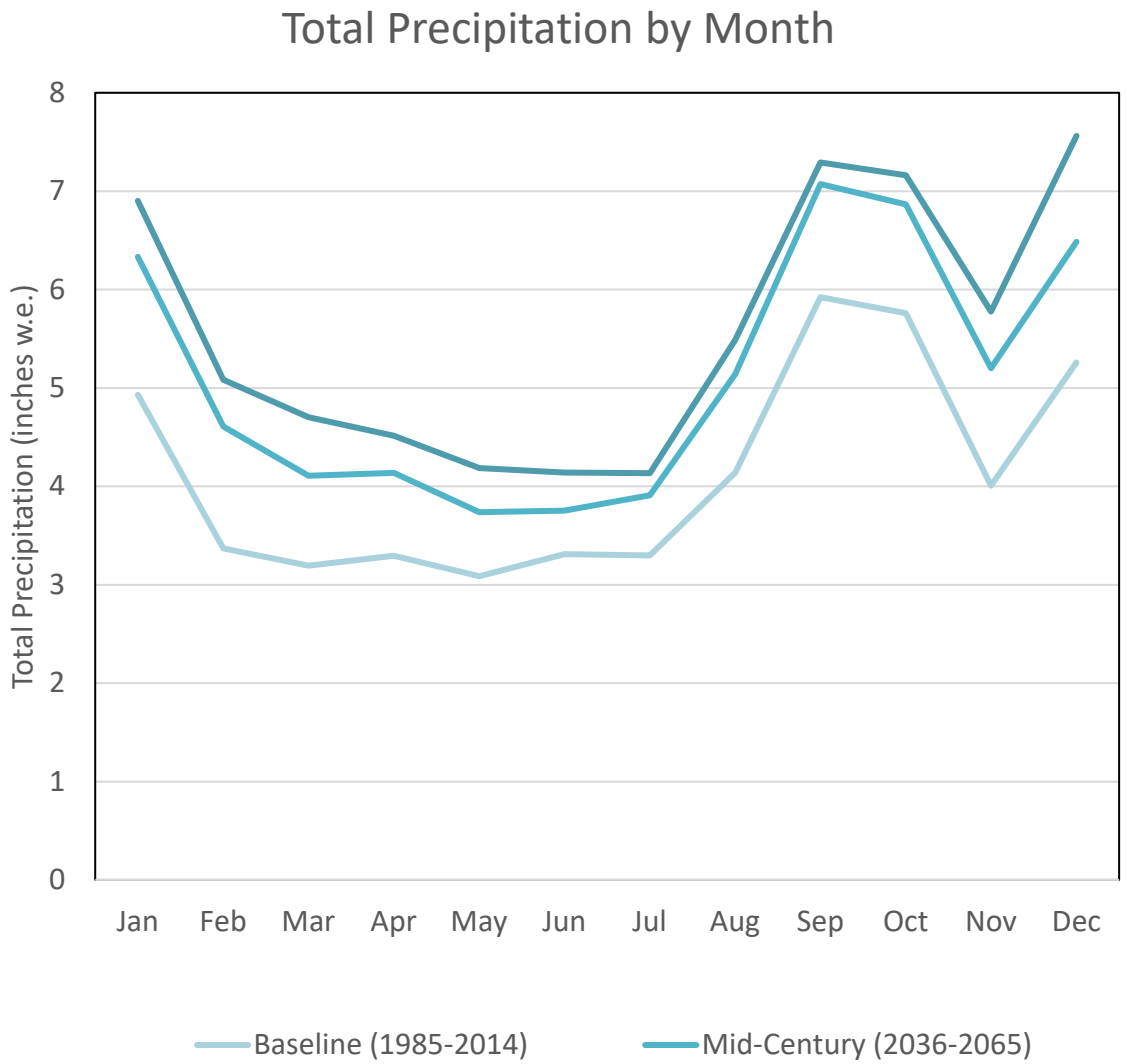


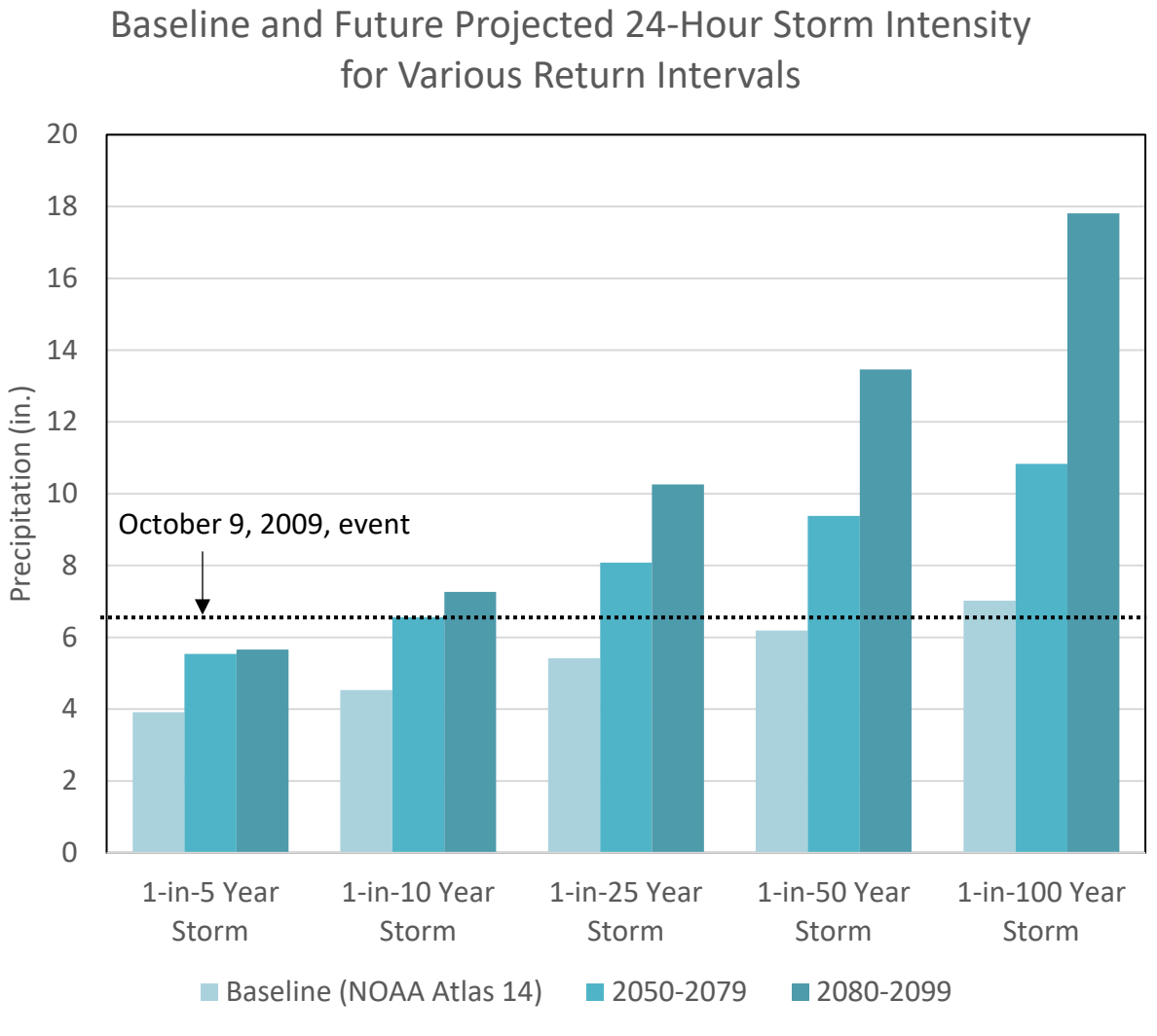
Facility Overview

- U.S. Coast Guard Base Kodiak is located in Kodiak, Kodiak Island, AK
- RCRA permitted facility, with 37 SWMUs at various stages of the hazardous waste cleanup process.
- The 23,000-acre facility includes much of the Buskin River Valley, is adjacent to Women's Bay
- Facility contains and borders Tribal lands and subsistence use areas. EPA plans to involve Tribes in development of future adaptation measures

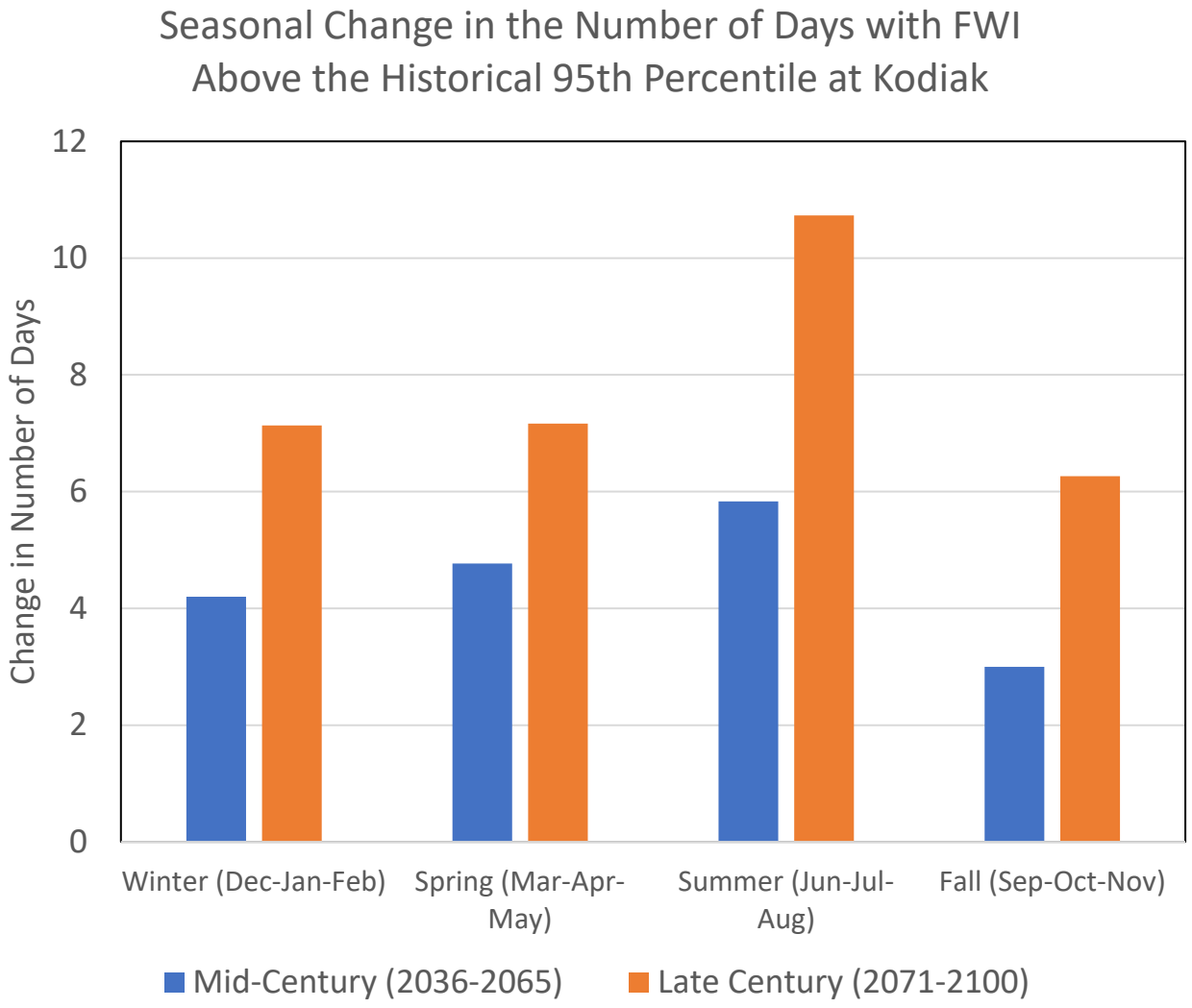
Site boundary shows the general area of the facility. BSU Kodiak consists of 37 Solid Waste Management Units.

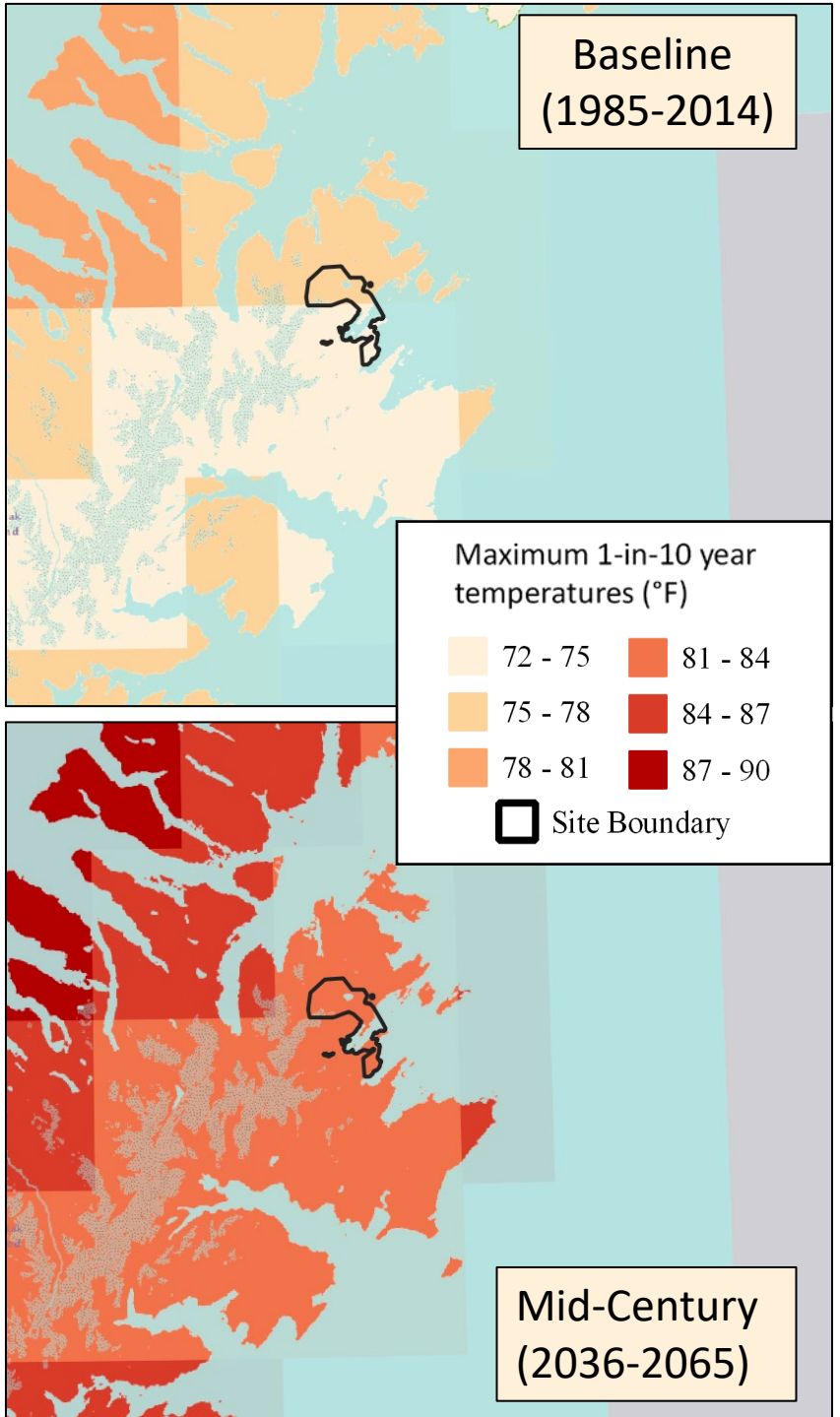
Climate Exposure: Precipitation





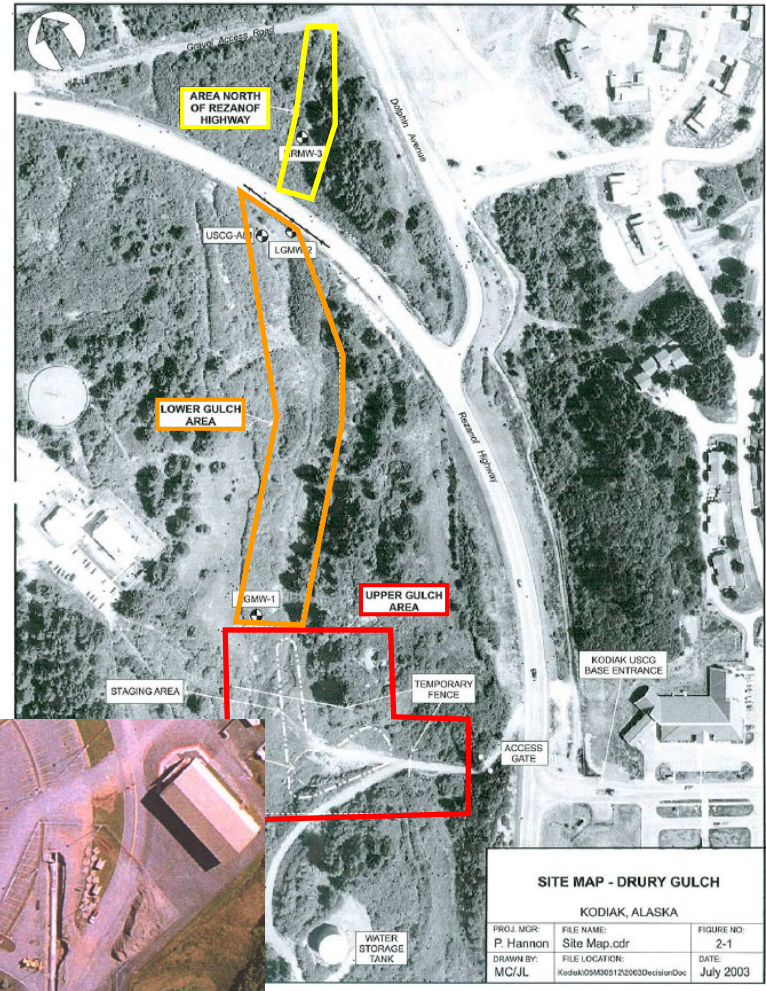
Climate Exposure: Temperature and Wildfire

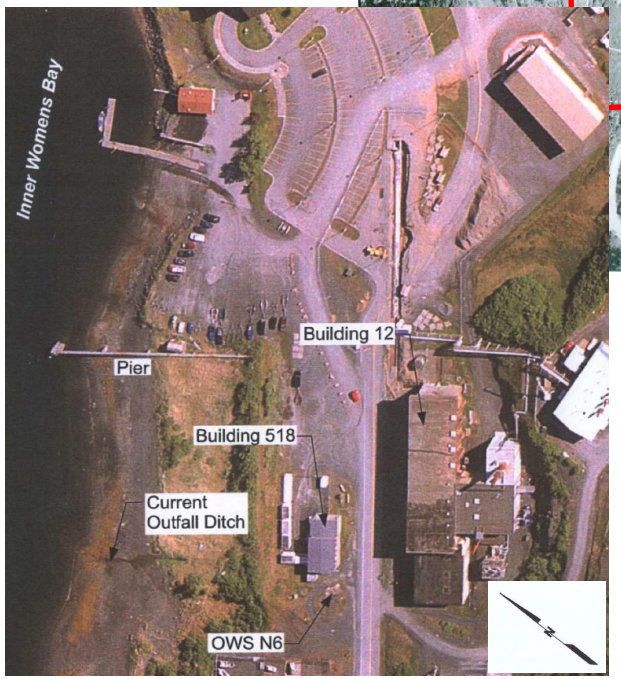




Vulnerabilities and Adaptation Measures

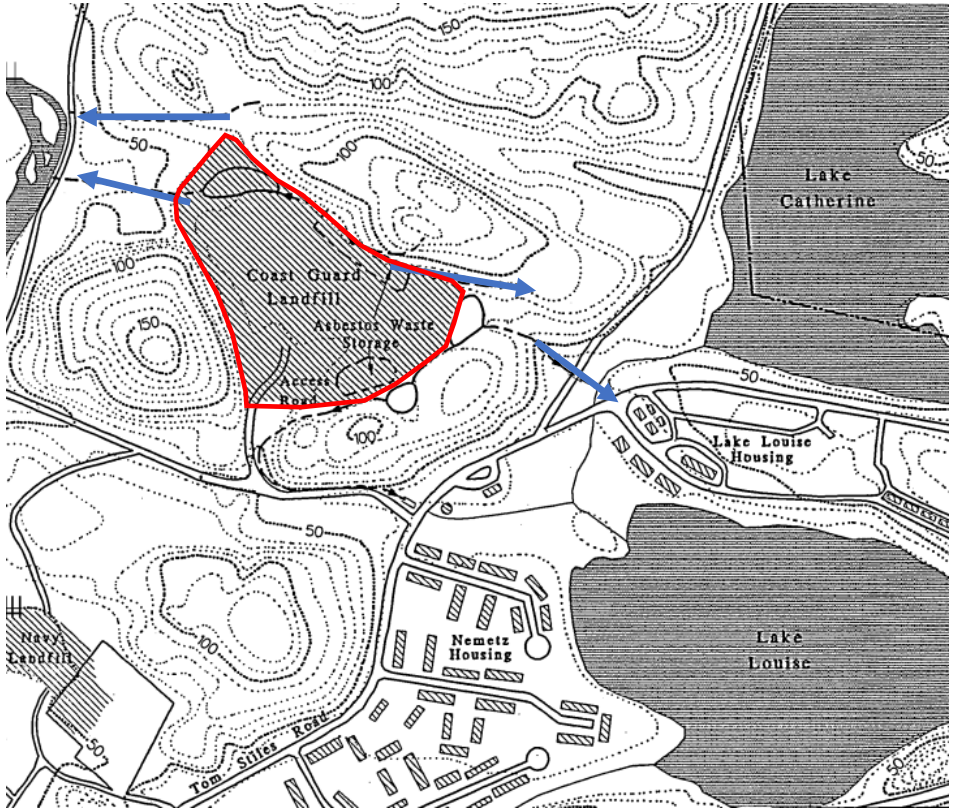
- Site 18: Drury Gulch
  - PCB-contaminated soil, surface water and groundwater
  - Vulnerabilities: changes in precipitation, increased temperatures and temperature fluctuations
  - Adaptation measures:
    - Require post-storm even inspections, future improvements
    - Maintain vegetation to reduce wildfires threat
- Site 23: Old Power Plant
  - PCB contaminated soil, asphalt cap
  - Vulnerabilities: Increased precipitation, extreme precipitation events, increased temperatures and increased temperature fluctuations
  - Adaptation measures:
    - Continued cap inspections, monitoring of groundwater elevations and contaminant concentrations
    - Armoring of cap
    - Incorporation of climate change data when evaluating remedial alternatives





Vulnerabilities and Adaptation Measures

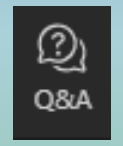
- Site Landfills
  - Closed landfills, leachate collection system, surface water and groundwater diversion systems
  - Metals- and VOC-contaminated groundwater, surface water and sediment
  - Vulnerabilities:
    - Changes in precipitation
    - Extreme precipitation events
  - Adaptation measures:
    - Require post-storm even inspections of cover and diversion ditches, future improvements
    - Monitoring of groundwater elevation and contaminant concentrations
    - Evaluation of stormwater sewer capacity
    - Maintain vegetation to reduce wildfires threat



Next Steps for Climate Adaptation

- CVA report provided to the U.S. Coast Guard
- In process of modifying the RCRA Permit to require site-specific vulnerability assessments for SWMUs where waste remains in place, and propose adaptation measures
- EPA and the Coast Guard plan to involve their Tribal partners in developing detailed, SWMU-specific vulnerability assessments and adaptation measures

Any Questions?

Use the Q&A button in Teams 

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Reflections and Closing Remarks

Additional Tools and Resources

Climate Exposure Tools:

- Climate Mapping for Resilience and Adaptation (CMRA) Assessment Tool
- Climate Toolbox, Climate Mapper
- EPA National RCRA and PCB Climate Hazard Screening Tool
- FEMA National Flood Hazard Layer
- NASA Interagency Sea Level Rise Scenario Tool
- NASA Landslide Susceptibility Map
- NOAA Historical Hurricane Tracks
- NOAA Sea Level Rise Viewer
- NOAA Sea, Lake and Overland Surges from Hurricanes (SLOSH) model
- U.S. Climate Resilience Toolkit, Climate Explorer
- USGS Costal Storm Modeling System (CosMos)
- USGS Our Coast, Our Future

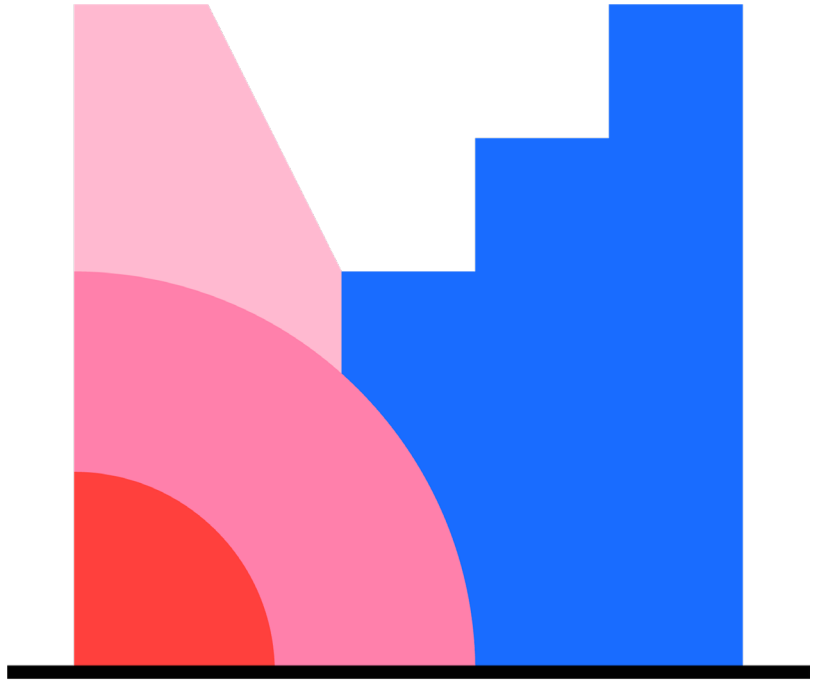
Additional Tools and Resources

Other Climate Vulnerability and Adaptation Resources:

- Upcoming Issue Paper: Conducting Climate Screenings and Climate Vulnerability Assessments at RCRA Facilities
- EPA Climate Change, Land and Emergency Management
- EPA Assessing Your Project's Climate Risk: A Worksheet for Applicants and Technical Assistance Providers
- EPA SEGS: OLEM Programs Climate Screenings and Vulnerability Assessments
- EPA Handbook on Indicators of Community Vulnerability to Extreme Events: Considering Sites and Waste Management Facilities
- EPA Climate Data Geoplatform
- EPA EJScreen Environmental Justice Screening and Mapping Tool (Version 2.3)
- EPA 2024-2027 Climate Adaptation Plan
- EPA Superfund Climate Resilience website, including climate adaptation profiles and technical factsheets
- Interstate Technology and Regulatory Council (ITRC) Sustainable Resilient Remediation

Reflections

- What are you going to take away from this training?
- What topics would you like to see in future trainings?



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Thank you!

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