

EPA Federal Facilities Superfund Program – RPM Bulletin 2023-01
Considerations for Climate Resilience in the CERCLA Process

14 February 2023

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1. Purpose

EPA’s Federal Facilities Restoration and Reuse Office (FFRRO) is developing a series of documents (“Remedial Project Manager (RPM) Bulletins”) which summarize issues that arise during work on federal facility National Priorities List (NPL) sites and propose a path forward to resolution. The bulletins are designed for rapid communication across regions and to promote consistent interpretation and implementation of issues of importance. The recommendations include suggestions for how to consider the issue or challenge based on existing guidance, requirements, and flexibilities. The RPM Bulletin represents a coordinated consensus on FFRRO’s approach to addressing issues and challenges and helps RPMs and technical support staff provide a consistent response across regions. These bulletins are not intended to create new or revise existing policy and/or guidance.

The purpose of this RPM Bulletin is to address climate resilience at NPL Federal Facility Sites. This bulletin presents current EPA guidance and policies that consider climate resilience in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedy selection and implementation process at federal facilities; the current guidance and policies from other federal agencies which consider climate resilience at their sites; regional climate change tools and products; and best management practices for incorporating climate resilience into CERCLA remedies. Climate science and terminology are covered in other documents and trainings provided by EPA. More information on these topics can be found at <https://www.epa.gov/climate-change>.

2. Existing Guidance

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- Executive Order 12580: Superfund Implementation
- Executive Order 14082: Implementation of the Energy and Infrastructure Provisions of the Inflation Reduction Act of 2022
- 2001 Comprehensive Five-year Review Guidance
- 2012 Memorandum: Clarifying the Use of Protectiveness Determinations for CERCLA Five-Year Reviews
- 2016 Five-year Review Recommended Template

3. Summary

Extreme weather events, including hurricanes, drought, wildfires and floods, which are exacerbated by climate change, can impact CERCLA actions at federal facilities. These climate-related events are not considered to be “new criteria” under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). However, since these events and climate change more broadly may impact overall protection of human health and the environment as well as the remedy’s timeline and performance, they must be considered during the remedy selection process and in five-year reviews. In partnership with other state and federal agencies, EPA has created tools to evaluate the impacts that climate change may have on a site. This bulletin presents some of these tools along with other agencies’ plans and strategies to incorporate climate change into their site operations.

4. Background

CERCLA Section 120 states that federal facilities shall comply with CERCLA “in the same manner and to the same extent, both procedurally and substantively, as any nongovernmental entity.” EPA maintains oversight responsibilities at these sites. Consistent with CERCLA, the NCP, and Executive Order 12580, EPA’s oversight must ensure that actions taken at the site protect human health and the environment with respect to releases of hazardous substances, pollutants or contaminants. Extreme weather events and changing climate conditions may impact the long-term integrity of response actions. The existing Superfund response selection and implementation process provides a basis to consider potential extreme weather impacts and to act, as warranted, to increase remedy resilience. As such, the consideration of climate resilience may be relevant to the following criteria under 40 CFR §300.430(e)(9)(iii):

(A)Threshold criteria: Overall protection of human health and the environment

(B)Primary balancing criteria:

- Long-term effectiveness and permanence;

- Reduction of toxicity, mobility or volume through treatment;
- Short-term effectiveness; and
- Implementability.

Thus, the Lead Agency at federal facility sites should consider climate change impacts in remedy selection as well as remedy modifications (i.e., in Record of Decision Amendments and Explanations of Significant Difference). In instances where remedial actions have already been selected but not yet implemented, the remedial design phase may also provide an opportunity to consider potential site and remediation system vulnerabilities and identify adaptation measures to help maximize climate resilience. For remedial actions under construction or those already in place, five-year reviews may provide opportunities to evaluate remedy protectiveness by considering new information including changes in intensity, frequency or duration of extreme weather events, groundwater level and quality changes due to drought or flooding, and other climate change impacts.

Gradual climate-related changes may pose additional risks to sites and should be considered in assessing vulnerabilities. These changes may include sea level rise, seasonal changes in precipitation or temperatures, increasing risk of floods, increasing intensity and frequency of hurricanes and wildfires, and melting of permafrost in northern regions.

5. Tools

The tools listed below have been developed by various federal agencies, some in partnership with universities, to analyze various potential impacts of climate change. The list of tools below is intended to help RPMs conduct assessments of federally owned Superfund sites and inform decision-making. Some of the listed tools may also be useful in informing site reuses that increase resiliency from climate change impacts or in identifying remediated federal facilities for potential reuses that support lower carbon footprint energy production, distribution and use. Note that no one tool will provide a “right” answer, and each should be used in conjunction with other data and observations to provide a path forward. Additionally, states and local agencies may maintain tools or databases that can provide historical data or monitor conditions in real time. It may be beneficial for RPMs to seek out these tools, and use them, with discretion, to evaluate site conditions dynamically.

5.1 Tools for Risk Assessments

- AirNow Fire and Smoke Map
 - <https://fire.airnow.gov/#>
 - The AirNow Fire and Smoke Map provides information to help protect human health from wildfire smoke. Use this map to see current particle pollution air quality information for a specific location; fire locations and smoke plumes; Smoke Forecast Outlooks, where available; and

recommendations for actions to protect from smoke. These recommendations were developed by agency experts in air quality and health.

- Climate Mapping for Resilience and Adaptation (CMRA)
 - <https://resilience.climate.gov/>
 - CMRA integrates information from across the federal government to help users consider their local exposure to climate-related hazards. Those working in community organizations or for local, Tribal, state, or Federal governments can use the site to help develop equitable climate resilience plans to protect people, property, and infrastructure. The site also points users to Federal grant funds for climate resilience projects including those available through the Infrastructure Investment and Jobs Act (formerly the Bipartisan Infrastructure Law).
- Climate Resilience Evaluation and Awareness Tool (CREAT) Risk Assessment Application for Water Utilities
 - <https://www.epa.gov/crwu/climate-resilience-evaluation-and-awareness-tool-creat-risk-assessment-application-water>
 - CREAT assists water sector utilities in assessing climate-related risks to utility assets and operations. Throughout CREAT's five modules, users consider climate impacts and identify adaptation options to increase resilience. The modules cover Climate Awareness, Scenario Development, Consequences and Assets, Adaptation Planning, and Risk Assessment.
- Coastal Storm Modeling System (CoSMoS)
 - <https://www.usgs.gov/centers/pcmssc/science/coastal-storm-modeling-system-cosmos>
 - CoSMoS makes detailed predictions of storm-induced coastal flooding, erosion, and cliff failures over large geographic scales. CoSMoS was developed for hindcast studies, operational applications and future climate scenarios to provide emergency responders and coastal planners with critical storm-hazards information that can be used to increase public safety, mitigate physical damages, and more effectively manage and allocate resources within complex coastal settings.
- Drought Map
 - <https://droughtmonitor.unl.edu/Data.aspx>
 - The U.S. Drought Monitor map, released every Thursday, shows areas of the U.S. that are currently experiencing drought. The map uses five classifications: abnormally dry (D0), showing areas that may be going into or are coming out of drought, and four levels of drought: moderate (D1), severe (D2), extreme (D3) and exceptional (D4).

- EJSscreen
 - <https://ejscreen.epa.gov/mapper/>
 - EJSscreen is an environmental justice mapping and screening tool that provides EPA with a nationally consistent dataset and approach for combining environmental and demographic indicators. Most recently updated in 2022, EJSscreen provides demographic and environmental information for a specific selected geographic area.
- FEMA Flood Map Service Center
 - <https://msc.fema.gov/portal/home>
 - The FEMA Flood Map Service Center (MSC) is the official public source for flood hazard information produced in support of the National Flood Insurance Program (NFIP). Use the MSC to find official flood maps and access a range of flood hazard products and tools for better understanding flood risk.
- National Water Dashboard
 - <https://dashboard.waterdata.usgs.gov>
 - The interactive National Water Dashboard from the U.S. Geological Survey provides water, weather, and flood information all in one place. This map includes real-time data, updated every minute, for over 13,000 USGS stream, lake, reservoir, precipitation, water quality, and groundwater stations in context with current weather and hazard conditions.
- Regionalized Sea Level Change & Extreme Water Level Scenarios
 - <https://drsl.serdp-estcp.org/>
 - The Department of Defense's Environmental Research Programs offer a publicly available version of the DoD Regional Sea Level (DRSL) database. The database provides regionalized sea level scenarios for three future time horizons (2035, 2065, and 2100) for 1,774 DoD sites worldwide. These scenarios enable a decision-maker to add temporal and physically-based information to assess future vulnerabilities to compare against the baseline assessments.
- Sea Level Rise Viewer
 - <https://coast.noaa.gov/slr/>
 - This map viewer provides federal, state, and local coastal resource managers and planners with a preliminary look at potential sea level rise and coastal flooding impacts. The viewer is a screening-level tool that uses best-available, nationally consistent data sets and analyses. Data and maps provided can be used at several scales to help estimate impacts and prioritize actions for different scenarios.

5.2 Tools for Renewable Energy Development

- Energy Zones Mapping Tool
 - <https://ezmt.anl.gov/>
 - The Energy Zones Mapping Tool is a free online mapping tool to identify potential energy resource areas and energy corridors in the United States.
- Marine Cadastre
 - <https://marinecadastre.gov/>
 - With over 300 data layers from numerous sources, MarineCadastre.gov is one of the premier sources for authoritative ocean data and tools. A cooperative effort between the Bureau of Ocean Energy Management (BOEM) and the National Oceanic and Atmospheric Administration (NOAA), MarineCadastre.gov works closely with national, regional, and state partners to develop and provide direct access to the best-available data and tools to meet the growing needs of the blue economy.
- RE-Powering America's Lands Mapper
 - <https://www.epa.gov/re-powering/how-identify-sites#looking>
 - EPA's RE-Powering Mapper is an interactive web application which allows users to identify contaminated lands, landfills and mine sites that have potential for renewable energy development.

6. Regional Climate Change Guidance Documents:

Some EPA Regions have created templates and guidance for their staff to incorporate the impacts of climate change into the CERCLA process. Sharing these documents across all regions can facilitate consistency and avoid the duplication of efforts.

- Region 1
 - Five Year Review Guidance Template – see Attachment 1
- Region 2
 - Climate Change Five Year Review Guidance – see Attachment 2

7. Other Federal Agency Documents and Policies

As federal facility Superfund sites are owned by other federal agencies, those agencies' policies and regulations may impact the RPM's depth of consideration of climate impacts at the site. Below is a list of other federal agency (OFA) climate policies which may be relevant on a site-to-site basis. Some OFAs are conducting site-specific climate vulnerability assessments. These assessments, as well as information on updates to these OFA policies including supplemental policies specific to agency cleanup programs, will be included in future bulletins when they become available.

Federal Agency	Publication	Publication Date	Link
Department of Agriculture	<i>Action Plan for Climate Adaptation and Resilience</i>	2021	https://www.sustainability.gov/pdfs/usda-2021-cap.pdf
Department of Defense	<i>Climate Adaptation Plan</i>	2021	https://media.defense.gov/2021/Oct/07/2002869699/-1/-1/0/DEPARTMENT-OF-DEFENSE-CLIMATE-ADAPTATION-PLAN-2.PDF
DOD – Air Force	<i>Climate Action Plan</i>	2022	https://www.safie.hq.af.mil/Portals/78/documents/Climate/DAF%20Climate%20Action%20Plan%20-%20FINAL%20Oct%202022.pdf
DOD – Army	<i>Climate Strategy</i>	2022	https://www.army.mil/e2/downloads/rv7/about/2022_army_climate_strategy.pdf
DOD – Army	<i>Climate Strategy Implementation Plan FY 2023-2027</i>	2022	https://www.army.mil/e2/downloads/rv7/about/2022_Army_Climate_Strategy_Implementation_Plan_FY23-FY27.pdf
DOD – US Army Corps	<i>Climate Action Plan</i>	2021	https://www.sustainability.gov/pdfs/usace-2021-cap.pdf
DOD – Navy	<i>Climate Action 2030</i>	2022	https://www.navy.mil/Portals/1/Documents/Department%20of%20the%20Navy%20Climate%20Action%202030.pdf
Department of Energy	<i>2021 Climate Adaptation and Resilience Plan</i>	2021	https://www.energy.gov/sites/default/files/2021-09/DOEClimateAdaptationandResiliencePlanSept21.pdf
Department of the Interior	<i>Climate Action Plan</i>	2021	https://www.sustainability.gov/pdfs/doi-2021-cap.pdf
Department of Transportation	<i>Climate Action Plan</i>	2021	https://www.sustainability.gov/pdfs/dot-2021-cap.pdf
Department of Veterans Affairs	<i>Climate Action Plan</i>	2021	https://www.energy.va.gov/docs/va-climate-action-plan.pdf
National Aeronautics and Space Administration	<i>Climate Action Plan</i>	2021	https://www.sustainability.gov/pdfs/nasa-2021-cap.pdf

8. Expectations and Actions:

RPMs are expected to address the potential for site impacts caused by climate change in site remedies and five-year reviews. If these impacts are severe enough to influence the protectiveness of the potential or selected remedy, alterations to the remedy should be considered and implemented.

The impacts of a changing climate cannot be assigned a single, numerical value at this time. The tools in this document can be used to demonstrate the RPM's effort to consider the impacts of climate change. Individual results will vary from site to site.

Climate change considerations are not new criteria under CERCLA and should be incorporated into site remedies and five-year reviews. There are many tools available to help inform RPMs on how federally owned Superfund sites may be impacted by a changing climate and to incorporate more resilient approaches into their CERCLA process.

FFRRO is available to facilitate conversations between RPMs and OFA personnel to alleviate any discrepancies between EPA and OFA guidance and policy.

9. Citations:

United States Code, 2006 Edition, Supplement 4, Title 42 - THE PUBLIC HEALTH AND WELFARE (2010).

U.S. EPA (U.S. Environmental Protection Agency). 2021. Memorandum: OLEM Directive: Consideration of Climate Resilience in the Superfund Cleanup Process for Non-Federal National Priorities List Sites. Office of Land and Emergency Management: Washington, DC. EPA OLEM #9355.1-120. June 30.

10. Attachments:

Attachment 1: Region 1 Climate Change Portion of FYR Template

Attachment 2: Region 2 Climate Change FYR Guidance

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

- **Important Note:** To avoid unnecessary duplication and redundancies, the information included in Question C normally should be different from information which has already been covered in Questions A & B.
- This question normally covers whether there are impacts from natural disasters
- This question should also address site changes or vulnerabilities that may be related to climate change impacts not apparent during remedy selection, remedy implementation or O&M (e.g., sea level rise, changes in precipitation, increasing risk of floods, changes in temperature, increasing intensity of hurricanes and increasing wildfires, melting permafrost in northern regions, etc.).
- Region 1's NPL Vulnerability Assessment mapping tool should be utilized in making potential climate impact evaluations. The online tool is located at: [EPA's GeoPlatform Online](#).

The expected impacts of climate change in New England pose increasing risks to contaminated sites. Increases in air and water temperature, precipitation, flooding, and periods of drought may result in altered fate and transport pathways and exposure assumptions, impaired aquatic habitats, dispersal of contaminants, damage to remediation related structures, and ultimately ineffective remedies. At coastal sites, saltwater impacts made more likely by sea-level rise may cause corrosion of remediation equipment and impair restoration efforts. Increased frequency of extreme weather events may cause damage or releases at sites, impairing remedial efforts where remedies have not been adequately designed to protect against these risks.

Insert either: The risks posed by climate change in New England are not expected to alter the protectiveness of the remedy at the [insert site name] site because [Insert statement explaining why (if that is the case) changes discussed do not impact protectiveness (e.g., low risk of flooding, robustly designed remedy, protected remedial equipment, etc.).] **OR:** The risks posed by climate change in New England are expected to impact the protectiveness of the remedy at the [insert site name] site. The impacts of [insert climate impacts of concern (e.g., flooding, storm risk)] may adversely affect components of the remedy including [insert explanation for what components of the remedy may be impacted by climate risks; explain why these components of the remedy are put at risk and the potential outcomes if they were to fail].

References (to be included in references section of FYR)

M. Grippo, J. Hayse, I. Hlohowskyj, and K. Picel. 2021. Derivation of PFAS Ecological Screening Values, Environmental Science Division, Argonne National Laboratory, September 2021.

US EPA. 2021. Human Health Toxicity Values for Hexafluoropropylene Oxide (HFPO) Dimer Acid and Its Ammonium Salt (CASRN 13252-13-6 and CASRN 62037-80-3) Also Known as “Gen-X Chemicals.” Office of Water, Health and Ecological Criteria Division, Washington, DC, October 2021.

US ATSDR. 2021. Toxicological Profile for Perfluoroalkyls.
<https://www.atsdr.cdc.gov/toxprofiles/tp200.pdf>

US EPA. 1988. CERCLA Compliance with Other Laws Manual: Interim Final (Part 1) EPA/540/G-89/006 August 1988.

US EPA. 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors Memorandum. OSWER Directive 9200.1-120.

US EPA. 2017. Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters Memorandum, May 17, 2017. OLEM Directive 9285.6-56.

US EPA. 2018. Vapor Intrusion Screening Level (VISL) Calculator. Office of Land and Emergency Management, Office of Superfund Remediation and Technology Innovation (OSRTI), May 2018.
<https://www.epa.gov/vaporintrusion/vapor-intrusionscreening-levels-calculator>

US EPA. 2021. Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonic Acid (PFBS) and Related Compound Potassium Perfluorobutane Sulfonate. Office of Research and Development, Center for Public Health and Environmental Assessment, EPA/690/R-21/001F, 2021.

US EPA. 2021. Recommendations on the Use of Chronic or Subchronic Noncancer Values for Superfund Human Health Risk Assessments Memorandum, May 26, 2021. Office of Land and Emergency Management, Washington, DC, 2021.

US EPA. Integrated Risk Information System (IRIS). Available at <https://www.epa.gov/iris>

US EPA. Provisional Peer-Reviewed Toxicity Values. Available at <https://www.epa.gov/pprtv>

US EPA. Regional Screening Level Tables. Available at <https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables>

Region 2 Guidance for Incorporating Climate Change Considerations in Five-Year Reviews (V.2)

Background

In June 2011, Environmental Protection Agency (EPA) issued a *Policy Statement on Climate Change Adaptation* which recognized that climate change can pose significant challenges to EPA's ability to fulfill its mission. It calls for the Agency to anticipate and plan for future changes in climate and incorporate considerations of climate change into its activities. The *Policy Statement* also requires the development of an Agency-wide adaptation strategy that would integrate climate adaptation into the Agency's programs, policies, rules and operations. In addition to the Agency strategy, the *Policy Statement* also directed every EPA Program and Regional Office to develop an Implementation Plan that provides more detail on how it will meet the priorities and carry out the work called for in the Agency-wide plan.

The Region 2 Climate Change Workgroup completed its *Adaptation Implementation Plan* in 2014. One of the priority actions identified in the Plan is to "include consideration of potential climate change impacts in Five-Year Reviews (FYR) of National Priorities List (NPL) sites (e.g. flooding impacts to capped sites, changes to aquifers and plume migration, etc.)." When updating the *Adaptation Plan* in 2021, Region 2 further invested in this action by committing to "update the Climate Change in the FYR Guidance to provide additional guidance to Remedial Project Managers (RPMs) on screening sites for climate vulnerabilities." This guidance outlines how the Region will implement this priority action.

Additionally, in June 2021, the Office of Superfund Remediation and Technology Innovation released a memo titled *Consideration of Climate Resilience in the Superfund Cleanup Process for Non-Federal National Priorities List Sites* (see Appendix A). This memo discusses how the Superfund cleanup process should consider climate resilience in a manner consistent with the Comprehensive Environmental Response and Liability Act, the National Oil and Hazardous Substances Pollution Contingency Plan and EPA policy and guidance documents. It encourages site teams to consider potential site and remediation system vulnerabilities to identify adaptation measures for climate resilience in the remedial design phase. Additionally, the memo states "for remedial actions under construction or those already in place, FYR may provide opportunities to evaluate remedy protectiveness considering new information, such as changes in intensity, frequency or duration of extreme weather events. Site changes and vulnerabilities also may concern climate-related changes that are gradual, such as sea level rise, seasonal changes in precipitation or temperatures, increasing risk of floods, increasing intensity and frequency of hurricanes and wildfires, and melting of permafrost in northern regions." The memo makes recommendations for Regions to consider during remedy selection and remedy implementation.

In Region 2, the prospect of more intense and frequent storms and sea-level rise carries with it the risk of contaminant releases from RCRA Corrective Action sites, Superfund sites, Brownfield sites and landfills. As noted in EPA's Climate Change Adaptation Plan, inundation and flooding may lead to transport of contaminants through surface soils, sediments, groundwater, surface waters

and/or coastal waters. Uncontrolled migration of contaminants may pose an increased risk of adverse health and environmental impacts. Severe storms, storm surge and sea level rise may also cause flooding of coastal or other riparian located facilities in Region 2 where chemicals, oil or other hazardous substances are present. Power outages may impact operations at Superfund sites during storm events. These are all things to consider in the FYR process.

Process for Considering Climate Change Impacts in the FYR

When preparing a FYR report, RPMs and the site project teams should follow the attached decision tree to determine potential site vulnerabilities from climate change. EPA Region 2 has already identified potential vulnerabilities that are likely to affect contaminated sites; these are included in the decision tree. Additionally, national guidance has outlined potential vulnerabilities of common remedies, a summary of this is shown in Table 1 below. It is anticipated that most impacted sites will already have provisions in the operation and maintenance (O&M) plan to respond to climate effects. In addition to the process in the decision tree, any new storm events, flooding, etc. that affects the site (whether or not they are related to climate change) are typically discussed in Question C, “Has any other information come to light that could call into question the protectiveness of the remedy?” This practice can continue.

Table 1. Site Remedies and Vulnerability to Climate Change Impacts

REMEDY	FLOODING	SEA LEVEL RISE	DROUGHT
Source In Situ			
Soil Vapor Extraction	Moderate	Major	Moderate
In situ solidification/stabilization	Major	Major	Minor
In situ thermal treatment	Major	Major	None
Multi-phase extraction	Moderate	Major	Moderate
Bioremediation (source in situ)	Moderate	Major	Minor
Source Ex Situ			
Ex situ solidification/stabilization	Major	Major	Minor
Physical separation	None	None	None
Recycling	None	None	None
Surface Water Treatment	Major	Major	Minor
Unspecified Offsite Treatment	None	None	None
On-site containment	Major	Major	None
Groundwater In Situ			
Bioremediation (groundwater in situ)	Minor	Major	Minor
Chemical Treatment	Minor	Major	Minor
Air sparging	Moderate	Major	Moderate
Permeable Reactive Barrier	Minor	Major	Minor
Groundwater Ex Situ			
Pump & Treat	Major	Major	Minor
Vertical Engineered Barrier	Minor	Major	Minor
Monitored Natural Attenuation	Minor	Major	Minor
Source: U.S. EPA, Adaptation of Superfund Remediation to Climate Change, February 2012, Table 1.			

Web resources that RPMs can use to evaluate climate data and indicators listed in the decision tree include:

Temperature/Precipitation/Drought – [The Climate Explorer](#)
 Inland Flooding – [Risk Factor](#) (formerly Flood Factor)
 Sea Level Rise – [NOAA Sea Level Rise Viewer](#)
 Landslides – [USGS National Landslide Inventory](#)

These screening tools give RPMs the ability to review potential climate impacts and may indicate that a more detailed assessment of potential impacts to the performance and protectiveness of the remedy is necessary. If this is the case, the RPMs should work with their management, regional optimization liaisons and remedy selection manager to determine what resources are available for a more detailed vulnerability assessment and the process for documenting any remedy changes that may be needed as a result of the assessment.

In completing the FYR, RPMs are expected to use the above tools to screen their sites depending on which are most appropriate. Screenshots of the outputs, similar to what is in Appendix B, should be included as an appendix to the FYR and referenced in the “Systems Operations/Operation & Maintenance Systems Operations/Operation & Maintenance” section of the FYR, along with the conclusions of the decision tree analysis. An example write up is included in Appendix B.

RPMs for federal facility NPL sites are encouraged to share this guidance with their lead federal agency counterparts so that these agencies will understand how the Region is evaluating their FYR submittals with respect to climate change.

Additional climate change resiliency resources can be found at the EPA Superfund Climate Resilience webpage at <https://www.epa.gov/superfund/superfund-climate-resilience> and in Appendix C. Information about O&M is available in *Guidance for Management of Superfund Remedies in Post Construction* (OLEM 9200.3-105, February 2017) on-line at <https://semspub.epa.gov/work/HQ/196829.pdf>. O&M information is also generally available at <https://www.epa.gov/superfund/superfund-post-construction-completion>.

Based on site history and/or screening using the appropriate tools above, has your remedy experienced any impacts from and/or is your remedy currently at risk from the following potential climate change effects in the future?

- Sea level rise
- Inland Flooding
- Increasing frequency and intensity of storm events
- Changes in temperature
- Landslides
- Drought

YES

Does the O&M Plan have provisions for responding to these changes?

YES

Include this template language in the O&M section of the FYR: *Potential site impacts from climate change have been assessed, and the performance of the remedy may be impacted by the following climate change effects in the region and near the site (list potential effects from above). However, the O&M Plan addresses these impacts by... (describe relevant mitigation or adaptation measures from the O&M Plan). {refer to appropriate appendix showing screening analysis}*

NO

Include this template language in the O&M section of the FYR: *Potential site impacts from climate change have been assessed, and the performance of the remedy may be impacted by the following expected effects of climate change in the region and near the site: (list potential effects from above). Consider updating the O&M Plan to include the following measures... (describe relevant mitigation or adaptation measures). {refer to appropriate appendix showing screening analysis}* If your analysis suggests a remedy change is necessary, consult with your management on FYR protectiveness next steps in amending the remedy.

NO

Include this template language in the O&M section of the FYR: *Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the site. {refer to appropriate appendix showing screening analysis}*

Appendix A



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

June 30, 2021

OFFICE OF
LAND AND EMERGENCY
MANAGEMENT

MEMORANDUM

SUBJECT: Consideration of Climate Resilience in the Superfund Cleanup Process for Non-Federal National Priorities List Sites

FROM: Larry Douchand, Director Douchand, Larry
Digitally signed by Douchand, Larry
Date: 2021.06.30 15:54:34 -0400

Office of Superfund Remediation and Technology Innovation

TO: Regional Superfund National Program Managers, Regions 1-10

PURPOSE

This memorandum¹ recommends approaches for U.S. Environmental Protection Agency (EPA or Agency) regions to consider when evaluating climate resilience throughout the remedy selection and implementation process for sites proposed or currently listed on the National Priorities List (NPL) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA).²

Consideration of climate resilience in the Superfund cleanup process should be carried out in a manner consistent with CERCLA as well as the National Oil and Hazardous Substances Pollution Contingency Plan (NCP)³ and EPA policy and guidance documents. This memorandum⁴ supplements the Agency's existing policy statements addressing climate resilience activities, tools, considerations and technical information found in fact sheets;⁵ however, it does not amend or modify the NCP in any way. Consideration of climate resilience should not be treated as a new criterion under 40 CFR §300.430(e)(9)(iii)).

¹ This document provides recommendations to regional staff and management regarding how the Agency interprets and implements the NCP, which provides the blueprint for CERCLA implementation, with respect to climate resilience. However, this document does not substitute for those provisions or regulations, nor is it a regulation itself. Thus, it cannot impose legally binding requirements on EPA, states, or the regulated community and may not apply to a particular situation based upon the circumstances. Any decisions regarding a particular situation will be made based on the statute and the regulations, and EPA decision makers retain the discretion to adopt approaches on a site-specific basis that differ from the recommendations where appropriate.

² 42 USC §9601 et seq.

³ 40 CFR Part 300.

⁴ The scope of this document is consistent with recommendations 3 and 4 of the U.S. Government Accountability Office report released on November 18, 2019 (GAO-20-73), <https://www.gao.gov/products/gao-20-73>.

⁵ For additional information, see <https://www.epa.gov/superfund/superfund-climate-resilience>.

BACKGROUND

Legal Authority

Consistent with CERCLA, the NCP and Executive Order 12580,⁶ EPA has broad authority at private-party Superfund sites as the lead agency to carry out response actions to protect human health and the environment with respect to releases of hazardous substances, pollutants or contaminants.⁷ While EPA also has oversight responsibilities at Federal facility NPL sites, this memorandum specifically addresses non-Federal NPL sites.⁸

Consistent with CERCLA and the NCP, the Agency ensures protection of human health and the environment and in doing so may consider potential impacts of extreme weather events and changing climate conditions at Superfund sites to ensure the long-term integrity of response actions. The existing Superfund response selection and implementation process provides a basis to consider potential extreme weather impacts and to act, as warranted, to increase remedy resilience.

For example, the NCP provides nine criteria to evaluate remedial action alternatives prior to issuing a proposed plan for a given site (see 40 CFR §300.430(e)(9)(iii)). Consideration of climate resilience should not be treated as a new criterion; however, some or all of the following five criteria may be relevant to evaluating a remedial action alternative's climate resilience:⁹

(A) Threshold criteria: Overall protection of human health and the environment

(B) Primary balancing criteria:

- *Long-term effectiveness and permanence;*
- *Reduction of toxicity, mobility or volume through treatment;*
- *Short-term effectiveness; and*
- *Implementability.*

In instances where remedial actions have been selected but not yet implemented, the remedial design phase may provide an opportunity to consider potential site and remediation system vulnerabilities and identify adaptation measures to help maximize climate resilience.

For remedial actions under construction or those already in place, five-year reviews may provide opportunities to evaluate remedy protectiveness considering new information, such as changes in intensity, frequency or duration of extreme weather events. As discussed in the 2001 *Comprehensive Five-year Review Guidance* and the 2016 *Five-year Review Recommended Template*,¹⁰ site changes or vulnerabilities that may not have been apparent during remedy selection, implementation or operation and maintenance are to be considered when assessing the protectiveness of a remedy. Site changes and vulnerabilities also may concern climate-related changes that are gradual, such as sea level rise, seasonal changes in precipitation or temperatures,

⁶ Executive Order 12580 as amended, "Superfund Implementation" (January 23, 1987) delegates to various federal officials the responsibilities vested in the President for implementing CERCLA.

⁷ 42 USC §9604(a)(1).

⁸ Non-Federal sites are those where EPA generally carries out or oversees the cleanup conducted by one or more potentially responsible parties (PRP).

⁹ 40 CFR 300.430(e)(9)(iii).

¹⁰ See Section 4 Exhibit 4-1 on p. 4-1 and p. 4-9 of the 2001 *Comprehensive Five-Year Review Guidance* (<http://semspub.epa.gov/src/document/11/128607>) and Technical Assessment Question C on p. 10 of the 2016 *Five-Year Review Recommended Template* (<https://semspub.epa.gov/work/HQ/100000001.pdf>).

increasing risk of floods, increasing intensity and frequency of hurricanes and wildfires, and melting of permafrost in northern regions. If the original remedial action selected in a record of decision (ROD) requires climate resilience-related changes, they should be documented in an explanation of significant difference or ROD amendment consistent with the provisions in CERCLA (e.g., § 117) and the NCP (e.g., 40 CFR §300.435).

Climate Resilience Key Terms

For purposes of this guidance, key terminology¹¹ used in climate resilience evaluations includes:

- **Adaptation:** adjustment or preparation of natural or human systems to a new or changing environment which moderates harm or exploits beneficial opportunities.
- **Adaptive capacity:** the ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.
- **Resilience:** a capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to human health and the environment.
- **Sensitivity:** the degree to which a system is affected, either adversely or beneficially, by climate variability or change. The change may be direct or indirect.
- **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.

IMPLEMENTATION

Consistent with CERCLA, the NCP and associated EPA Superfund guidance, we encourage regions to consider the following recommendations during remedy selection and remedy implementation for non-Federal NPL sites. The recommended approach may involve program or site activities intended to assure or build, where needed, resilience in the long-term integrity of remedial actions, considering extreme weather events. Specific adaptation measures may be identified through an evaluation of the following recommended considerations:

- (1) Regions generally should assess the vulnerability of a remedial action's components, including its associated site infrastructure and evaluate whether the long-term integrity of a selected remedy may be impaired by adverse effects of climate change. A site-specific analysis of the remedial action in light of current, forward-looking information on local or regional climate and weather regimes may be useful. For example, the assessment may include predictive information on future climate conditions, such as intensities and frequencies of extreme weather events over a timeframe corresponding to a remedy's anticipated duration, including long-term monitoring.
- (2) Based on any potential vulnerabilities identified in (1) above, regions generally should evaluate adaptation measures that increase the system's resilience to a changing climate

¹¹ Vocabulary Catalog; Topic: Climate Change; Publisher: EPA Office of Air and Radiation/Office of Atmospheric Programs/Climate Change Division. https://ofimpub.epa.gov/sor_internet/registry/termreg/searchandretrieve/glossariesandkeywordlists/search.do

and ensure continued protectiveness of human health and the environment.¹² Examples of climate resilience measures may include adapting a system's operating parameters, such as installing equipment that enables offsite workers to remotely adjust or suspend operations during extreme weather events. Other measures may involve installing engineered structures that address vulnerabilities, such as elevation of onsite power supplies and enhanced erosion controls. Engineered structures also may help prevent transport of contaminated material across a site or to offsite areas during heavy or prolonged precipitation, thereby avoiding site recontamination due to stormwater runoff from offsite sources.

- (3) Regions generally should consider implementing adaptation measures, as needed, to ensure the long-term integrity of CERCLA remedial actions and their protectiveness of human health and the environment. Multiple adaptation measures may be appropriate based on the evaluation of (2) above; in such cases, the site team typically should prioritize the resilience measures to maximize return on limited resources, based on best professional judgment regarding factors, such as cost and impact on site operations.

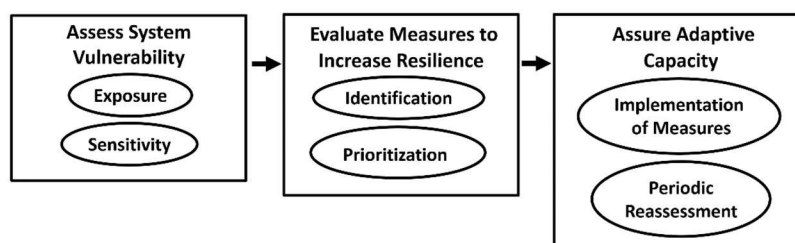


Figure 1: Climate resilience planning for a remedy generally involves: (1) Assessing vulnerability of the remedy's elements and site's infrastructure. (2) Evaluating measures potentially increasing the remedy's resilience to a changing climate. (3) Assuring the remedy's capacity to adapt to a changing climate, which helps the remedy continue to be protective of human health and the environment (Climate Resilience Technical Fact Sheet: Groundwater Remediation Systems, EPA 542-F-19-005).

Available Resilience Tools

There are several sources of information and tools that may be useful to support teams assessing and addressing climate resilience. The Agency's Superfund web page has a [climate resilience section](https://www.epa.gov/superfund/superfund-climate-resilience)¹³ with information about recommended considerations and approaches for adapting to climate change and building resilience to extreme weather at contaminated sites undergoing cleanup. The Agency's [Climate Change Adaptation Resource Center](https://www.epa.gov/superfund/superfund-climate-resilience)¹⁴ website includes broader information on climate resilience efforts and tools.

In 2019, the Agency's Superfund Program released three updated climate resilience technical fact sheets designed to help project managers and other cleanup stakeholders identify, prioritize and implement site-specific measures for increasing remedy resilience to climate change and extreme weather events. These fact sheets cover three of the most common remedy and site types

¹² Selected federal resources can be accessed at *Superfund Climate Resilience: Vulnerability Assessment*, <https://www.epa.gov/superfund/superfund-climate-resilience-vulnerability-assessment>

¹³ Superfund Climate Resilience, <https://www.epa.gov/superfund/superfund-climate-resilience>

¹⁴ Climate Change Adaptation Resource Center (ARC-X), <https://www.epa.gov/arc-x>

likely to have significant investments in remedy infrastructure, potential for contaminant remobilization and longer operating periods

- [Climate Resilience Technical Fact Sheet: Groundwater Remediation Systems](#);
- [Climate Resilience Technical Fact Sheet: Contaminated Sediment Sites](#); and
- [Climate Resilience Technical Fact Sheet: Contaminated Waste Containment Systems](#).

Technical assistance with site-specific vulnerability and resilience assessments is available through the Optimization and Technical Support Program. For questions, please contact your Regional Optimization Liaison.

CONCLUSION

Throughout the CERCLA remedial process at non-Federal NPL sites, including the decision-making and implementation processes, regions generally should continue to consider remedial actions' climate resilience to ensure protectiveness of human health and the environment. Regional staff should continue to use the existing response selection and implementation process at non-Federal NPL sites in a manner consistent with CERCLA, the NCP, and relevant EPA guidance and policy.

If you have questions or would like assistance with evaluating climate vulnerabilities and adaptation measures as they relate to remedy protectiveness resilience, please contact Carlos Pachon, Office of Superfund Remediation and Technology Innovation (OSRTI) or your Regional Optimization Liaison.

Attachments

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Appendix B – Example Analysis to be used for the “Systems Operations/Operation & Maintenance Section” of the FYR

According to the *Region 2 Guidance for Incorporating Climate Change Considerations in Five Year Reviews*, three climate change tools were utilized to assess the Ciba Geigy Superfund Site. Screenshots from each of the tools assessed are included in Appendix *.

The first tool used to assess Toms River Township was *The Climate Explorer*. According to this tool, coastal flooding may increase as global sea level rises 0.5-2 feet. Intense rainstorms in the area are projected to have a 1% decrease and a 4% increase. As can be seen from Figure 1, there is a projected increase of days per year with maximum temperatures > 100 °F. As can be seen on Figure 2 there is a slight increase in potential drought conditions. A summary of the Top Climate Concerns from the tool can be seen as Figure 3.

The second tool utilized is called the *Risk Factor (formerly Flood Factor)*. According to this assessment tool, there are over 12,000 properties in Toms River that have greater than a 26% chance of being severely affected by flooding over the next 30 years which gives the Township a rating of “Major.” However, as can be seen from Figure 4, the Ciba Geigy Site is outside of that major flood risk area.

The final tool utilized is called *Sea Level Rise*. Once again, Toms River Township is vulnerable to sea level rise, however, the Ciba Geigy site is located farther from the Atlantic Ocean compared to other parts of the Township. Figure 5 shows the site, notated as “Toms River Cincinnati Chemical Corp,” at current conditions. For comparison, Figure 6 shows the area with a 10-foot sea level rise which shows the Township affected by the rise; however, the Site itself is unaffected. This can also be seen from Figure 7 showing flooding frequency.

Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the site. It should be noted, however, that the Ciba Geigy Site has been affected by power outages during intense storms that tend to have a greater effect on the coastal areas of New Jersey. During Superstorm Sandy, the site was out of power for a week and, as a result, the PRPs were not able to maintain the GERS system during that time. In 2019, as part of a 35-megawatt direct current (MW DC) grid-tied solar array system, a smaller 2-MW DC net-metered solar array was installed. This smaller system provides nearly 100% of the electricity required to power the GERS system. This would protect the system from shutdowns during large, intense storms in the future.

Figure 1



Figure 2



Figure 3

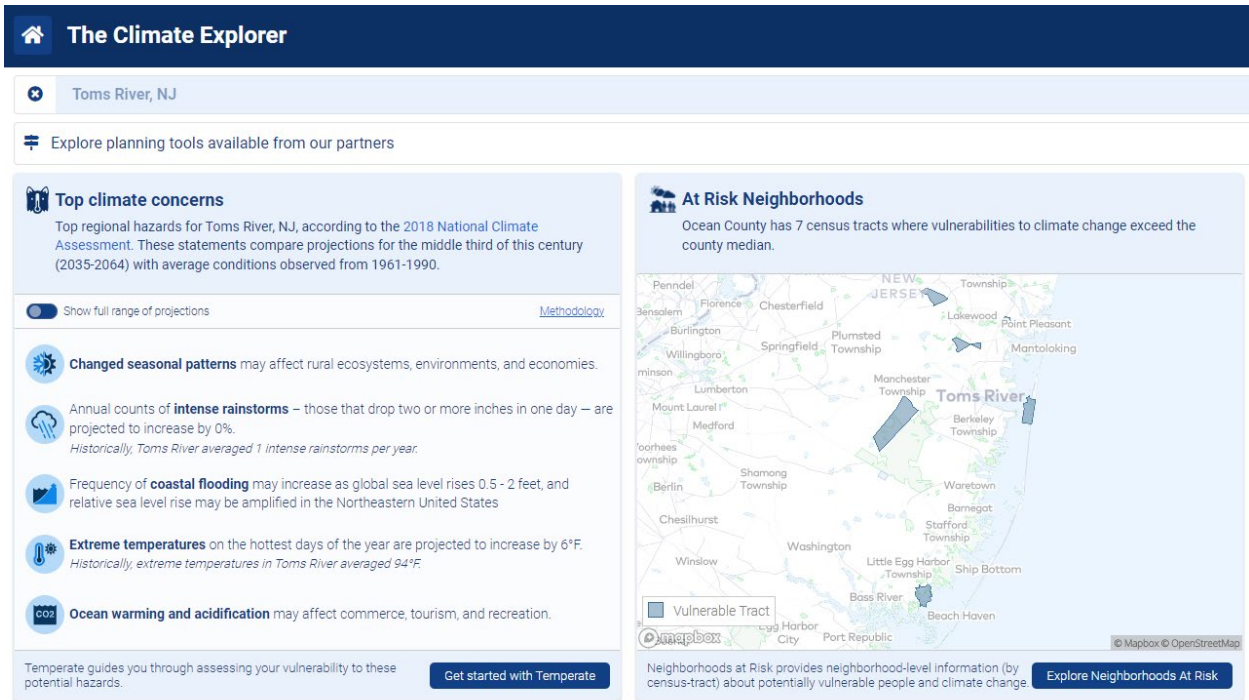


Figure 4

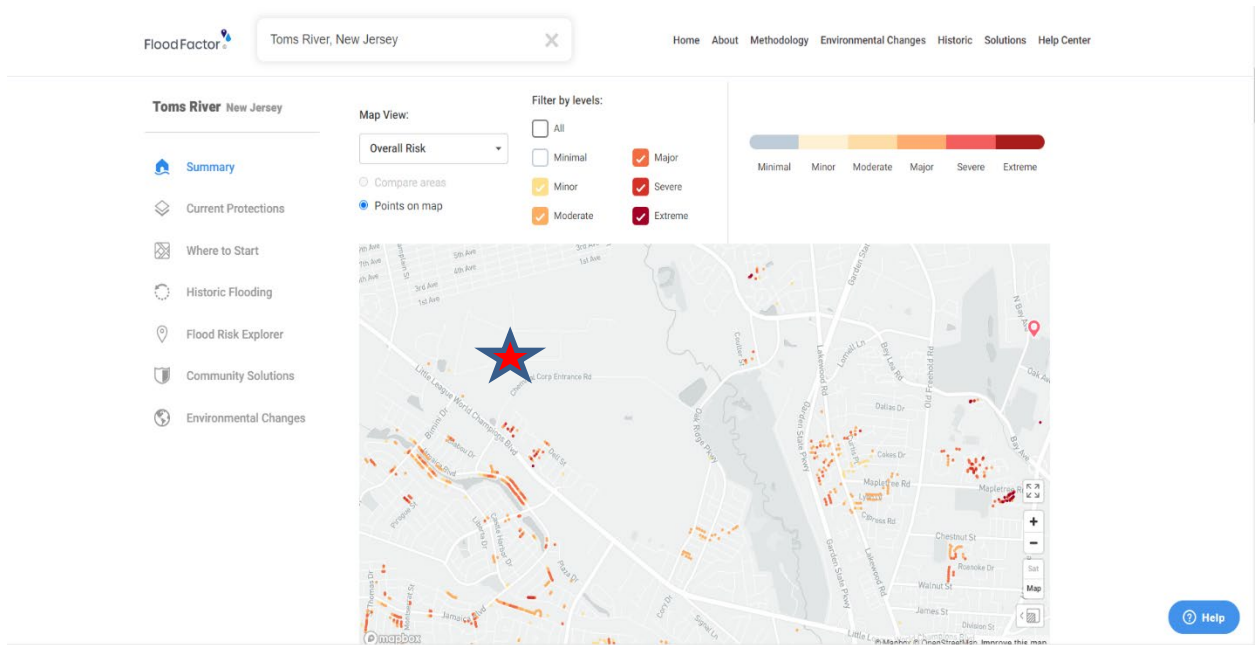


Figure 5

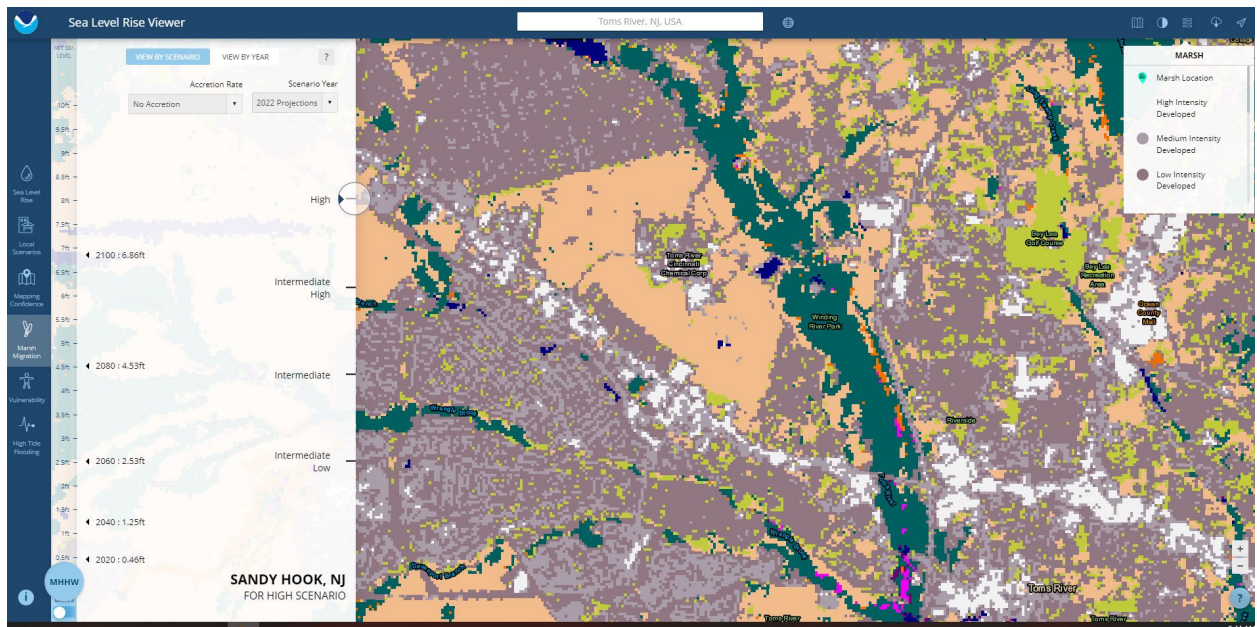


Figure 6

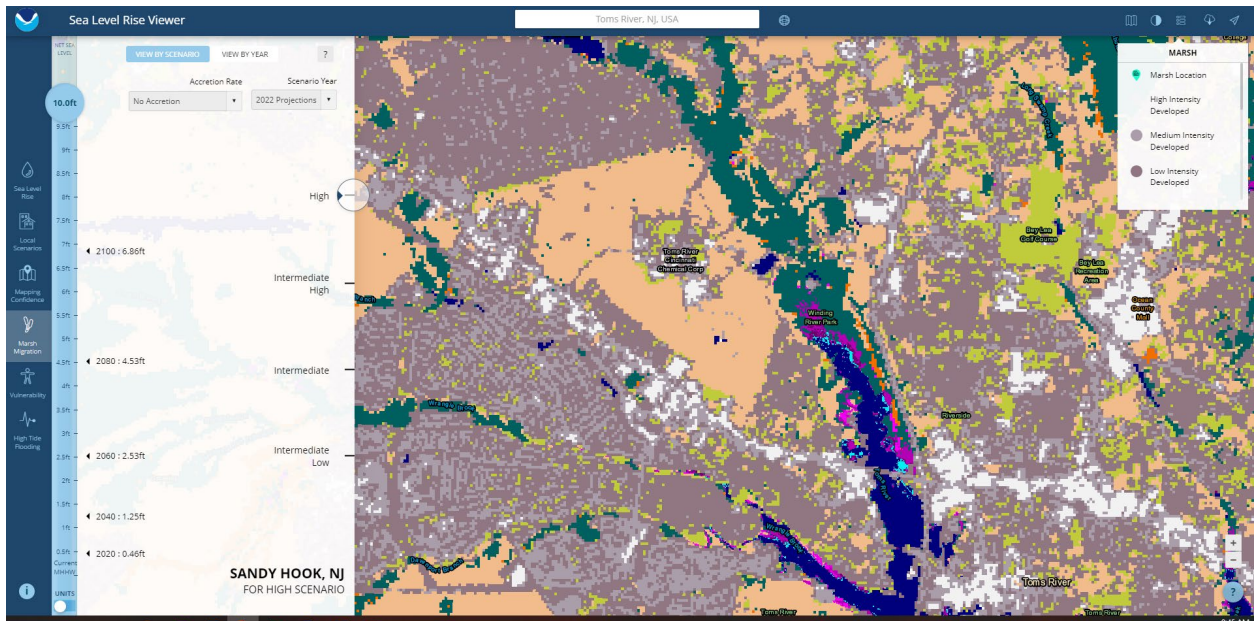
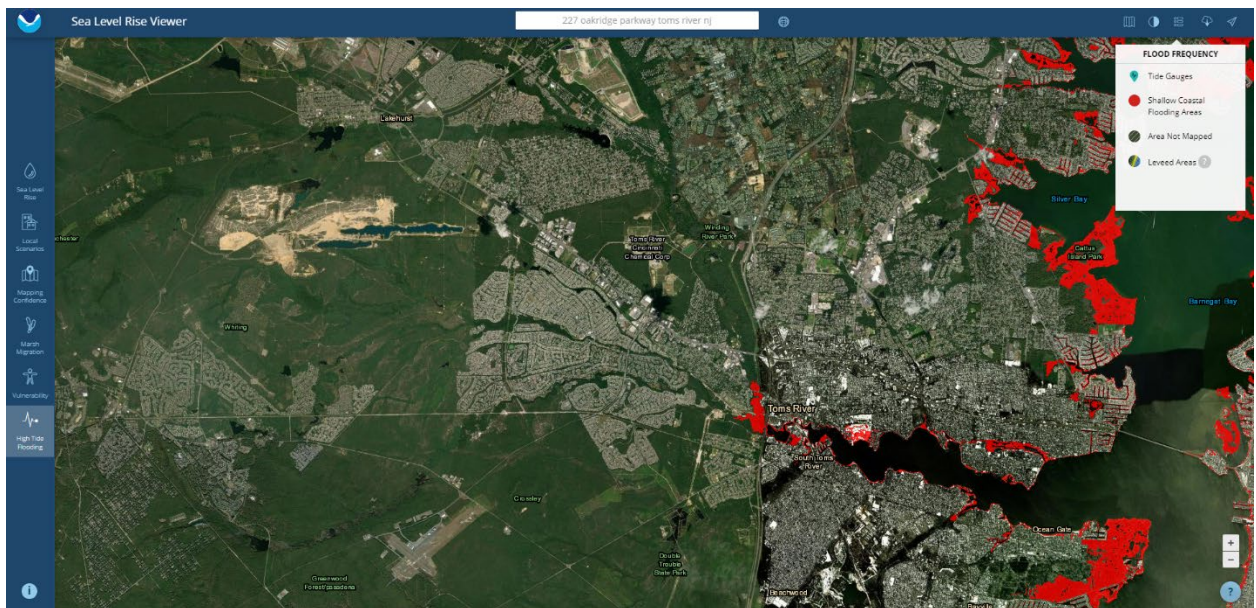


Figure 7



Appendix C - Additional Climate Change Resources

- EPA Superfund Climate Resilience webpage
 - <https://www.epa.gov/superfund/superfund-climate-resilience>
- Climate Change Adaptation Plan
 - <https://www.epa.gov/greeningepa/climate-change-adaptation-plans>
- OLEM Climate Change Adaptation Implementation Plan
 - <https://www.epa.gov/superfund/oswer-climate-change-adaptation-implementation-plan>
- Evaluation of Remedy Resilience at Superfund NPL and SAA Sites
 - <https://www.epa.gov/superfund/evaluation-remedy-resilience-superfund-npl-and-saa-sites>
- Technical Fact sheets
 - Contaminated Sediment Sites: <https://www.epa.gov/superfund/climate-resilience-technical-fact-sheet-contaminated-sediment-sites>
 - Contaminated Waste Containment Systems: <https://www.epa.gov/superfund/climate-resilience-technical-fact-sheet-contaminated-waste-containment-systems>
 - Groundwater Remediation Systems: <https://www.epa.gov/superfund/climate-resilience-technical-fact-sheet-groundwater-remediation-systems>
- Climate Change Adaptation Resource Center
 - <https://www.epa.gov/arc-x/tools-climate-change-adaptation>
- O&M in the Superfund Program
 - <https://semspub.epa.gov/work/HQ/196829.pdf>
- General O&M Information
 - <https://www.epa.gov/superfund/superfund-post-construction-completion>