Resilience Requirements
Supplemental Guide and Checklist

This document serves as an application guide and checklist to fulfill the requirements for the Building Resilient Water Infrastructure: Climate Change Resilience Guidance for New Jersey's Clean Water and Drinking Water State Revolving Funds.

The **Resilience Requirements** should be submitted as part of the **Project Report** for review by the New Jersey Department of Environmental Protection (Department) and used within the **Alternatives Analysis** to justify the selected alternative. It is required before the EDD can be issued and the Letter of Intent (LOI) is submitted. Previous requirements for the State Revolving Fund (SRF) program required applicants to consider resilience to the .2% annual chance floodplain. These new requirements expand resilience to account for current and future climate change impacts, including increased extreme precipitation, sea level rise, and worsening storms.

The Resilience Requirements include provision of maps, justifications for planning horizons and climate impact projections, and a resilience assessment for the selected project alternative, where applicable. The purpose of these requirements is to verify exposure of the project to current and future climate change impacts and to incorporate resilience as a crucial component of the alternatives analysis and justification for the selected alternative. Applicants should consult the program during their pre-planning meeting to verify which requirements they must meet. The following items are required for submission to the Department within the Project Report for review:

Maps, where applicable:

- ❒ Community Served
- ❒ Existing and Proposed Location/s of the Proposed Project
- ❒ Current Mean Water Line for Relevant Bodies of Water
- ❒ 0.2% Annual Chance Flood + One (1) Foot*
- ❒ 0.2% Annual Chance Flood + Sea Level Rise*
- ❒ Category 1 Hurricane Storm Surge Extent
- ❒ Locations of Existing and Proposed Climate Change Impact Mitigating Infrastructure

* See section 3.2.4

Tips:

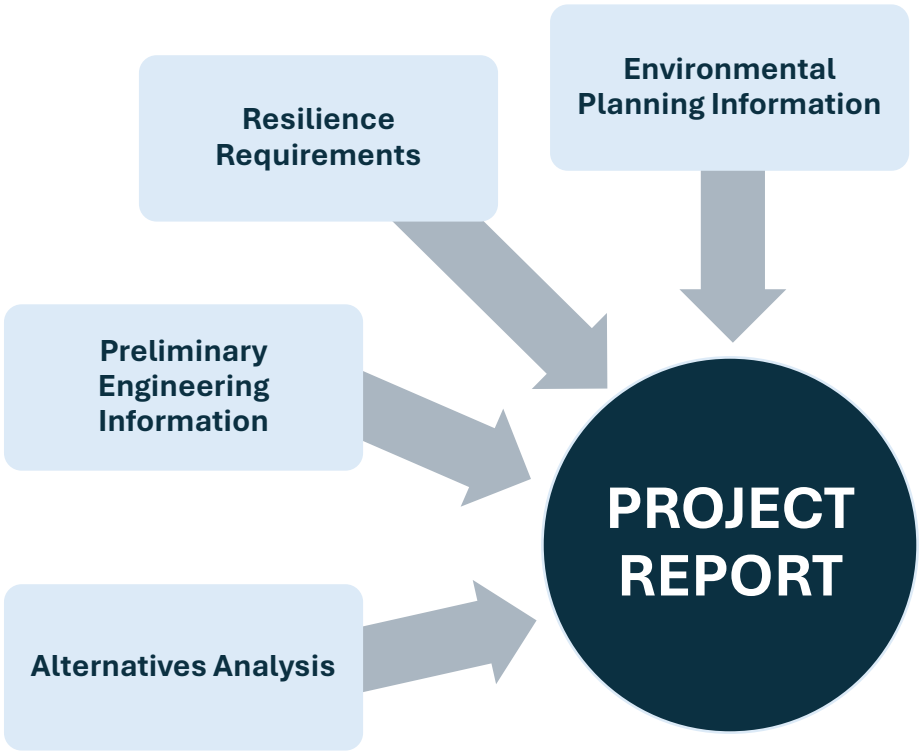
Wait until you have received a comment letter from DEP to begin the design process to avoid delays.

Consider consulting with the Program during a pre-planning meeting to determine specific resilience requirements relevant to their project

Resilience:

- ❒ Project Details (Project Scope and Type)
- ❒ Description of the Impact of Extreme Precipitation Projections
- ❒ Description of Relevant Climate Change Impacts and Flood Hazard Elevations
- ❒ Description and Justification of Relevant Planning Horizons
- ❒ Resilience Considerations within the Alternatives Analysis
- ❒ Justification of Resilience for the Selected Alternative
- ❒ Resilience Assessment (If Applicable)
- ❒ If There are No Resilience Concerns, a Justification of Why

Please read the Resilience Guidance thoroughly prior to using this Supplemental Guidance and Checklist to ensure a comprehension of the climate change standards and planning horizons required by the Program. ***This guide will assist applicants and consulting engineers to understand the relationship between climate change impacts and water infrastructure, determine the relevant scope of assessment necessary for their specific project, and find relevant flood hazard elevations.*** Follow the subsequent steps:



Project Report refers to the comprehensive document submitted to H2LOans in Step 3, detailing project details, the alternatives analysis, and environmental planning, preliminary engineering, and resilience information for the proposed environmental infrastructure facilities (see N.J.A.C. 7:22-3 and 7:22-10).

Alternatives Analysis refers to an evaluation, combining insights from environmental planning and preliminary engineering to determine the most feasible, cost effective, resilient, and environmentally sound of various project alternatives. No action alternative is always required in the evaluation of alternatives.

Resilience Requirements refer to the detailed description and mapping of relevant climate change impacts and any Resilience Assessments that are required by the program.

Resilience Considerations: refers to the insights derived from the Resilience Requirements used in the Alternative's Analysis to summarize preliminary determinations of exposure and vulnerability of different alternatives. The selected alternative will require an in-depth evaluation of the Resilience Requirements.

1 DEFINITIONS

“0.2% Annual Chance Flood or the 500-Year Flood” means a flood that has a 0.2% chance of being either equaled or exceeded in a given area in a given year.

“1% Annual Chance Flood or the 100-Year Flood” means a flood that has a 1% chance of being either equaled or exceeded in a given area in a given year.

“Base Flood Elevation (BFE)” is the elevation that surface water will likely reach during a base flood or the 1% annual chance flood.

“Design Flood Elevation (DFE)" means the peak water surface elevation that will occur in a water during the flood hazard area design flood.

"Flood hazard area design flood" means a flood equal to the 100-year flood plus an additional amount of water in fluvial areas to account for possible future increases in flows due to development or other factors and provide a factor of safety in cases when the 100-year flood is exceeded.

“New Construction” refers to new water infrastructure providing essential services for health and safety such as wastewater treatment, water supply, and stormwater management facilities.

“Substantial alterations” refer to any alterations to existing infrastructure where the cost of work is higher than or equal to 50% of the current market rate of the lawfully existing infrastructure.

"Stormwater management facilities" include, but are not limited to, any equipment, plants, structures, machinery, apparatus, or land, or any combination thereof, acquired, used, constructed or operated by or on behalf of a local government unit to prevent, reduce, store or treat stormwater runoff, correct interconnections or cross-connections, or otherwise address adverse impacts of stormwater runoff that enters a municipal separate storm sewer system or any combination thereof.

“Wastewater treatment facilities” include, but are not limited to, any equipment, plants, structures, machinery, apparatus, land that will be an integral part of the treatment process or used for the ultimate disposal of residues resulting from such treatment, or any combination thereof, acquired, used, constructed or operated by or on behalf of a local government unit for the storage, collection, reduction, recycling, reclamation, disposal, separation or other treatment of wastewater, wastewater sludges, septage or industrial wastes, including, but not limited to, pumping and ventilating stations, treatment systems, plants and works, connections, extensions, outfall sewers, combined sewer overflows, intercepting sewers, trunklines, sewage collection systems, and other equipment, personal property and appurtenances necessary thereto.

"Water supply facilities" means and refers to the plants, structures, service and house connections, well sealings, interconnections between existing water supply facilities, machinery, equipment and other property, personal and mixed, constructed or operated, or to be constructed or operated, in whole or in part by or on behalf of a project sponsor, for the purpose of augmenting the natural water resources of the State and making available an increased supply of water for all uses, and any and all appurtenances necessary, useful and convenient for collecting, impounding, storing, improving, treating, filtering or transmitting of water, and for the preservation and protection of these resources and facilities and providing for the conservation and development of future water supply resources, and facilitating incidental recreational uses thereof.

2 EVALUATE THE PROJECT TYPE AND SCOPE

2.1 PROJECT TYPE

2.1.1 Stormwater Management Facilities Projects

Determine whether the project is vulnerable to extreme precipitation and will be impacted by updated projections. To learn more, visit https://dep.nj.gov/njpdes-stormwater/.

- ❒ Does the project require a stormwater permit?
- ❒ Will the project alter or expand existing storm sewer infrastructure?
- ❒ Is the project primarily focused on stormwater management, including but not limited to drainage systems, retention ponds, and green infrastructure?

Coordinate with the Water Bank prior to securing stormwater design approvals or permits to ensure compliance with the Climate Resilience Guidance for Water Infrastructure.

Describe how the proposed infrastructure will be impacted by an increase in extreme precipitation for mid-century and end of century projections and justify the use of either planning horizon, accounting for feasibility, design life, and risk tolerance.

Stormwater infrastructure may also be vulnerable to flooding, particularly coastal flooding. Sponsors should address if sand and debris will impact O&M costs and how the sponsor plans to address disruptions in the level of service following a flood event to mitigate impacts. Any possible disruptions in the level of service caused by fluvial or coastal flooding should be addressed in the Project Report. Prudent design should address lesser storms and allow for prompt drainage of flooded areas once larger flooding events subside. Applicants should also consider backflow for outfalls vulnerable to sea level rise and flood events, even if outfall alterations are not planned, as existing outfalls will affect the functionality of proposed stormwater improvements. Additionally, they should consider any impacts caused by erosion due to sea level rise and storm surge events.

2.1.2 Wastewater Treatment Facilities

It is critical to understand how different types of infrastructure are affected by inundation and flood events, including fluvial flooding, coastal flooding, and storm surge. Some project types may not require a Resilience Assessment, such as:

- Wastewater facilities that are constructed below ground level and are typically engineered to be watertight and resilient to inundation.
    - Conveyance systems such as sanitary sewer lines, force mains, and interceptor sewers, where manholes within the flood elevation are waterproofed
    - Underground storage tanks designed to be resistant to buoyancy during flood events
- Effluent discharge outfalls designed with hydraulic structures and elevation controls to prevent backflow or flooding of the treatment plant. (check valves, tide gates, duckbills, etc.)
- Submersible or waterproofed assets that are designed to be operational while inundated
    - Submersible pumps
- Equipment purchase

If a determination is made that the project type is not vulnerable to climate change impacts, include a justification for that determination in the Project Report.

Vulnerability is highly context sensitive and general rules may not apply to all projects. For example, typically resilient infrastructure may be vulnerable to erosion and damage caused by storm surge in coastal communities. Additionally, assets and operations below ground may be vulnerable due to exposed assets above ground. Consider all factors before determining that the project type is not vulnerable to flood related climate change impacts.

Putting it into Practice

In a proposed combined sewer separation project, a municipality aims to repurpose the existing combined sewer system for stormwater management while constructing a separate line for sewage, reducing combined sewer overflow events during heavy rainfall and minimizing pollution discharge into nearby water bodies. There are no resilience concerns for extreme precipitation, as the existing sewer will become stormwater only and there are no proposed changes in capacity resulting from this project. The stormwater system will remain tied to the existing outfall, which will be outfitted with backflow prevention, that releases into a tidally influenced river and is not impacted by wave action during storm surge. Additionally, the newly constructed sanitary sewer will be designed to be an enclosed system and designed to be watertight, with watertight manhole covers. The Sponsor determines that the project type is not vulnerable to coastal flooding or storm surge. In the Project Report, the Sponsor includes a description of their justification for a lack of vulnerability to each climate change impact for the selected alternative and provides the most up to date preliminary FIRM Panel for the project location, showing asset locations. The Sponsor is still responsible for ensuring that they obtain all necessary permits regardless of the Program's Resilience Requirements.

2.1.3 Drinking Water Facilities

Similarly to wastewater treatment facilities, some water supply facilities may not require a Resilience Assessment due to the type of project. These may include:

- Water supply facilities that are constructed below ground level and are typically engineered to be watertight and resilient to inundation.
    - Water mains replacement and extensions
    - Transmission pipelines, distribution lines, etc.
    - Lead service line replacement.
- PFAS treatment units and other drinking water treatment tanks designed to be waterproof and resistant to buoyancy during a flood event, where control mechanisms and electrical components are not exposed to climate change impacts.
- Water storage tanks, including water towers, engineered to be watertight and resistant to buoyancy during a flood event.
- Water meter replacement
- Equipment purchase

If a determination is made that the project type is not vulnerable to climate change impacts, include a justification for that determination in the Project Report.

Drinking water facilities may be particularly vulnerable to climate change impacts outside of flood inundation, such as saltwater intrusion, drought, and coastal erosion. For example, rising sea levels can increase the salinity of intake water drawn from estuaries or nearshore wells for treatment at desalination plants. Higher salinity may require more intensive desalination processes, increasing operational costs and potentially straining existing treatment capacities. These kinds of impacts may be more complex and require careful and project-specific consideration.

2.2 PROJECT SCOPE

2.2.1 New Construction and Substantial Alterations

Provide information to determine if the project involves new construction or substantial alteration.

- ❒ Is the planned project a new wastewater or drinking water facility providing an essential service (sewer treatment and drinking water) to a new or existing customer bases whose design life is longer than the SRF loan terms?
- ❒ Is the planned project an essential component of a wastewater or drinking water facility and is it significant to providing those essential services?
- ❒ Does the planned project qualify as a substantial alteration to existing water infrastructure?

If so, the alternatives analysis must include SLR at 2100 and/or end of century extreme precipitation projections, where those climate change impacts are applicable.

If not, decide on the required planning horizon for the project, if sea level rise or extreme precipitation are applicable. The minimum planning horizon must be for the end of the Fund loan, set at the expected year of the Project Report's submission. Justify the planning horizon in the Project Report.

For new construction and substantial alterations, elevation of entire structures or even relocation may often be a more cost effective alternative than mitigation measures, such as floodproofing or minimizing damage to non-critical assets, given the design life of the infrastructure and the financial investment undertaken. Consider, for instance, a newly constructed building housing elevated equipment and electronics. While the building itself may not directly impact operational functions, damages resulting from fluvial or coastal flooding pose a significant threat to the financial viability of the infrastructure investment. Repairing such structural damage can incur substantial costs and the need for additional loans, potentially undermining the long-term sustainability of the project. New construction and substantial alterations are held to a higher level of scrutiny for review. Decision matrices and justifications of selected projections should be comprehensive to demonstrate that the selected alternative is resilient and protective of the health and safety of its customers.

2.2.2 Rehabilitation, Repair, and Replacement

Much of New Jersey's water infrastructure currently operates within flood prone areas with limited opportunities for relocation. These projects may be more nuanced when considering routine maintenance, repair, or even modernization of individual assets in and around preexisting infrastructure that is exposed to fluvial or coastal flooding. Routine activities such as valve replacement, equipment upgrades, and pipe repairs are often conducted to maintain reliability and functionality of the system and may not impact overall system design or vulnerability to inundation. On the other hand, some activities are more critical for level of service, such as repair of electrical equipment, rehabilitation of wells, or replacement of critical components of the wastewater treatment process (clarifiers, digesters, etc.).

The Vulnerability Assessment detailed in the Resilience Guidance is a tool to assist the development of resilient alternatives, considering assets' exposure, sensitivity, and adaptive capacity and can serve to justify resilience of the overall project to allow for flexibility and iterative asset management where elevation or relocation may not always be feasible. Assets may also be grouped together for simplification of the assessment given the type of asset or their function, particularly if they are all planned to be the same elevation. It may not be feasible to evaluate the elevation of each asset. Consider providing a list of assets, their criticality, and whether the assets or parts of a group of assets will be designed to be above the flood elevation. Describe the mitigation measures to be taken to ensure any exposed assets will not result in a disruption to level of service in the event of a flood event. Any strategic or capital investment plans to improve resilience or resilience projects currently in the program may be used as justification of planned resilience measures if the proposed infrastructure will benefit from these measures. Consider the below questions when determining the scope of your assessment and see section 4 for more information about assessment scope:

- What is the level of service for the operable segment/ project and how critical is it for the functionality and performance of utility operations?
- Which assets directly contribute to essential services or have significant implications for public health, safety, and environmental protection?
- How will the proposed project affect the redundancy and robustness of the overall system during unplanned outages or extreme conditions?
- What is the design life and financial investment of assets that are not critical for operations?

Putting it into Practice

In a town exposed to coastal flooding, a wastewater treatment facility plans to replace aging Rotating Biological Contactor (RBC) units and enhance sludge handling systems to maintain the system and provide additional redundancy. All existing assets are above the 100-year flood but below the 500-year flood standards of the NJ Water Bank (excluding the top of the sludge tank). The existing WWTP already has established process elevations, which makes it less feasible to avoid the floodplain or to elevate infrastructure throughout the facility.

During assessment of vulnerability, engineers evaluate the exposure of the following assets and groups of assets: RBC units and related components, sludge feed station, sludge thickener tank, sludge discharge pumping station, sludge feed station, sludge system controls, and piping systems. While it is possible that operations would be disrupted during a 500-year flood due to processes outside of the project scope, the utility must evaluate the financial, public health and safety, and environmental consequences of a flood event to the proposed infrastructure. If it is not possible to all elevate critical assets, the utility must consider a variety of mitigation measures such as flood proofing piping systems, utilizing submersible pumps, moving control mechanisms to an elevated structure, or building a flood wall around the RBC units to mitigate these consequences. They may even plan to implement system level resilience measures as another project in another fiscal year to ensure safety and functionality into the future.

This vulnerability assessment, as well as risk tolerance and community impact assessments, must be included in the Project Report and detailed for the selected alternative to justify the resilience of the proposed project. The Sponsor may utilize the alternatives analysis to evaluate the feasibility of other mitigation options that were considered during development of the project plan.

3 Assess Exposure to Flood Hazards

3.1 Understanding Flood Hazards

The New Jersey Water Bank Resilience standards for fluvial and coastal flooding are based on either the 0.2% Annual Chance Flood or the Design Flood Elevation (DFE) per the Flood Hazard Area Rules (N.J.A.C. 7:22-13), whichever has a higher flood elevation. This means the relevant floodplain elevation will be the highest flood elevation of the following:

- 0.2% annual chance flood plus sea level rise
- 0.2% annual chance flood plus one (1) foot
- 1% annual chance flood plus additional amount of water per N.J.A.C. 7:22-13 and all future amendments (e.g., the Inland Flooding Rule)

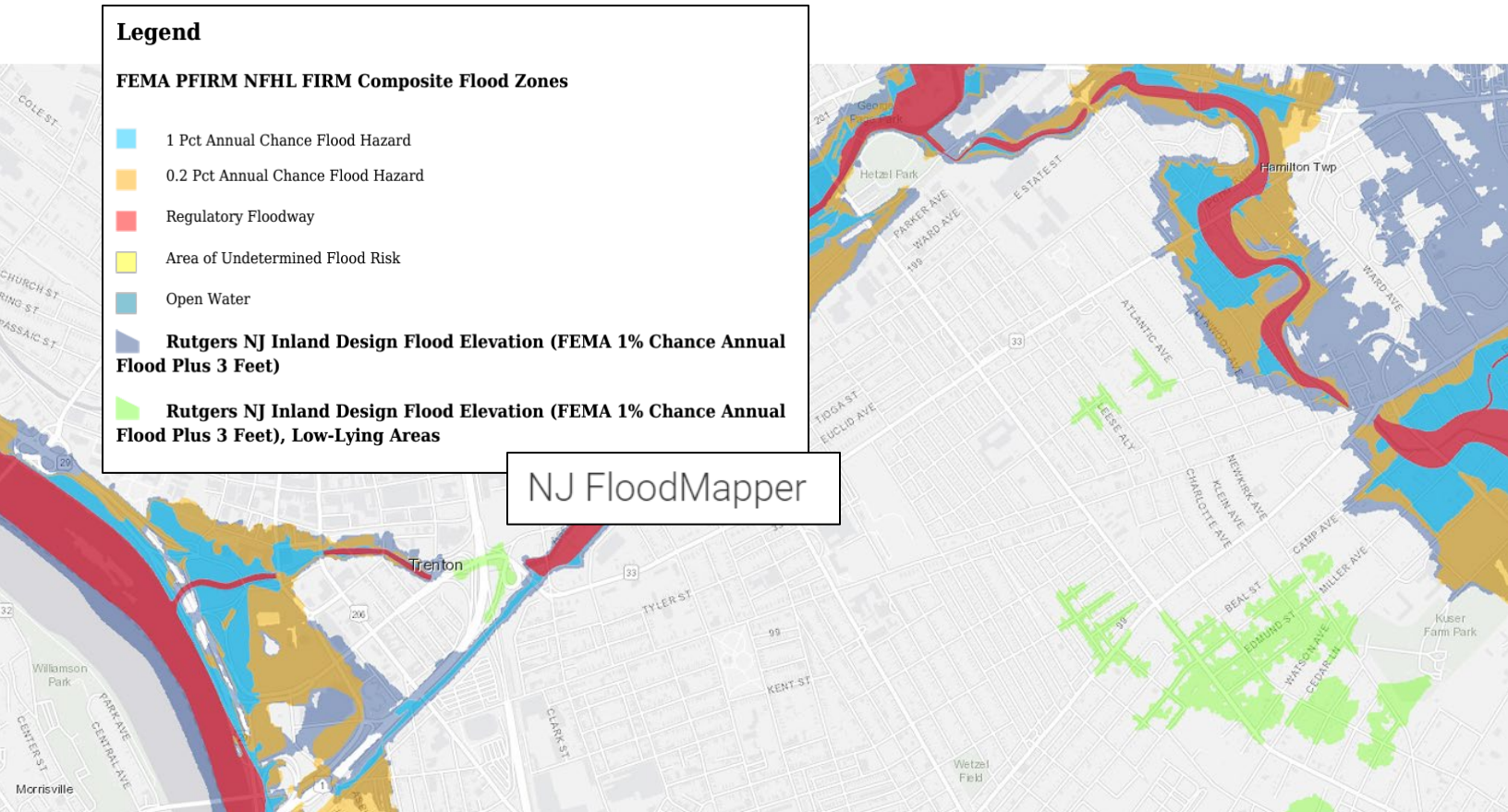
Be careful not to confuse DFE with Base Flood Elevation (BFE). The standards of the Water Bank's Resilience Requirements do not utilize BFE. BFE can be used to determine a flood hazard area's DFE. However, it cannot be used to determine the 0.2% annual chance flood.

For preliminary analysis, check your project location on NJFloodMapper which includes Flood Hazard Overlays for preliminary (default) and effective FEMA FIRMs and the NJ Inland Design Flood Elevation (FEMA 1% Chance Annual Flood Plus 3 Feet). You can see the relationship between the two layers in the image below. In some cases, the DFE, based on the 1% annual chance flood, may be higher than the 0.2% annual chance flood plus one foot. Check to see if your project requires a Flood Hazard Area Verification for any Land Use permits. This verification may replace mapping requirements if using the DFE.

The NJFloodMapper flood hazard overlays indicated above are not appropriate for assessing the coastal flood hazard. If your project is in a coastal area or may be impacted by tidally influenced water bodies, skip the preliminary analysis and move on to the steps in the next section. The NJFloodMapper tool is for planning and guidance purposes only and cannot be used for site specific planning and design. ***Do not use these maps as supporting documentation.***

Coastal flooding: *governed by tidal flooding from the Atlantic Ocean and may be contributed to or influenced by stormwater runoff from inland areas, but the depth of flooding generated by the tidal rise and fall of the Atlantic Ocean is greater than flooding from any fluvial sources. Superstorm Sandy in 2012 is one infamous example of these impacts.*

Fluvial flooding: *governed by stormwater runoff and may be contributed to or influenced by elevated water levels generated by the tidal rise and fall of the Atlantic Ocean, but the depth of flooding generated by stormwater runoff is greater than flooding from the Atlantic Ocean. Hurricane Ida in 2021 was responsible for significant fluvial flooding.*



If your project is located near any flood hazards or any tidally influenced bodies of water:

1. Find the DFE based on FHA rules
2. Identify the flood hazard (coastal or fluvial) and find the flood hazard elevation based on the 0.2% annual chance flood
3. Provide flood hazard elevation calculations, any planning horizons, data sources, and supporting documentation and maps in the Project Report*

* If your project has already submitted a Project Report, you may be asked to submit a separate memo or to resubmit an amended Project Report for the Resilience Requirements.

3.2 Calculating the 0.2% Annual Chance Flood Hazard Elevation

3.2.1 Step 1: Locate the Project Location and FIRM Panel

Visit the FEMA Flood Map Service Center and type in your project location into the search bar. Use the FEMA map to determine your project location's relevant **FEMA Flood Insurance Rate Map (FIRM) Panel** number, which should consist of 10 digits, followed by a letter that indicates the version of the FEMA FIRM Panel. Remember the panel number and the effective date, which will be displayed underneath the panel number. If the built-in mapping portal is running slowly, click the button '*Go To NFHL Viewer'* to view through the ArcGIS web app.

You must utilize the most recent preliminary or effective FIRM panels. Preliminary FEMA analyses will not be displayed on the National Flood Hazard Layer (NFHL) or FEMA mapping portal. It is therefore necessary to view all FEMA products for your project location to ensure appropriate data usage. From the mapping portal, select "*Show All Products*" to see all FEMA related products for the county. You may also select "*Search All Products*" in the side navigation bar and select your jurisdiction or type in the FIRM Panel number in the product search bar to be directed to more specific products. Find the most recent preliminary or effective FIRM panel and open it.

Figure 2.1: FEMA Map Center Home Page

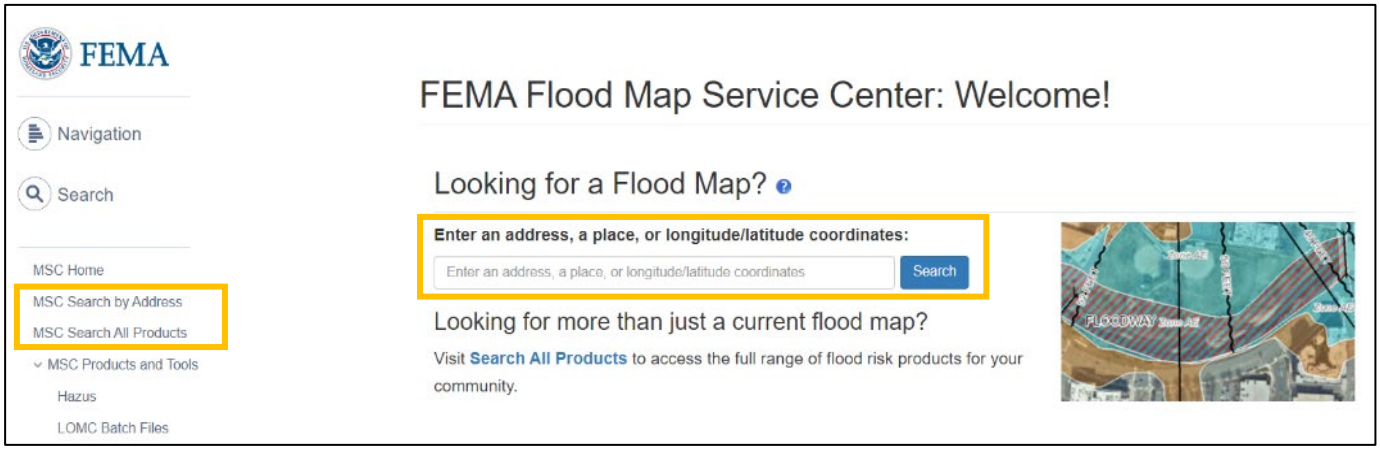
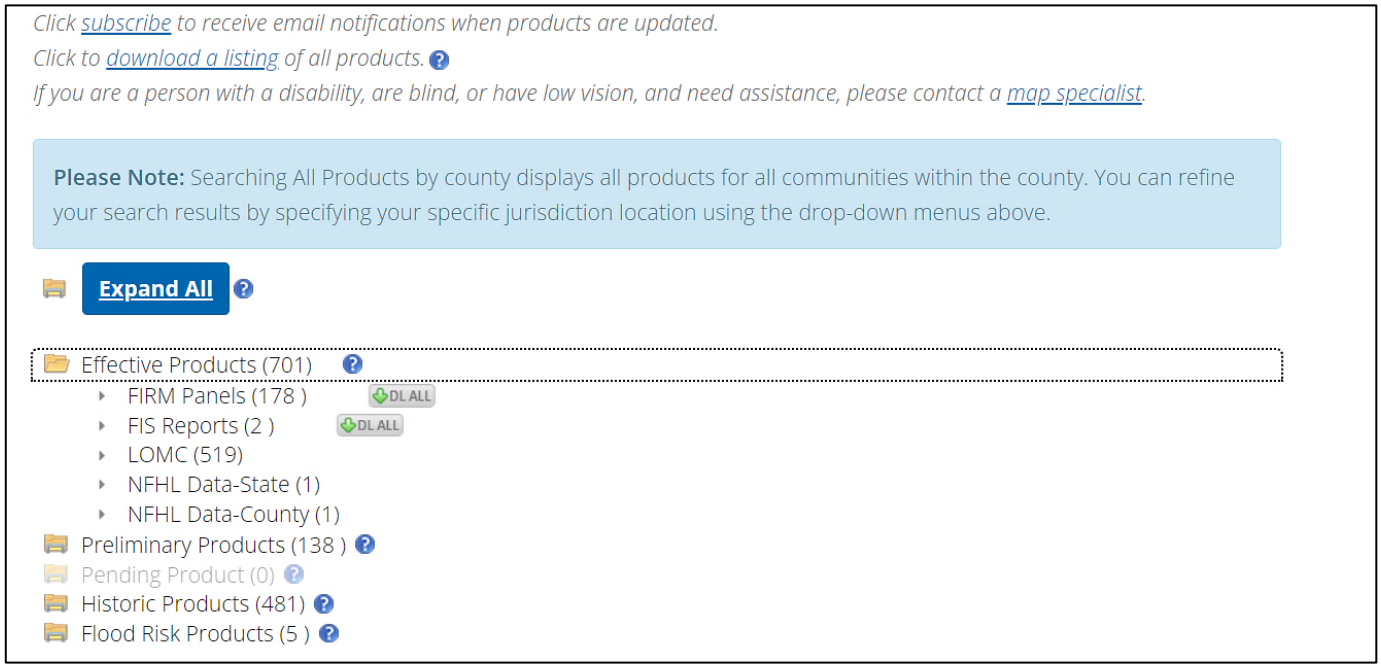


Figure 2.2: FEMA Products



3.2.2 Step 2: Find the 0.2% Annual Chance Flood Elevation

Ensure there is a FEMA study for your project location on the FIRM panel. If there is not, a manual floodplain calculation may be required. The FEMA FIRM panels are supplementary to determine and demonstrate the project's relevant flood hazard elevation as per the standards of the Resilience Guidance. The FEMA 0.2% annual chance flood elevation must be determined using the corresponding flood profiles or transect data found in the **Flood Insurance Study (FIS) Report**. If your project is within or close to a floodplain for which there is a FEMA study, determine whether the flood hazard is a product of coastal or fluvial flooding. Coastal flooding will correspond with transect lines and data while fluvial flooding will correspond with cross section and flood profiles (see cross sections and transect lines on the legend).

If your project is located close to a **cross section,** evaluate the flood profile for the relevant body of water to assess exposure to fluvial flooding. Take note of the name of the flooding source (river, stream, lake, etc.), and go back to the county FEMA products and open the preliminary or effective FIS Report. There may be several volumes, and you may need to open one and view the table of contents to determine which volume contains your relevant **flood profile**.

To locate your property on the flood profiles, refer to the FIRM panel and measure your property's distance between landmarks such as bridge or culvert crossings over the watercourse or between cross sections shown on the FIRM panel. Find your site on the flood profile for the corresponding watercourse using landmark or cross section measurements and locate the elevation of the 0.2% annual chance flood elevation

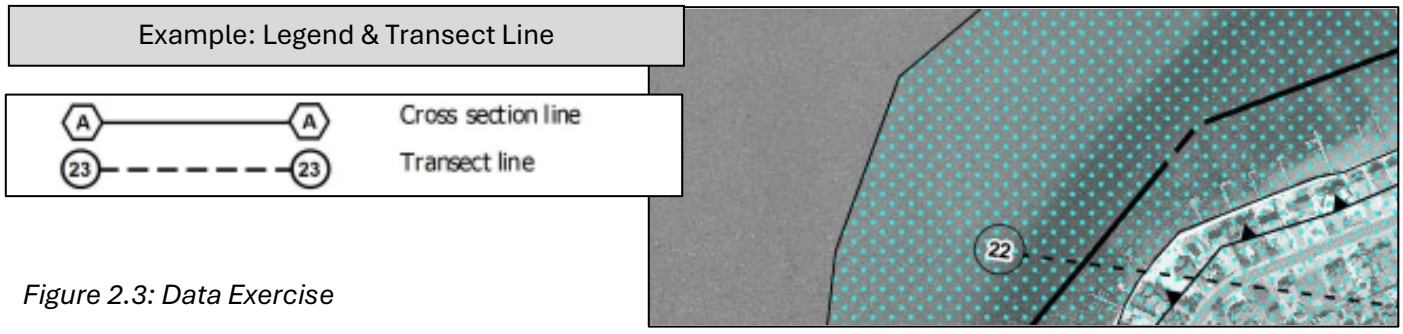
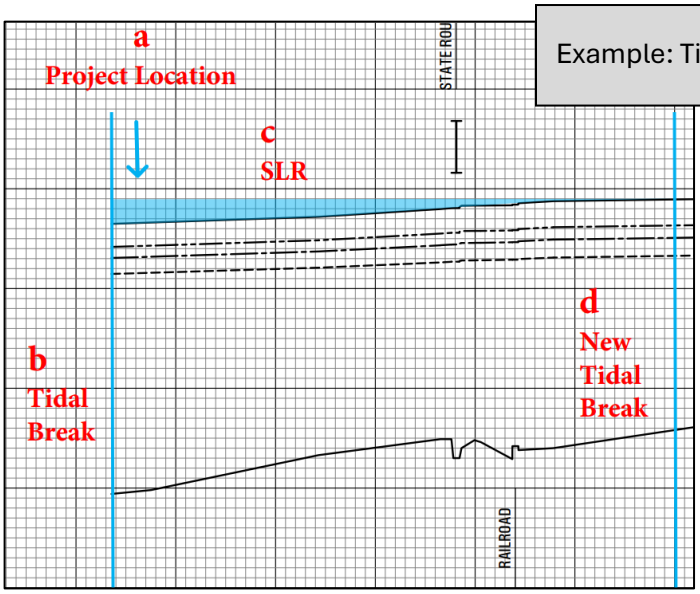


Figure 2.3: Data Exercise

.The FIS does not contain flood profiles for watercourses whose flood plains are tidally controlled. Flood profiles with intersecting flood sources might indicate, for example, that downstream flood is "controlled" by a coastal source such as a bay or the Atlantic Ocean. In these instances, flood elevations are printed in transect data tables in the FIS Report. The **tidal break** (b), where the tidal floodplain ends and the fluvial floodplain begins, must account for sea level rise. Add relevant feet of sea level rise (c) to the end of the flood profile at the tidal break and draw a straight line until it meets the .2% annual chance flood elevation, creating a new tidal break (d). If the project (a) is within this area, use transect data.

If your project is located close to a **transect line**, you will need to evaluate the coastal analysis in the FIS Report. Find the transect data in the county FIS Report and locate the closest transect line. Your project may be very close to two different transect lines with different flooding sources, such as a bay and the Atlantic Ocean. Check both transect lines and determine which or if both are relevant to the project location. Use topographic information, understanding of the project site, and the FEMA coastal analysis to determine which transect line and corresponding flood source must be used for the location. In the transect data table, use the Starting Stillwater Elevation to find the 0.2% annual chance flood.



Example: Tidal Break & Sea Level Rise

Example: Transect Data

Transect	Starting Wave Conditions for the 1% Annual Chance			Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations* (ft NAVD88)			
	Coordinates	Significant Wave Height	Peak Wave Period	10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
118	N 39.929239 W 74.136690	2.42	2.55	3.6 3.6 – 7.0	5.7 5.2 – 6.0	6.7 6.3 - 6.9	9.2 8.9 - 9.2
119	N 39.921574 W 74.107836	3.65	3.23	3.6 3.2 - 4.2	5.8 5.5 - 5.8	6.7 6.5 - 6.8	9.2 8.9 - 9.4
120	N 39.909061 W 74.124882	4.09	3.65	3.6 0.6 - 3.7	5.8 5.3 - 5.9	6.7 6.6 – 7.0	9.3 9.2 - 9.6
121	N 39.894594 W 74.133356	3.97	3.71	3.7 2.7 – 6.0	5.7 5.1 - 5.8	6.7 6.3 - 6.8	9.2 8.9 - 9.3
122	N 39.884630 W 74.139514	3.37	3.55	3.7 3.7 - 3.9	5.7 5.5 - 5.8	6.6 6.4 - 6.7	9.1 8.8 - 9.1
123	N 39.873173 W 74.130801	3.54	3.68	3.7 3.5 - 5.1	5.6 5.2 - 5.8	6.5 6.5 - 6.9	9.0 8.8 - 9.1

3.2.3 Step 3: Calculate the Flood Hazard Elevation

Once you find or manually calculate the 0.2% annual chance floodplain, add a safety factor to meet the standards of the guidance. Projects impacted by fluvial flooding must add one (1) foot safety factor to the 0.2% annual chance flood elevation. Projects impacted by coastal flooding must add sea level rise based on the project's planning horizon to the 0.2% annual chance flood. Review the guidance to find these sea level rise projections.

Fluvial Flood Hazard Elevation = 0.2% Annual Chance Flood Elevation + One (1) Foot

Coastal Flood Hazard Elevation = 0.2% Annual Chance Flood Elevation + Projected Sea Level Rise

In the Resilience section of the Project Report, include a description of the relevant flood hazard and the calculated elevation, the 0.2% annual chance flood elevation, and the data sources used to make the determination.

3.2.4 Step 4: Submitting Flood Hazard Supporting Documentation

Maps and supporting documentation are required in the Project Report to support flood hazard elevations and demonstrate the proposed project's exposure to flooding.

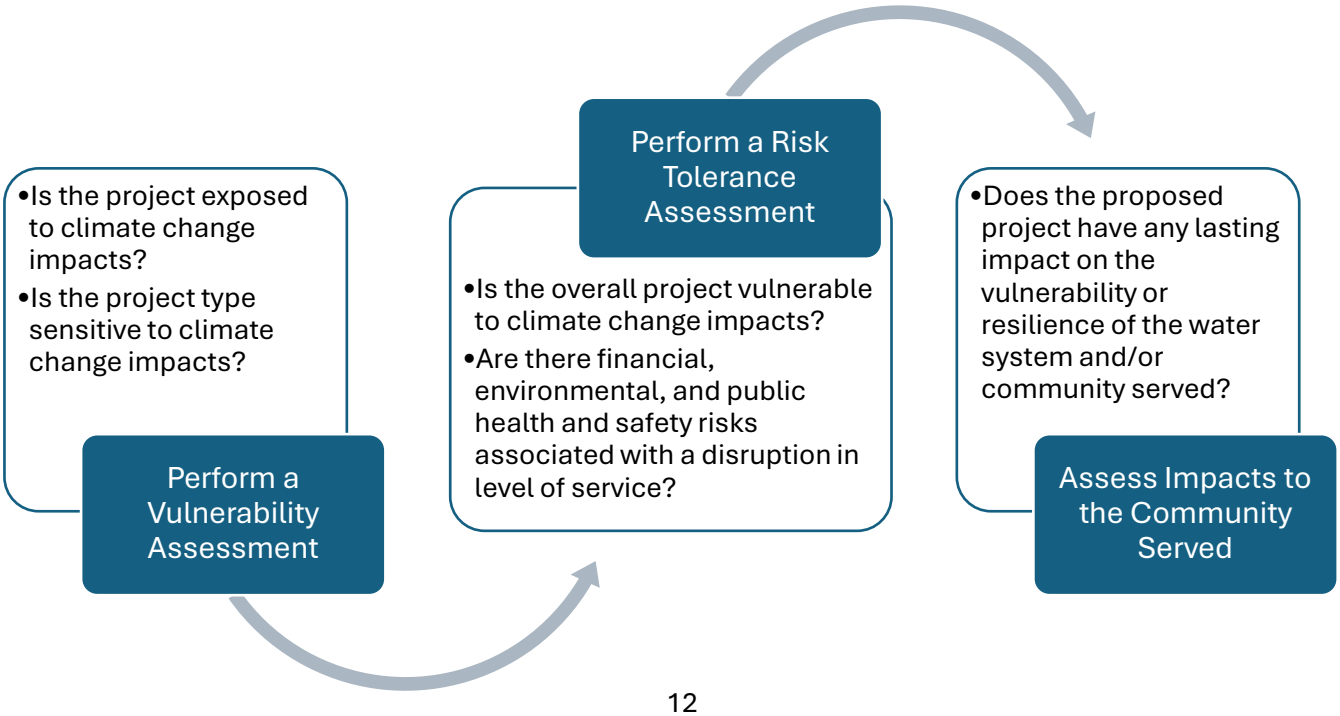
For supporting documentation, you may upload one or more of the following:

1. Upload the Project Report with relevant FEMA FIRM Panels, Flood Profiles, and Transect Data along with the methodology for calculating the project's flood hazard elevation. Use a pdf of the FEMA FIRM Panel to maintain picture quality and ensure the most recent FEMA data is used.
2. Upload a map with on-site topography provided by a professional surveyor and the extent of the calculated flood hazard.
3. Upload all supporting documentation to show the Sponsor's manually calculated floodplain in the case that FEMA analyses were not available.
4. Upload FEMA or New Jersey mapping documentation for the FHA BFE, if higher than the guidance standards.

4 PERFORMING AN EFFECTIVE RESILIENCE ASSESSMENT

The Resilience Guidance includes a comprehensive step-by-step for assessing resilience based on the proposed project's vulnerability, the risk tolerance of disruption in level of service, and its overall contribution to resilience for the system and area served. Depending on the project type and scope (see section 2), a Resilience Assessment may not be required. Furthermore, if the project is demonstrated to not be vulnerable to climate change impacts, a risk tolerance assessment may not be necessary. Use your best judgement, local expertise, and communication channels with the Program to develop an effective Resilience Assessment.

The Sponsor may use other technical and analytical approaches to evaluate resilience, such as the EPA's CREAT assessment. However, these analyses must include all components of the guidance. For example, using a tool that primarily focuses on financial risk will require supplemental analyses to determine environmental and public health and safety risks and the project's impact to system and community level resilience, where applicable. **Applicants are required to assess resilience of the proposed project, not the existing infrastructure.** This includes analyzing vulnerability of the proposed infrastructure, risk tolerance for disruption in level of service for the proposed project, and the proposed project's direct and indirect impacts to system and community resilience.

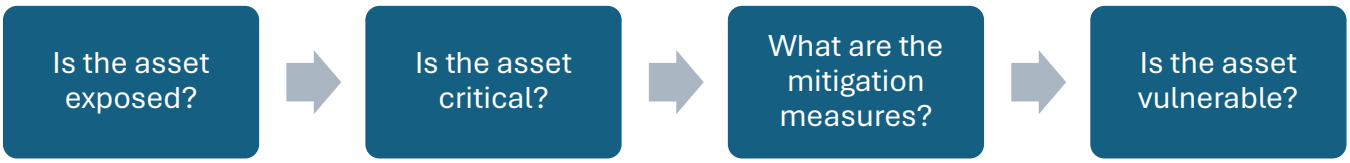


4.1 Assess Vulnerability

The vulnerability assessment is used to demonstrate the physical vulnerability of the infrastructure. Once you have determined that the project is exposed to climate change impacts and is sensitive to these impacts, you must justify the resilience of the project's components related to the facility's **Level of Service (LOS).** Critical infrastructure is expected to maintain a high LOS, as any failure can have severe consequences. This includes components that handle large volumes or serve critical health and safety functions, such as main treatment plants or main supply lines. If the project scope is connected to the overall operation of critical infrastructure, the LOS should refer to the operation of that facility, including measures such as system reliability, water quality, and compliance with regulatory standards.

You do not need to measure the elevation of each asset or group of assets. It is sufficient to state which assets are within the flood hazard elevation and which are not. Planning and design documents must reflect the Resilience Assessment for the proposed infrastructure.

1. **List assets and groups of assets (based on type and exposure).**
   a. If no assets within the project scope are exposed, provide flood hazard elevations and the elevation of the lowest component.
   b. If the project scope is connected to processes that are vulnerable to the flood hazard, summarize vulnerability and any future planned mitigation measures.
2. **Evaluate sensitivity, adaptive capacity, and vulnerability of exposed assets for the proposed infrastructure.**
   a. Determine each asset's or asset group's sensitivity to climate change impacts based on its level of criticality in maintaining LOS. Critical assets are those whose failure would result in significant disruptions. Use your best judgement, local expertise, or technical modeling.
   b. Assess adaptive capacity by considering the resilience of each asset's or asset group's design, the redundancy of critical systems, and the flexibility of operational procedures to withstand or quickly recover from flood events. This may include existing, proposed, or future planned mitigation measures. Use your best judgement, local expertise, or technical modeling.
   c. Determine the vulnerability of exposed assets and groups of assets based on sensitivity and adaptive capacity.



Here's a Tip!

1) Sponsors with frequent funding needs at a particular location such as a wastewater treatment plant should consider developing an **Asset Management Plan (AMP)** if they do not have one already. AMPs can be highly beneficial for long-term and project specific planning, including development of capital investment plans, project planning and design, and assessing vulnerability to climate change impacts. The Water Bank Program can fund development of AMPs. Visit the asset management website to learn more about best practices and the resources of the Department's Asset Management Program.

2) **Group assets** by type and/or location. For example, if several assets are contained within a building where the finished floor is above the flood hazard, group these assets.

4.2 Risk Tolerance

If the project or components of the project are found to be vulnerable to climate change impacts, determine whether there may be significant negative financial, environmental, and public health and safety risks, due to a potential disruption in LOS. If the project is connected to the overall operations of critical infrastructure, the risk tolerance assessment should evaluate the tolerance of risk for a disruption in LOS to that critical infrastructure. A risk tolerance assessment may not be required for projects with minimal environmental, financial, or public health impacts, projects operating in environments where existing regulations and controls effectively manage risk, or where potential disruptions have insignificant consequences. Conduct the following:

1. Identify LOS
2. Identify environmental, financial, and public health and safety consequences to a disruption in LOS
3. Evaluate risk tolerance per the Resilience Guidance or through other technical analyses

Putting it into Practice: Urban Landscaping and Green Infrastructure

Project Description: This project involves the enhancement of urban green spaces, including the installation of rain gardens, trees, and permeable pavement in a city's public park. The goal is to increase urban resilience to climate change by improving stormwater management and reducing the potential of combined sewage flooding and combined sewage overflows (CSOs).

Vulnerability Assessment Summary: The project is vulnerable to climate change impacts such as fluvial flooding and changing precipitation patterns. The 0.2% annual chance flood and irregular heavy rainfall might overwhelm newly designed rain gardens and permeable surfaces.

Assessment of LOS and Need for Risk Tolerance Assessment:

- **Level of Service (LOS):** In this context, LOS focuses on the management and collection of stormwater to reduce flows into the combined sewer system. The infrastructure is engineered to mitigate flood risks, manage stormwater at its source, and alleviate pressure on the city's sewage system during peak flow conditions. The primary function of the green spaces is supplementary in terms of urban infrastructure resilience and does not directly relate to critical infrastructure that impact public health and safety.
- **Disruption of Service:** Extreme precipitation and fluvial flooding could challenge the capacity of the installed green infrastructure, disrupting the effectiveness of stormwater management and leading to increased runoff and potential stress on the CSO system.
- **Consequences of LOS Disruption:**
    - **Environmental Impact:** There may be reduced effectiveness in stormwater management during extreme weather conditions, but the system is designed to minimize such events, and disruptions are expected to be manageable within existing urban infrastructure capacities.
    - **Financial Impact:** Financial risks are limited mainly to the costs of replacing plants or repairing the permeable pavement, which are relatively low and often part of routine maintenance budgets.
    - **Public Health and Safety:** The disruption in LOS does not endanger public health or safety directly, as these risks are mitigated by the design of the project to perform under varying climatic conditions, aimed at reducing such occurrences.

Given that the potential disruptions in LOS do not lead to significant environmental, financial, or health and safety risks, conducting an extensive risk tolerance assessment for this urban landscaping and green infrastructure project may not be necessary. The project's vulnerability to climate change, while present, results in inconsequential disruptions in LOS, allowing for standard maintenance and periodic adjustments rather than intensive risk mitigation strategies.

4.3 Impact Assessment

Your impact assessment will be highly qualitative, assessing the overall impact that the project has on the water system and the community served in terms of resilience. Use insights from the vulnerability and risk tolerance assessment, as well as an understanding of the vulnerability of the community served to climate change impacts to justify the net benefit of the environmental infrastructure project. An impact assessment may not be required for projects that are not vulnerable and do not have risks associated with a disruption in level of service but may be beneficial for a variety of projects to strengthen the argument for project need. For those with identified risks or vulnerabilities, this assessment is vital for demonstrating the project's net benefits, particularly within long term resilience strategies. Utilize resources like Municipal and Regional Comprehensive/Master Plans and Vulnerability Assessments, Long-Term Control Plans, and Asset Management Plans to evaluate community and water system vulnerabilities and articulate the project's contributions to resilience.

4.4 Justifying the Selected Alternative

Every Project Report should include resilience considerations in the alternatives analysis and a detailed summary of any analyses within the justification of the selected alternative, regardless of the scope of Resilience Assessment. If the project type does not have resilience concerns, state this in the justification.

The Resilience Assessment can be a supplemental tool in scoping alternatives, especially where resilience is a primary project objective. Use the analysis to explore how each alternative might avoid, minimize, or mitigate identified climate impacts. Balance these considerations with the project’s cost effectiveness, environmental impact, and feasibility to select your proposed alternative.

Checklist

This checklist serves as a roadmap for applicants preparing submissions for SRF projects. Climate change impact maps are required if the project is exposed or is in proximity to an impact. If a project isn't affected by these impacts, this should be clearly stated in the planning report. Applicants are also encouraged to consult with the program during pre-planning meetings to clarify specific resilience requirements. This checklist ensures all key components of your application are addressed for an effective, climate-resilient project proposal. You may submit this checklist with your planning report, including page numbers where the items can be found.

Mapping	**Page Number**
☐ Community Served	
☐ Existing and Proposed Locations of the Project	
☐ Current Mean Water Line	
☐ .2% Annual Chance Flood + 1 Foot and On-Site Topography	
☐ .2% Annual Chance Flood + Sea Level Rise and On-Site Topography Category 1	
☐ Hurricane Storm Surge Extent	
☐ Climate Change Impact Mitigating Infrastructure	

Resilience Assessment (if applicable)

- ☐ Project Details
- ☐ Description of the Impact of Extreme Precipitation Projections
- ☐ Vulnerability Assessment and Supporting Documents
- ☐ Risk Tolerance Assessment and Supporting Documents Description of
- ☐ Community Vulnerability
- ☐ Impact Analysis
- ☐ Resilience Considerations within the Alternatives Analysis Resilience
- ☐ Considerations within the Justification of Selected Alternative