



South Florida Military Resilience Strategy

Mission Assurance Through Community Resilience

September 2023



U.S. Department of Defense
Office of Local Defense
Community Cooperation



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Mission Assurance through Community Resilience

September 2023



Prepared for
U.S. Department of Defense
Office of Local Defense Community Cooperation

William Van Houten
Associate Director

By
South Florida
Regional Planning Council



Isabel Cosio Carballo, MPA
Executive Director
isabelc@sfrpc.com

Christina Miskis, AICP
Principal Planner & Project Manager
cmiskis@sfrpc.com

With Jacobs (with Aptim) and SFDA

Jacobs

Susanne M. Torriente
Global Principal, City Resilience
Jacobs Engineering
susy.torriente@jacobs.com



Rick Miller
Executive Director
South Florida Defense Alliance
rmiller@pharosmissioncritical.com

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For additional information or assistance, please contact:

Isabel Cosio Carballo, MPA
Executive Director
isabelc@sfrpc.com

Randy Deshazo, MA, MUP
Deputy Director and
Director of Economic Development & Research
rdeshazo@sfrpc.com

Christina Miskis, AICP
Principal Planner
cmiskis@sfrpc.com

Hailey Lazzaroni, MS
Regional Planner
hlazzaroni@sfrpc.com

South Florida Regional Planning Council
1 Oakwood Blvd #250
Hollywood, FL 33020

(954) 924-3653
<https://sfrpc.org/>

A full copy of this Study can be accessed at:

<https://sfrpc.org/south-florida-military-installation-resilience-review>

Letter from South Florida Regional Planning Council Director

Dear South Florida Stakeholders,

On behalf of the South Florida Regional Planning Council (SFRPC), it is my pleasure to share with you the *South Florida Military Resilience Strategy: Mission Assurance through Community Resilience*. This Strategy was made possible with generous financial assistance from the U.S. Department of Defense Office of Local Defense Community Cooperation (OLDCC) and the Florida Defense Support Task Force.

Over the last 18 months, the South Florida MIRR Project Team, comprised of Council Staff, Jacobs Solutions, and the South Florida Defense Alliance, has been working diligently in partnership with South Florida's Military Commands and other key stakeholders to identify risks, hazards, and vulnerabilities of concern "outside of the fence line" that potentially adversely impact the missions of the installations. This review was then followed by the development of resilience-enhancing investments and policy approaches to address vulnerabilities that benefit both the installation and community. This review assessed resilience challenges and opportunities of four key installations:

- **South Florida Ocean Measurement Facility**
- **U.S. Army Garrison-Miami/U.S. Southern Command**
- **Homestead Air Reserve Base**
- **Naval Air Station Key West**

This Strategy builds upon the robust body of data, policies, and adaptation planning programs developed by Miami-Dade and Broward counties, municipalities, South Florida Water Management District, research universities, and the Southeast Florida Regional Climate Change Compact. For more than a decade, these and other partners have worked diligently to expand research and knowledge and to develop best practices to increase climate resilience throughout Southeast Florida.

I would like to extend our sincere appreciation to OLDCC Program Manager William "Bill" Van Houten for his support, guidance, and encouragement throughout the lengthy application and planning process. Thank you also to the Military Installation Commanders and staff; Dr. Wesley Brooks, Florida's Chief Resilience Officer; our elected leaders and staff for their support and participation throughout this planning effort; and our Consultant Team. Lastly, thank you to the SFRPC Board for their enthusiastic support of this initiative over the last two years. As a result of South Florida's groundbreaking work, many of the state's regional planning councils are now spearheading regional Military Installation Resilience Reviews throughout Florida.

We look forward to quickly moving from this initial planning phase to implementation to ensure that South Florida's military installations can fulfill their critical missions long into the future. I am sure that I speak for everyone involved in the South Florida MIRR, that it is a great honor and privilege to be of assistance to our nation's heroes.

With sincere appreciation,

Isabel Cosio Carballo, MPA
SFRPC Executive Director

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While it is impossible to thank everyone individually that contributed to this effort and the creation of this strategy, we take this opportunity to thank the following institutions and key individuals who made this planning initiative possible. In addition to our funding partners, we would like to thank the Installation Commanders and staff for their hospitality, generous assistance, and many contributions so critical to this study. We also extend our sincere thanks to the South Florida MIRR Study Advisory Committee, Chief Resilience Officers Dr. Jennifer Jurado of Broward County, Jim Murley of Miami-Dade County, and Alison Higgins of the City of Key West, for their generous assistance and contributions of time and expertise.

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U.S. Coast Guard

Participating Installations

Homestead Air Reserve Base
Naval Air Station Key West
South Florida Ocean Measurement Facility
U.S. Army Garrison-Miami/U.S. Southern Command

South Florida MIRR Team

South Florida Regional Planning Council

Isabel Cosio Carballo, MPA, Executive Director
Christina Miskis, MURP, Principal Planner
Hailey Lazzaroni, Regional Planner

Federal Elected Officials & Staff - Florida

Senator Marco Rubio
Congressman Diaz-Balart, 26th District
Congressman Giménez, 28th District

State of Florida

Chief Resilience Officer Wesley R. Brooks, Ph.D.
Department of Transportation Districts IV and VI

Local and Regional Partners

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City of Dania Beach
City of Doral
City of Homestead
City of Key West
Town of Cutler Bay
Broward County
Miami-Dade County
South Florida Water Management District
South Florida Regional Planning Council

Consultant Team

South Florida Defense Alliance

Rick Miller, Executive Director
Pamela Berkowsky, Senior Executive Defense Consultant

Jacobs

Susy Torriente, Global Principal, City Resilience
Sarah Marrs, Senior Planner
Samantha Danchuk, Ph.D. (Aptim), Climate and Coastal Resilience Lead

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List of Terms

Adaptive Capacity Assessment: Identifies assets that are unable to respond and/or adapt to future conditions. Adaptive capacity is quantified by mapping installations and nearby emergency response facilities and critical access roads that may experience a flood depth greater than 2 feet.

After performing the aforementioned analyses, asset vulnerability scores are calculated, and assets are ranked, with those identified as critical and/or vulnerable included in the risk analysis.

Asset Adaptive Capacity/Redundancy: *Adaptive capacity* is the ability of an asset to accommodate climate changes (for example, the ease of which an electrical box can be elevated above the anticipated future flood elevation). *Redundancy* is defined as having additional/backup means of providing service (for example, backup electrical power generation or distribution).

Asset Sensitivity (also referred to as impact analysis): Impacts or disruption from the hazard on the asset (for example, electrical equipment is sensitive to flood inundation).

Blue Infrastructure: Stormwater infrastructure that temporarily stores and treats stormwater.

Community Resilience: Ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions.

Compound Flooding: Co-occurrence of several flood drivers, including storm surge, (non-storm) tidal flooding, groundwater flooding, and stormwater.

Ecological Disturbance: An event or force, of non-biological or biological origin, that brings about changes in the spatial patterning of an inhabited ecosystem. Disturbance plays a significant role in shaping the structure of individual populations and the character of whole ecosystems.

Economic Infrastructure: A type of intervention that promotes the financial well-being and security of a community. Can include changes that promote commercial corridors, support healthy businesses, improve the job market and wages, or enhance supply chain reliability.

Ecosystem Services: Benefits yielded to a community in the form of natural processes conducted by a healthy ecosystem.

Event Likelihood: Probability that the event will occur and impact the asset (for example, the likelihood of a specific sea level rise projection).

Exposure Analysis: To identify areas where mission-critical assets are exposed to each hazard, an exposure analysis is conducted by mapping the extent of each hazard and comparing these to asset locations to determine the proximity of the assets to each hazard. A numerical score is determined for asset exposure, with an asset exposed to a specific hazard receiving a value of one, and an asset not exposed receiving a zero.

Exposure: Degree to which a vulnerability provokes a change in conditions.

Feasibility Study: A detailed analysis that considers all of the critical aspects of a proposed project to determine the likelihood of it succeeding.

Green Infrastructure: Stormwater infrastructure that typically uses vegetation and/or soils to treat and reduce stormwater flows.

Greywater: Wastewater that comes from sinks, washing machines, bathtubs and showers. It contains lower levels of contamination, making it easier to treat and process.

Hazard Exposure: Proximity of the asset to the hazard (for example, asset inside of 100-year flood zone).

Impact Consequence: Effect of asset failure or service disruption (for example, inability to access a critical facility because of flooding making a roadway impassable).

Intervention: Specific action or group of actions that are executed to mitigate risk.

Military Installation Resilience: Capability to avoid, prepare for, minimize the effect of, adapt to, and recover from extreme weather events, or from anticipated or unanticipated changes in environmental conditions, that adversely affect, or have the potential to adversely affect, the military installation or essential transportation, logistical, or other necessary resources outside of the military installation that are necessary to maintain, improve, or rapidly reestablish installation mission assurance and mission-essential functions.

Natural Hazards: Natural phenomena that may have a negative effect on societies and the human environment; examples include hurricanes, sea level rise, rain bombs or extreme rainfall, and tidal flux.

Natural Infrastructure: Type of intervention that consists of natural elements or features that benefit both human well-being and the environment. Natural infrastructure can be implemented in a variety of environments, such as coastal, riverine, or desert regions, and can mitigate flood risk, attenuate wave energy, cool an area, or control erosion.

Physical Infrastructure Improvement: Any physical construction to reduce or avoid possible impacts of hazards, or application of engineering techniques to achieve hazard-resistance and resilience in structures or systems.

Physical Infrastructure: Type of intervention that includes projects done in the transportation, water, wastewater, power, stormwater, or communications sectors to reduce risk and enhance system reliability and resilience. Improvements to natural infrastructure are also in this category.

Policy Action: Any measure not involving physical construction that uses knowledge, practice, or agreement to reduce risks and impacts, particularly through policies and laws, public awareness raising, training, and education.

Resilience: Ability to survive, recover, adapt, and thrive from chronic and acute stresses.

Risk Assessment: Measure of Likelihood × Consequence.

Risk: Potential for negative impacts resulting from a natural hazard. Risk = Likelihood × Consequence

Sensitivity/Impact Analysis: To determine the impact a hazard has on an asset, its sensitivity to the hazard is identified and analyzed using methodologies accepted as common practice. The methodologies vary by hazard, and sensitivity thresholds vary by asset. At the time of this study, a robust method for analyzing extreme heat does not yet have a standard assessment practice published.

Shock: External, short-term deviations from long-term trends that have substantial negative effects on people's current state of well-being, level of assets, livelihood, safety, or their ability to withstand future shocks. Shocks can be slow onset (such as drought) or relatively rapid onset (such as flooding, disease outbreak, or market fluctuations).

Social Infrastructure: Type of intervention that consists of the services and assets that benefit a community, such as emergency services, affordable housing, and education. Interventions for social infrastructure improve these assets and services.

Social Vulnerability: Susceptibility of social groups to adverse impacts of natural hazards. Social Vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

Socio-environmental: Mutually dependent relationship between human and ecological systems: human behavior, decisions, and policies influence the health of ecosystems and, in turn, changes in ecosystems affect human resources and opportunities.

Stress: Long-term trends or pressures that undermine the stability of a system and increase vulnerability within it.

Threats: Potential negative interaction of natural hazards with natural, physical, economic, or social systems.

Vulnerability: System that is susceptible to a threat – defined as interplay between sensitivity, exposure, and adaptive capacity. Vulnerability = (Exposure × Sensitivity) / Adaptive Capacity

Abbreviations and Acronyms

AFB	Air Force Base	mph	Mile(s) Per Hour
AOR	Area of Responsibility	MPO	Metropolitan Planning Organization
APZ	Accident Potential Zone	N/A	Not Applicable
ATMO	Atlantic Targets and Marine Operations	NASKW	Naval Air Station Key West
BASH	Bird Air Strike Hazard	NAVFAC	Naval Facilities Engineering Systems Command
BBSEER	Biscayne Bay Southeastern Everglades Ecosystem Review	NFWF	National Fish and Wildlife Federation
BERT	Bus Express Rapid Transit	NNBF	Natural and Nature-Based Feature
BFE	Base Flood Elevation	NOAA	National Oceanic and Atmospheric Administration
BRIC	Building Resilient Infrastructure and Communities	NOFO	Notice of Funding Opportunity
BRT	Bus Rapid Transit	NSU	Nova Southeastern University
CDBG	Community Development Block Grant	OLDCC	Office of Local Defense Communities Cooperation
CIF	Critical Infrastructure Facility	OPAREA	Operating Area
CSRM	Coastal Storm Risk Management	P3	Public-Private Partnership
DAR	Defense Access Road	RAISE	Rebuilding American Infrastructure with Sustainability and Equity
DARPA	Defense Advanced Research Projects Agency	RCAP	Regional Climate Action Plan
DCIP	Defense Community Infrastructure Pilot	REPI	Readiness and Environmental Protection Integration
DoD	Department of Defense	RO	Reverse Osmosis
DOE	U.S. Department of Energy	ROW	Right Of Way
EECBG	Energy Efficiency and Conservation Block Grant	SAC	Study Advisory Committee
EEL	Environmentally Endangered Lands	SDDC	Surface Deployment and Distribution Command
EFAC	Emergency Family Assistance Center	SFDA	South Florida Defense Alliance
EUL	Enhanced Use Lease	SFOMF	South Florida Ocean Measurement Facility
EWN	Engineering With Nature™	SFRPC	South Florida Regional Planning Council
FAA	Federal Aviation Administration	SFWMD	South Florida Water Management District
FAU	Florida Atlantic University	SLR	Sea Level Rise
FDEM	Florida Department of Emergency Management	SMR	Small Modular Reactor
FDEP	Florida Department of Environmental Protection	SOF	U.S. Special Operations Forces
FDOT	Florida Department of Transportation	SRF	State Revolving Fund
FEMA	Federal Emergency Management Agency	TNC	The Nature Conservancy
FHWA	Federal Highway Administration	UFC	Unified Facilities Criteria
FO	Forward Osmosis	USACE	U.S. Army Corps of Engineers
FPL	Florida Power & Light	USAF	U.S. Air Force
GOV	Government Owned Vehicle	USAG	U.S. Department of Agriculture
GRIP	Grid Resilience and Innovation Partnerships	USCG	U.S. Coast Guard
HARB	Homestead Air Reserve Base	USCGC	U.S. Coast Guard Cutter
HMGP	Hazard Mitigation Grant Program	USDOT	U.S. Department of Transportation
HUD	Department of Housing and Urban Affairs	WBGT	Wet Bulb, Globe Temperature Index
INFRA	Infrastructure for Rebuilding America	yd ²	Square Yard(s)
JIATF-S	Joint Interagency Task Force – South		
MIRR	Military Installation Resilience Review		

Executive Summary



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Executive Summary

The South Florida Military Installation Resilience Review (MIRR) spans three counties and four key installations, including Naval Air Station Key West, Homestead Air Reserve Base, U.S. Southern Command (co-located with U.S. Army Garrison-Miami), and the South Florida Ocean Measurement Facility. With funding from the Department of Defense Office of Local Defense Community Cooperation, the MIRR identified the risks, hazards, and vulnerabilities – outside the fence line of the installations – related to the ability of the military to carry out its missions. The process identified adaptation *interventions* (a specific action or group of actions that are executed to mitigate risk) and investments to promote mission resilience. Consistent with State of Florida guidance, 2040 and 2070 projections were used to forecast the shocks and stresses the installations and their surrounding communities face.

A very well-attended project kickoff and visioning session took place in May 2022 at the U.S. Southern Command Headquarters. At that time stakeholder mapping, engagement, and data collection began. Over the summer, the project team conducted four site visits with tours and work group meetings with installation planners, municipal leaders, and utility providers for fact finding and data collection.

Over the last 16 months, the Jacobs project team has successfully engaged many stakeholders including leadership from four installations, leadership (elected and appointed) from three counties (Broward, Miami-Dade, and Monroe) the four home cities (Dania Beach, Doral, Homestead, and Key West) and the local utility providers (water, energy, and communications). State representatives, the state chief resilience officer, and Congressional delegate staff participated in the Study Advisory Committee (SAC).

“A big Thank You to the military installation resilience review [team]- the relationship between military and community planners has been developed and is growing. Military readiness and mission assurance through community resilience is achieved through regional planning, cooperation and investments. Increasing resilience at these regional facilities better enables SOUTHCOM's component commands and mission reliance on these critical locations.”

— **General Laura Richardson**
Commander
U.S. Southern Command

The vulnerability assessment completed in the fall of 2022 identified top shocks and stresses affecting the region and the installations' mission readiness. These include sea level rise (SLR) and flooding, extreme heat, shoreline erosion, energy and fuel supply stress, and affordable housing.

To address these vulnerabilities, recommendations range from formalized cooperative planning to investments for shoreline protection, stormwater management, roadway enhancements, resilient utilities, Complete Streets improvements, land management, resilience, and affordable housing at a rough order of magnitude value of approximately \$90 million. The resilience plan for each installation includes a funding strategy aligning grant opportunities with actionable projects that will ensure the military installations and surrounding communities survive, recover, adapt, and thrive. Building military mission assurance through community resilience is South Florida's roadmap to a secure future.

The Good News

Over the last several years, both the U.S. Congress and the Department of Defense (DoD) have acknowledged the important connections between **climate resilience** and **national security**, especially as it pertains to the protection of military facilities and installations through mitigation and adaptation measures. More recently, both institutions have recognized the vital importance of community resilience, enabling the expenditure of defense dollars outside the fence line through targeted legislation such as the Defense Access Roads Authority and innovative programs such as Office of Local Defense Communities (OLDCC) MIRR grants.

For more than a decade, South Florida has been at the forefront of climate and resilience planning, policy development, and technology, leveraging the critical expertise of its public, private, and non-profit sectors. As a non-traditional defense community, however, South Florida's military installations had not routinely been involved in those deliberations. As a result of this MIRR effort, there is now greater civil-military engagement and integration in South Florida's municipal and regional resilience arenas. There are also potential new funding opportunities for local governments seeking funding for infrastructure that provides a resilience co-benefit to an adjacent military installation. National security considerations have also become an important element in the prioritization of both funded and unfunded community resilience projects and investments.

This project takes the necessary and proactive step of outlining manageable, incremental projects that protect South Florida installations and communities against increasing threats. In addition to bringing stakeholders together to work collectively, the project team identified many instances of current

and ongoing resilience efforts and initiatives. The good news is these locations, communities, and efforts provide a solid foundation for continued mission assurance.



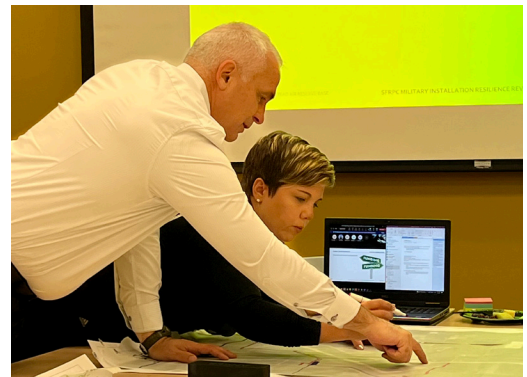
Reviewing Strategy



Observing Conditions



Organizing Communication Outreach



Identifying Key Factors

South Florida Region Overview

South Florida is more naturally resilient than may seem at first glance. The region experiences extreme storms less often than other locations in the State of Florida. Hurricanes track less than half as often in South Florida when compared to northwest Florida or other southeastern and gulf coastal states (NOAA 2022d). The area also has an abundance of natural infrastructure. From the Everglades, Biscayne Bay, Big Cypress Preserve, coastal ridgelines, and connecting waterways, the region's naturally occurring infrastructure protects the built environment. This means the region is a prime location to continue to invest.

Local communities in South Florida have actively engaged in strategic planning and undertaken significant investments for more than a decade to prepare for and respond to foreseeable threats

from climate change and SLR. Extensive resilience leadership and planning operations within Broward, Miami-Dade, and Monroe counties, taken individually and collectively through the four-county Southeast Florida Regional Climate Change Compact, provide a coordinated regional response to shared vulnerabilities and benefits to the entire region. In summary, South Florida is a resilient community ready to thrive and adapt to changing conditions including, but not limited to, natural threats, economic crisis, and pandemics. South Florida also benefits from a vibrant and growing economy with an appetite for strongly investing in resilience. This is the foundation from which this military resilience strategy is built. The following text summarizes the vulnerability assessment of the study areas surrounding the four installations that are the subject of the South Florida MIRR.



Thank You MIRR Team!

INSTALLATION PROFILE: South Florida Ocean Measurement Facility

Dania Beach, Florida



SFOM North Site at the Port Everglades Inlet

The South Florida Ocean Measurement Facility (SFOM) is located on the south side of the Port Everglades inlet in the City of Dania Beach. The land it occupies sits within the Dr. Von D. Mizell-Eula Johnson State Park. The primary mission of the SFOM is to perform research in the deep sea range – this range contains the Navy's only shallow and deep water electromagnetic research and development ranges. The installation also performs technology testing and monitoring of environmental and aquatic conditions in the region.

The SFOM's primary mission is supported by a set of underwater cables that travel from the installation to the ranges in the Atlantic Ocean, without which the one-of-a-kind research could not be done. The installation is also dependent upon the roadways that connect it to the mainland, the seawalls around the installation, the jetty to the east, and the communications infrastructure outside the fence line. The installation has two sites, connected by North Ocean Drive, and is accessed from the mainland by Dania Beach Boulevard. The seawalls that border the installation protect it from erosion and flooding. The jetty on the east side of the installation provides erosion protection as well as community benefits.



North Ocean Drive and Surrounding Wetlands



Utility Infrastructure

Vulnerability Assessment Findings

Natural infrastructure around the SFOMF provides benefits to the installation. While the unique water-adjacent location of the SFOMF increases the installation's vulnerability to flooding, it also offers protection from encroachment at the inlet. The sand dunes adjacent to SFOMF provide higher-frequency storm surge protection along the oceanfront. As identified during the workshops and vulnerability assessment, there are multiple vulnerabilities facing the installation.

The primary mission critical vulnerability is erosion due to wave action and lack of maintenance on the beach shoreline protecting the underwater cables. Located south of the inlet and jetty, the shoreline is rapidly eroding and past renourishment efforts have not always restored the critical area on a consistent basis.

Secondary mission critical vulnerabilities include flooding of North Ocean Drive (due to tidal, storm surge, and SLR), erosion occurring at the seawall and jetty, and high winds damaging power transmission lines during storm events.

The seawall along the installation is damaged in multiple areas. There is erosion and damage (exposed rebar) along the seawall, suggesting potential failure of the seawall during future storm events.

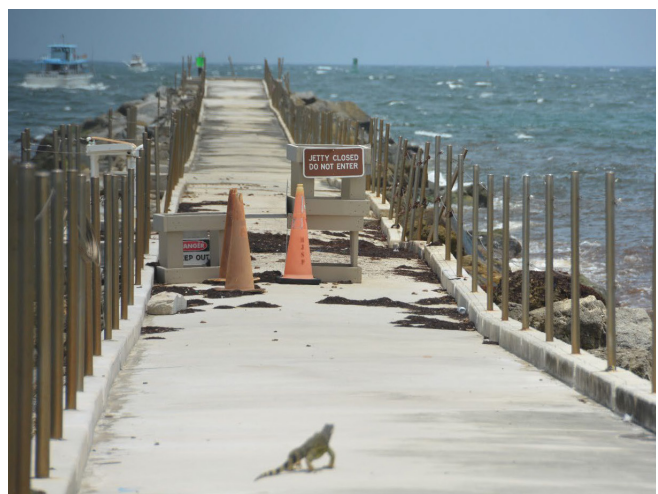
Mission-supportive vulnerabilities include aging communication junction boxes on Franklin Street, which support the communication between the staff onsite and the personnel in the deep sea equipment. They also include erosion of the shorelines southeast of the installation, and the underperformance of the wetlands and stormwater canals between the north and south sites.



Eroded Seawall



T-Groins and Beach with Critical Cables



Damaged Jetty

Resilience Plan

To address these vulnerabilities, the South Florida MIRR proposes the following projects.



A Joint Participation Agreement (JPA) is recommended to leverage existing

relationships between area stakeholders to provide formal structure and space for planning and coordinating the other projects. The JPA can advocate for mutually beneficial changes in policy, planning, design, construction, and maintenance of the environments shared by the stakeholders. Funding can be pursued through this avenue as well.



The Shoreline Protection project will protect the critical cables

between the installation and the testing ranges, which will promote sustained mission assurance. The cables will be protected through a combination of beach renourishment, reconstructed seawall, and restored habitat. Interventions identified in the project will also help installation staff access the beach and jetty and restore habitat using a hybrid approach of traditional and nature-based solutions. The hybrid approach will restore habitat and improve water quality.



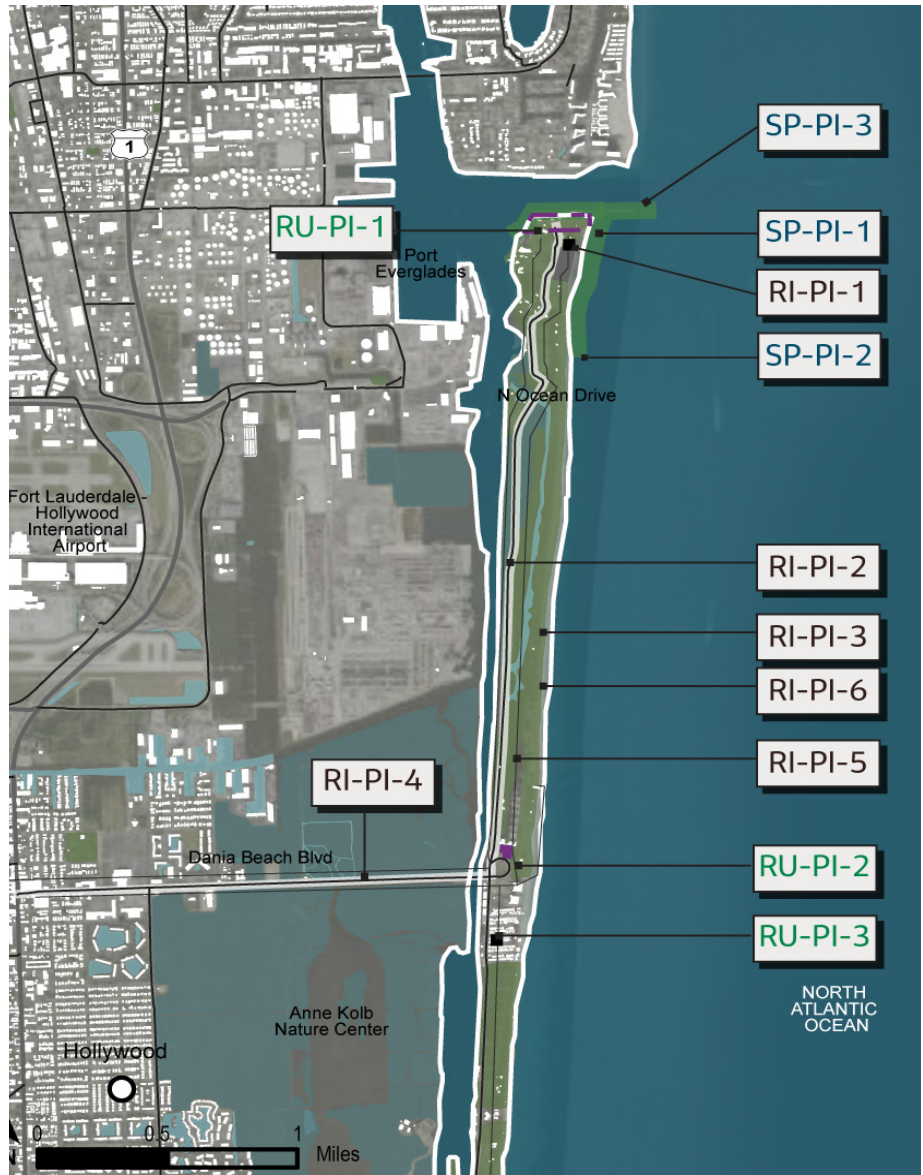
The Roadway Improvements project will address flooding and accessibility of roadways, particularly on North Ocean Drive, and protect the wetlands.

Roadway accessibility will be improved by elevating the roadway and connected areas. This work will be accompanied by the incorporation of green infrastructure in the roadway projects and reconstruction of the wetlands. In addition to improving water quality and providing habitat, this



The Resilient Utilities project will ensure continuation of SFOMF's secondary mission and mission supportive assets – the electrical power and communications

services that support the installation. Hardening and replacing the aged, outside the fence line communications infrastructure and hardening the critical power infrastructure will enhance service reliability.

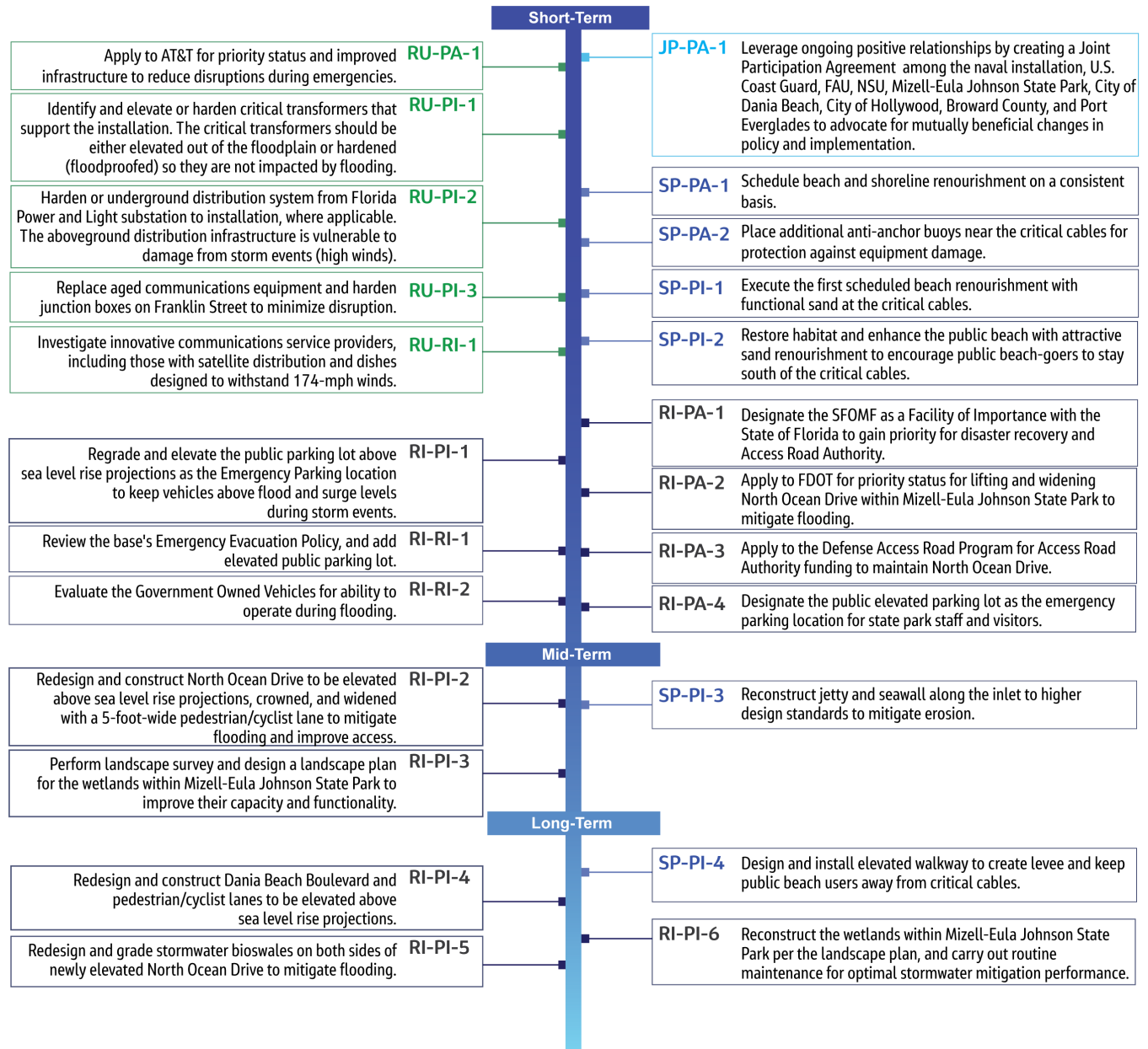


SFOMF Resilience Plan

project will improve access to the other facilities on the peninsula: the Nova Southeastern University campus, the U.S. Coast Guard (USCG) Station, and the state park amenities.

Project Timeline

The component interventions of all SFOMF projects were plotted on an implementation timeline to define when the project pieces would be carried out. There are three categories within the timeline: short-term, indicating 0 to 3 years, mid-term, indicating 4 to 7 years, and long-term, indicating 8 to 15 years. Refer to Sections 6 and 7 for full project details and funding options.



LEGEND

- Project Name
- JP Joint Participation Agreement
 - RU Resilient Utilities
 - SP Shoreline Protection
 - RI Roadway Improvements

- Intervention Type
- PA Policy Action
 - PI Physical Infrastructure
 - RI Recommendations to Installation

JP-PA-1

Project Name Intervention Type Project Number

INSTALLATION PROFILE: USAG-Miami/SOUTHCOM

Doral, Florida

U.S. Army Garrison-Miami (USAG-Miami) and U.S. Southern Command (SOUTHCOM) are co-located in Doral, Florida. The primary mission of SOUTHCOM is to provide contingency planning, operations, and security cooperation in Central America, South America, and the Caribbean. In addition, SOUTHCOM is responsible for protecting U.S. military resources in these locations and defending the Panama Canal. The installation is crucial for protecting the United States and its interests in Central and South America.

SOUTHCOM's primary mission is dependent upon the power lines, both connected and adjacent, that provide the installation with electrical service. Mission assurance depends on the provision of continuous power without disruption from Florida Power & Light (FPL).

The installation also relies on other utilities, including water supply lines and wastewater conveyance and treatment facilities, and the roadways that personnel utilize to access the installation. Water supply, furnished by the Miami-Dade County Water and Sewer Department (WASD), provides installation personnel with potable water via a network of water distribution lines. Wastewater service, also supplied by WASD, helps the installation maintain sanitary facilities. Wastewater service is supported by wastewater lines and lift stations that convey wastewater to the Central District Wastewater Treatment Plant on Virginia Key. Critical roadways that are used for daily access to the installation include SR 826, 87th Avenue, 33rd Street, and 35th Lane. Additionally, the installation also relies on the community to house its workforce. SOUTHCOM staff live throughout Miami-Dade County and commute to the base using these roadways.



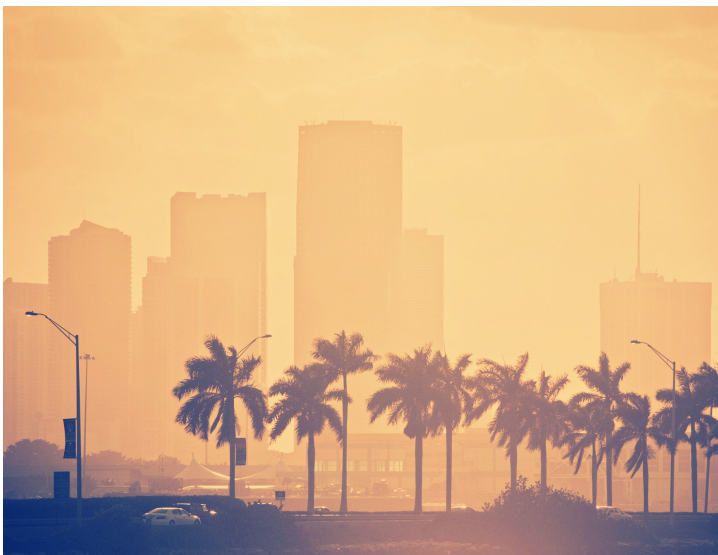
USAG-Miami/SOUTHCOM Headquarters



General Laura Richardson Addressing the SAC Stakeholders



Wood Utility Poles



Urban Heat Island

Vulnerability Assessment Findings

The USAG-Miami/SOUTHCOM study area has few areas of high risk – localized at critical points as opposed to large areas of risk. Stakeholders communicated that this installation site was originally selected for its location within the nation, which is highly resilient within the region. The finding of limited risk aligns with pre-assessment expectations for vulnerability severity, and speaks to the local municipality and County's active adaptation efforts. This includes flood depths likely being manageable with mitigation and adaptation measures. Additionally, the ongoing and planned projects of the service providers should mitigate some identified risks for utilities.

Stakeholder workshops and the vulnerability assessment identified hazards to which the installation is exposed that can impact mission assurance. The primary mission critical vulnerability is the loss of electric power at the installation.

Secondary mission critical vulnerabilities identified are flooding of water supply lines and lightning and storm surge (traveling inland through canals) damaging wastewater lift stations. Due to the industrial nature of the surrounding community, there is also an urban heat island effect.

Additional important vulnerabilities were identified during engagements. The lack of affordable housing and high cost of living in the region is causing high turnover and low workforce availability, putting stress on SOUTHCOM's ability to execute its mission. Typical support amenities found on larger military installations, such as groceries, pharmacies, and childcare facilities, are not available inside the installation fence line and must be sourced from the wider community. The City of Doral is actively engaged in planning for Complete Streets and bike and pedestrian improvements. Doral has prioritized safe access improvements and this effort can be built on.

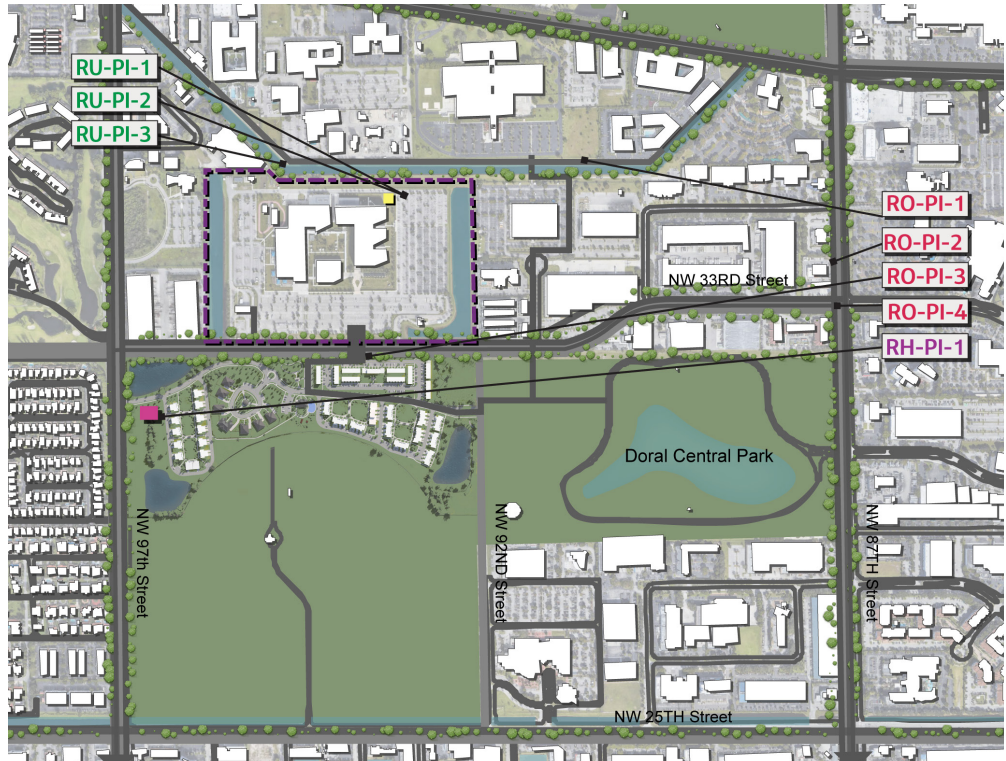
Resilience Plan

To address these vulnerabilities, the South Florida MIRR proposes the following projects.


 The **Resilient Utilities** project is recommended


to enhance utility service continuity to the installation, which will promote sustained mission assurance. By building on the existing efforts of FPL, WASD, and Miami-Dade County to strengthen the physical supporting infrastructure, a more resilient utility service for the installation can be achieved. Hardening the electric power infrastructure – distribution lines and transformers – can protect it from the effects of high wind and flood hazards. Similarly, hardening and elevating the wastewater lift stations can protect those assets from lightning and flooding.

 The **Right-of-Way Improvements** project builds upon the City of Doral's current efforts and will improve access to the installation and reduce the urban heat island effect in the area. Adding bike trails can connect the installation to existing City of Doral bike infrastructure, improving connectivity to surrounding amenities. Construction of a new pedestrian crossing between the new housing development and the installation will also spur connectivity and safe access to SOUTHCOM for personnel. Updating the City of Doral's Complete Streets plan to include installation-adjacent road segments will improve the transit access and reduce the urban heat island effect with the addition of shade trees and infiltration planters.



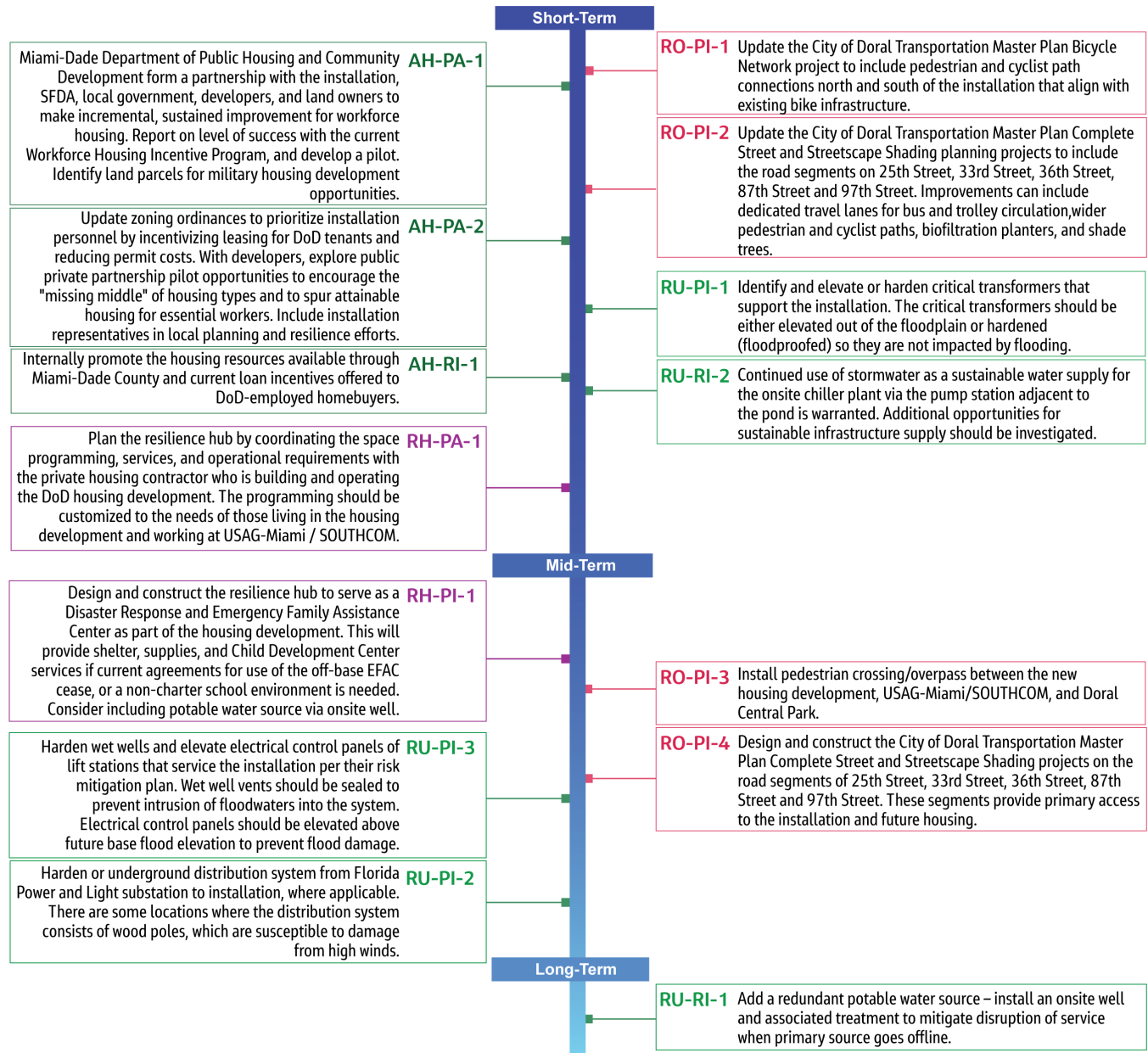
USAG-Miami/SOUTHCOM Resilience Plan

 There is an **Affordable Housing** project already underway that will improve the availability of affordable housing near the installation. It will be built on land leased by the Federal Aviation Administration and adjacent to the installation. In addition to the housing project, the installation should partner with the City of Doral on zoning ordinances to incentivize leasing for DoD tenants. These projects will make it easier for installation personnel to live closer to work, reducing the burden associated with long commutes and high costs of living. Partnerships can also be identified with local stakeholders to make incremental, sustained improvements to workforce housing in the region.

 The addition of a **Resilience Hub** in the proposed housing development can improve the installation's disaster preparedness and its response to climate hazards. The design and construction should be coordinated with the housing development contractor to create a place that provides shelter, supplies, and services such as childcare, for the installation personnel residing in the housing development.

Project Timeline

The component interventions of all USAG-Miami/SOUTHCOM projects were plotted on an implementation timeline to define when the project pieces would be carried out. There are three categories within the timeline: short-term, indicating 0 to 3 years, mid-term, indicating 4 to 7 years, and long-term, indicating 8 to 15 years. Refer to Sections 6 and 7 for full project details and funding options.



LEGEND

Project Name		Intervention Type	
AH Attainable Housing	PA Policy Action	RU Resilient Utilities	PI Physical Infrastructure
RO ROW Improvements	RI Recommendations to Installation		
RH Resilience Hub			

AH-PA-1		
Project Name	Intervention Type	Project Number

INSTALLATION PROFILE: Homestead Air Reserve Base Homestead, Florida



HARB Aerial View

Homestead Air Reserve Base (HARB) is located adjacent to Homestead, Florida. The City of Homestead is experiencing rapid development and the installation itself is just a few miles from the coastline. HARB's primary mission is to provide aviation support for advanced fighter mission – its mission critical assets include the runways and the hangers that support the operations of the 482nd Fighter Wing.

HARB's primary mission relies upon the G-95 stormwater canal, which conveys stormwater from Homestead and the installation to Biscayne Bay, and Biscayne Drive and Tallahassee Road, which are the primary access roads for the installation. Mission assurance depends upon keeping the base dry via the regional stormwater system, run by the South Florida Water Management District (SFWMD), and 482nd personnel being able to access the installation.

The installation depends on a variety of secondary mission critical assets to execute its mission. The power supply for the base is supplied by FPL and comes from the Turkey Point Nuclear Power Plant. Potable water for the installation comes from the Naranja Lakes and Leisure City water treatment plants through a vast network of transmission and distribution infrastructure. Wastewater leaving the installation is treated at the South District Wastewater Treatment Plant.

Similar to SOUTHCOM, HARB relies on the community to house its workforce; 482nd personnel commute from communities near and far to reach the installation.

Vulnerability Assessment Findings

Many positive findings were apparent in the assessment. The coastal ridge adjacent to HARB protects utilities west of the installation and limits the extent and severity of inundation. While development density in Homestead is growing, it does not currently affect the mission or present noise implications for current F-16 or future F-35 operations at HARB. Extensive resilience planning operations within Miami-Dade County may benefit the concentrated county assets in the HARB study area. Additionally, shared vulnerabilities in the area may prompt coordinated responses across jurisdictions.

The onsite stormwater pump efficiently drains the runway area to the SFWMD G-95 canal and flood control system and to Biscayne Bay. SFWMD has initiated planning for maintaining level of service in this area under future conditions. Proximity to the bay and Everglades National Park mitigates current storm-related and encroachment risks.

The MIRR workshops and vulnerability assessment identified vulnerabilities to which the installation is exposed that can impact mission assurance. There are two primary mission critical vulnerabilities: storm surge and SLR on the G-95 canal, and flooding on Biscayne Drive and Tallahassee Road. Because the G-95 canal drains stormwater from the airfield, if it were to become flooded from surge and SLR, the airfield would be inoperable. Biscayne Drive and Tallahassee Road must be passable, as they are the primary roads connecting HARB to its workforce.

The secondary mission critical vulnerability is high wind speeds at the power distribution lines, which can disrupt power service to the installation. Vulnerabilities for mission supportive assets include storm surge and SLR overtaking the capacity of the regional wetlands and stormwater canals.

Additional known vulnerabilities for the installation include high turnover and low workforce availability, potential encroachment on the accident potential zones (APZs), and lack of onsite redundant utility services. The high cost of living and lack of affordable housing in the area has forced installation personnel to commute from farther away. If unchecked, the rapid growth in the surrounding areas can impinge on the APZs, posing a danger to both pilots and community members.

The installation faces an additional challenge – there is currently a lack of redundant service for potable water, wastewater, and power onsite. In the event of a service disruption, the installation may be out of a critical utility service.



SFWMD Stormwater Canal



Turkey Point Nuclear Power Plant



Heavy Rainfall

Resilience Plan

To address these vulnerabilities, the South Florida MIRR proposes the following projects.



A **Joint Participation Agreement** is recommended to leverage existing relationships between area stakeholders to provide formal structure and space for planning and coordinating the other projects. The JPA can advocate for mutually beneficial changes in policy, planning, design, construction, and maintenance of the environments shared by the stakeholders. Funding can be pursued through this avenue as well.



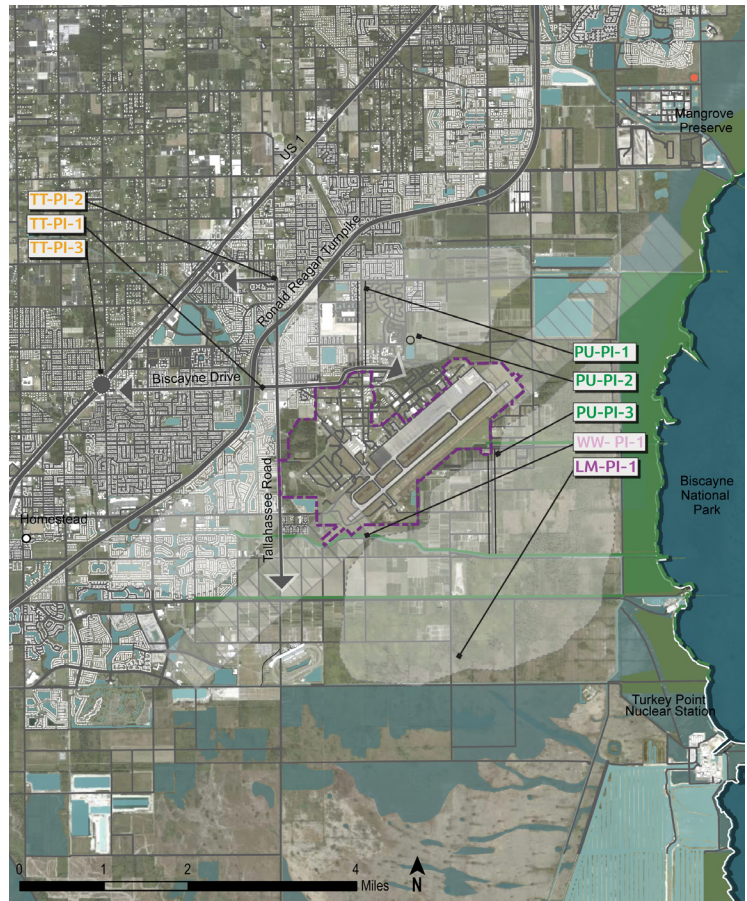
The **Transit and Transportation** project will address the inaccessibility of primary access roads due to flooding and provide alternative transit options for installation personnel with long commutes. To address the primary mission critical roadway flooding vulnerabilities, Miami-Dade County should commission a planning study on Biscayne Drive and Tallahassee Road that focuses on flood risk mitigation and Complete Streets design. The projects resulting from this study will alleviate the flooding challenges. The Complete Streets design, coupled with a Bus Rapid Transit stop on Biscayne Drive, will connect the installation to Miami-Dade County's ongoing rapid transit program and can ease the commute burden on personnel.



To address the mission critical stormwater flooding in canals, the **Natural Infrastructure** project will utilize existing efforts by SFWMD and the U.S. Army Corps of Engineers. SFWMD is already developing watershed resilience projects in the region. HARB should engage with these projects and other ongoing studies in the region, such as the Biscayne Bay and Southeastern Everglades Ecosystem Restoration study and the Miami-Dade Back Bay Study. Coordination with these efforts will ensure HARB is represented when decisions are being made. In addition, HARB can recycle stormwater for various uses, thereby reducing the base's potable water demand and benefiting it during periods of scarcity.



The **Power Utilities** project will mitigate the impacts of hazards on supporting power infrastructure and improve electrical service reliability. FPL should harden or move underground the supporting distribution



HARB Resilience Plan

infrastructure and harden or elevate critical transformers, as well as install an automated switch at the offsite substation to ensure service continuity.



The **Water and Wastewater Utilities** project can address the additional known vulnerabilities stemming from a lack of redundant water and wastewater service. WASD will connect the installation to a proposed wastewater line, providing a redundant connection. In addition, a variety of initiatives (e.g., recycling both stormwater and greywater for non-potable demands and using an onsite well as a backup potable water source) can address the lack of redundant potable water service.



The **Land Management** project will address the mission supportive land use and encroachment concerns around the base. Miami-Dade County and HARB should work together on a study that confirms the compatible land uses and defines the various forms of encroachment. These definitions can be incorporated into Miami-Dade County's land use plans and codes and enforced, subsequently protecting the installation from this threat.

Project Timeline

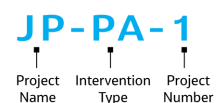
The component interventions of all HARB projects were plotted on an implementation timeline to define when the project pieces would be carried out. There are three categories within the timeline: short-term, indicating 0 to 3 years; mid-term, indicating 4 to 7 years, and long-term, indicating 8 to 15 years. Refer to Sections 6 and 7 for full project details and funding options.



LEGEND

- Project Name
- JP** Joint Participation Agreement
 - PU** Power Utilities
 - TT** Transit and Transportation
 - NI** Natural Infrastructure
 - LM** Land Management
 - WW** Water and Wastewater Utilities

- Intervention Type
- PA** Policy Action
 - PI** Physical Infrastructure
 - RI** Recommendations to Installation



INSTALLATION PROFILE: Naval Air Station Key West

Key West, Florida

Naval Air Station Key West (NASKW) is located on Boca Chica Key and has additional facilities at Trumbo Point and Truman Annex on Key West and Fleming Key and Dredgers Key. The installation's primary mission is to enable and sustain warfighter readiness. The assets on the installation most critical for supporting this mission are the runway and hangers on Boca Chica.

The primary mission critical assets for NASKW are the shorelines south of the runway and the power transmission lines that service the base. The runway is very close to the water, with the shorelines that abut against it providing protection from erosion, wave action, and flooding. The power transmission lines are particularly important because Boca Chica Key is at the end of a transmission system spanning 120 miles between Homestead and the island.

There are a multitude of secondary mission critical assets that support the installation: the roadways that are used by personnel to traverse the island, including U.S. Route 1, Roosevelt Boulevard, and White Street; the entrances to the various facilities, such as Palm Avenue at Trumbo Point; and the other utility services that the installation relies upon, such as wastewater service from the Florida Keys Aqueduct Authority (FKAA). These assets all enable NASKW to execute its mission.

There are multiple mission supportive assets as well – installation-adjacent shorelines and roads, local emergency services, and communications services. NASKW relies on the island and surrounding keys to provide a home for its personnel.



Entry Control Point



Shoreline at Truman Annex



Airfield at Boca Chica Key

Vulnerability Assessment Findings

On a positive note, the electrical and water utilities servicing the Keys can potentially become incentivized to adapt their infrastructure to higher standards, given that they are largely reliant on the small, local customer base for maintenance. Most electrical and water facility structures are already located on high ground or have redundant operation protocols in place.

The availability of Federal property may create Public-Private Partnership opportunities for resilience projects (for example, housing). As identified during the workshops and vulnerability assessment, there are multiple vulnerabilities facing the installation.



Electrical Power Lines Servicing Key West



Shoreline Erosion



U.S. Route 1



Servicemen and Servicewomen Arrive to Aid Citizens After Disaster


The primary mission critical assets are vulnerable to the following hazards: erosion, storm surge and SLR at the shorelines south of the runway on Boca Chica and high wind speeds affecting the power transmission lines that service the installation. Erosion at the shoreline can cause instability of the runway itself while storm surge and SLR can flood the runway, preventing the base from performing its duties. Meanwhile, high wind speeds damaging the power transmission lines can disrupt electric power service for the installation.


The secondary mission critical assets are vulnerable to flooding. Flooding at the Palm Avenue entrance to Trumbo Point causes access issues for base personnel, as well as transportation challenges for the community at large. Flooding on U.S. Route 1, Roosevelt Blvd., and White St. creates similar issues. Severe flooding at the FKAA wastewater storage facility can halt wastewater service, creating sanitation problems for the base. Additional mission supportive vulnerabilities include erosion at the shorelines on North Boca Chica, Fleming Key, Dredgers Key, and the Truman Annex; flooding on the local roads; storm surge and SLR inundating the local fire station; and storm surge impacting communications assets.


Additional vulnerabilities include the lack of affordable housing and high cost of living, security at shorelines and boundaries stemming from nearby tourist attractions, compliance with the Federal Electric Vehicle Fleet Mandate, sustaining the viability of the community airports despite SLR, and maintaining a consistent supply of fuel for emergencies. Monroe County and the City of Key West have been very proactive in planning and adapting to SLR and flooding – this work has reduced vulnerabilities throughout the island.

Resilience Plan


To address these vulnerabilities, the South Florida MIRR proposes the following projects.


 An amendment to the existing **Joint Participation Agreement** currently held between the installation, City of Key West, and Monroe County is recommended to include other stakeholders identified in the MIRR process. Funding for the MIRR projects can be pursued through this amended JPA.


 The **Shoreline Stabilization and Security** project will address the erosion and security threats at the installation's shorelines. The JPA should invite Engineering With Nature and the Defense Advanced Research Projects Agency to research and design innovative shoreline solutions that the installation, the city, and the county will be able to construct. These projects promote carbon sequestration, habitat development, and biodiversity improvements. The development of a citywide Landscape Master Plan, with Installation Adjacent typology, will incorporate elements that promote installation security into the local landscape.

 The **Resilient Utilities** project will ensure continuation of the primary mission at NASKW. The City of Key West should commission two feasibility studies and construct the recommended projects – one for alternative backup power generation and one for cistern creation for stormwater reuse. Keys Energy and

communications providers should adapt their assets to mitigate the impacts of current and future flooding and high winds.

 The **Stormwater Infrastructure** project will address flooding from storms, surge, and SLR at the Palm Avenue entrance to Trumbo Point. The City of Key West should construct a pump station project that has already been identified in the Stormwater Master Plan.

 The **Roadway Improvements** project will utilize the results of existing studies and plans to address flooding on U.S. Route 1, Flagler Street, and White Street. These studies will be amended to include additional mission supportive road segments as needed. This project also recommends the City of Key West incorporate electric vehicle infrastructure into its master plans, to support NASKW's compliance with the Federal Electric Vehicle Fleet Mandate. These efforts will improve transportation access and emergency response times for the community.

 NASKW is facing challenges associated with a high cost of living and unattainable housing. The **Affordable Housing** project will improve the availability of affordable housing for the installation. The U.S. Navy has applied for approval for an enhanced-use lease (EUL) on Dredgers Key. NASKW should develop a program for the EUL site and communicate with the JPA on additional housing projects. The City of Key West is designing resilience hubs – facilities that support residents (including civilian staff) during and after disasters.



NASKW Resilience Plan

Project Timeline

The component interventions of all NASKW projects were plotted on an implementation timeline to define when the project pieces would be carried out. There are three categories within the timeline: short-term, indicating 0 to 3 years, mid-term, indicating 4 to 7 years, and long-term, indicating 8 to 15 years. Refer to Sections 6 and 7 for full project details and funding options.



LEGEND

<ul style="list-style-type: none"> JP Joint Participation Agreement RU Resilient Utilities SS Shoreline Stability SI Stormwater Infrastructure AH Attainable Housing RI Roadway Improvements 	<ul style="list-style-type: none"> PA Policy Action PI Physical Infrastructure to Installation RI Recommendations to Installation 	<p>JP-PA-1</p> <p>↑ Project Name ↑ Intervention Type ↑ Project Number</p>
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Policy Recommendations for Further Consideration

During the MIRR project, issues surfaced beyond the scope of grant work, yet worthy of noting and highlighting. The following recommendations are logged for further discussion and development at the national, regional, and local level as appropriate.

National Recommendations

- The Congressional authorization and appropriation for the OLDCC MIRR Grant Program should be amended to include the U.S. Department of Homeland Security and USCG installations, facilities, and their surrounding communities; all are crucial military mission partners and neighbors in South Florida. This is larger than just South Florida and may also result in significant resilience gaps in other locations around the country where USCG support is integral to success of DoD mission.
- OLDCC should consider and fund MIRR Phase 2 activities to support the creation and staffing of a formal “Mission Assurance through Community Resilience” partnership to maintain momentum, synergy, and communication as stakeholders work to secure funding and implement resilience projects identified in the South Florida MIRR.
- The DoD should develop department-wide guidance directing installations to adopt local, science-based resilience and design standards to address regional climate conditions and concerns.

Regional Recommendations

- It is highly recommended that communities leverage the relationships built or strengthened through the MIRR process to also include military installations in any ongoing planning processes for their community.
- The Southeast Florida Climate Change Compact is a model for regional collaboration, planning and information sharing. It is recommended that the Compact partners consider opportunities to include military priorities and issues in the next regional climate action plan, annual summits, annual state and federal policy statements, and periodic subject-specific workshops.



Changing Climate



Zoning and Developing the Built Environment



Mission Assurance Through Community Resilience

- South Florida installations should continue to actively communicate and coordinate with their surrounding cities and counties for the express purpose of increasing resilience on both sides of the fence line. It is also recommended that installations pursue backup utility options inside the fence lines to increase resilience in times of disaster.

Local Recommendations

- To support the availability of attainable housing for installation personnel, local policy actions should focus on updating land management and construction cost incentives, and broadening the acceptable housing product types beyond single-family homes.
- Traditional zoning and development patterns should be reviewed and updated to ensure they support the critical needs of installations and their personnel.
- HARB and Miami-Dade County should leverage their current coordinated efforts, and enlist City of Homestead's assistance, to create a natural conservation buffer that will protect HARB's airfield from encroachment without interfering with flight operations.

- Installations are encouraged to pursue redundant utility sources inside the fence lines for backup power, water, and communications systems. Redundancy is key for resilience during local outages and disruptions.

Next Steps

The South Florida Regional Planning Council, the South Florida MIRR project grantee, was established in 1974. Its governing board consists of county and municipal elected officials, gubernatorial appointees, and ex-officio members representing key state agencies and the SFWMD. The Council has well-established, collaborative, and productive relationships with not only elected officials and staff in South Florida but also the region's Chief Resilience Officers; Economic Development Organizations; Chambers of Commerce; Southeast Florida Regional Climate Change Compact; SFWMD; the Florida departments of Transportation, Environmental Protection, Commerce, and Emergency Management; and other regional stakeholders. The Council's working relationships with Federal partners include, but are not limited to, the DoD's OLDCC, U.S. Environmental Protection Agency, U.S. Department of Commerce Economic Development Administration, and U.S. Department of Energy.



Sunset on the Airfield

EXECUTIVE SUMMARY

The Council also brings to the South Florida MIRR and subsequent implementation efforts experienced planning staff that is well versed in myriad planning areas, including transportation, resilience, economic development, affordable housing, and land use. Its proven and successful track record of developing and furthering the work of inter-disciplinary regional partnerships in Southeast Florida, including the three-county region where the South Florida MIRR installations are based, will be a great benefit to the Partnership and its future implementation activities.

The South Florida Defense Alliance (SFDA) will continue to provide support in coordination and collaboration. The SFDA is ready to continue assisting the South Florida Regional Planning Council implementation team by fostering relationships with federal, state, and local military representatives and identifying additional creative funding opportunities. The South Florida MIRR stakeholders are active in effective local resilience efforts. They are familiar with funding, phasing, and implementing similar and adjacent projects across the region and are well-equipped to drive the South Florida MIRR recommended projects forward.