

A large American flag is waving from a ship's mast against a blue sky with light clouds. The flag's red and white stripes and blue field with white stars are prominent. In the lower right, the ship's deck, a metal railing, and a piece of electronic equipment are visible. The ocean is a deep blue with white-capped waves.

## Section 6

# Adaptation Strategies and Projects

## 6. ADAPTATION STRATEGIES AND PROJECTS

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## Section 6

# Adaptation Strategies and Projects

### Identification of Mitigation and Adaptation Improvements

With an established list of vulnerable assets and an understanding of the hazards that threaten them, the next step was to identify adaptation interventions that can mitigate the risks (Figure 6-1). For the purpose of this study, "intervention" is defined as a specific action or group of actions that are executed to mitigate risk. The process of identifying interventions consists of defining the type of intervention (typology), determining which interventions are viable for the site, developing ranking criteria, and identifying the priority interventions according to their rankings.

### Physical Infrastructure

Physical infrastructure improvements include projects undertaken in the transportation, water, wastewater, power, stormwater, or communications sectors that reduce risk and enhance system reliability and resilience.

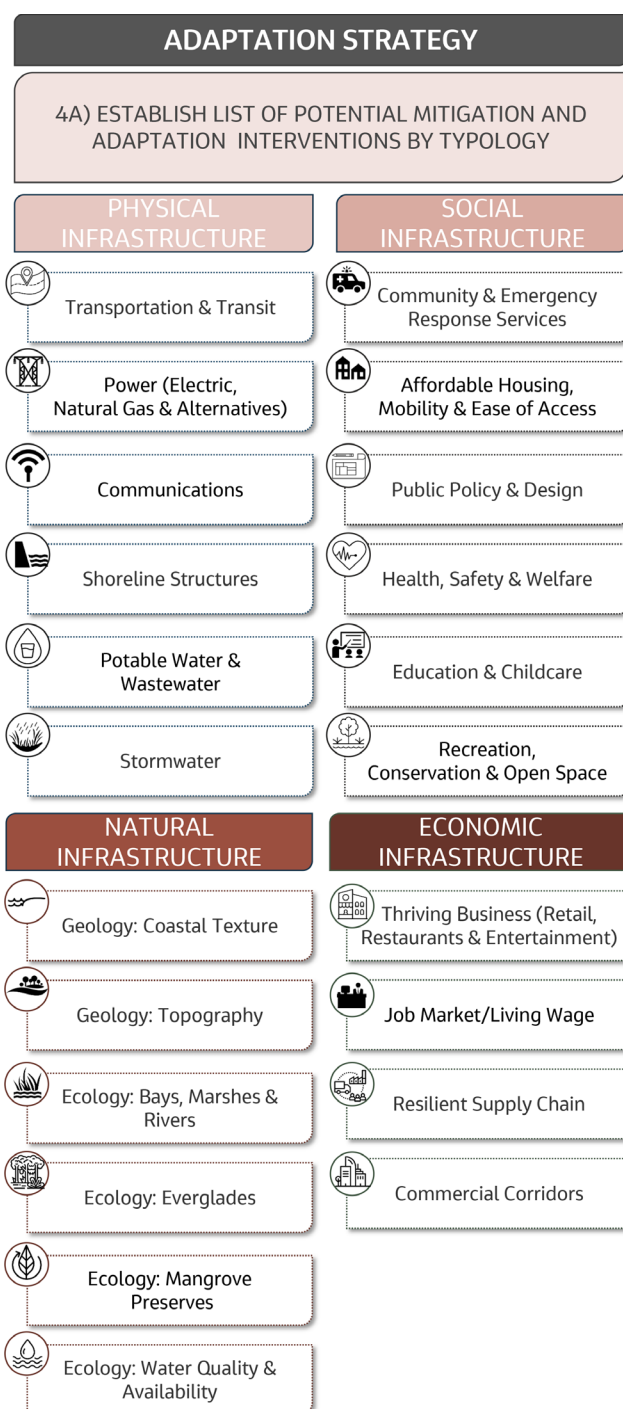
### Social Infrastructure

Social infrastructure is people-centered. It consists of the services and assets that benefit a community, such as emergency services, attainable housing, and education. Interventions for social infrastructure improve these assets and services.

### Natural Infrastructure

Natural infrastructure 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, including coastal, riverine, or desert regions, and can mitigate flood risk, attenuate wave energy, cool an area, or control erosion.

**Figure 6-1. Adaptation Methodology Step 4A**



## 6. ADAPTATION STRATEGIES AND PROJECTS

### Economic Infrastructure

Economic infrastructure promotes the financial well-being and security of a community. Economic interventions seek to improve this and can include changes that promote commercial corridors, support healthy businesses, improve the job market and wages, or enhance supply chain reliability.

### Decision-Making Framework for Adaptation Investment

Potential improvements were evaluated primarily based on their alignment with project objectives, which were determined by evaluating and filtering the interventions through a variety of metrics. These metrics were weighted and compared to determine the best applicable improvements to meet the stated objectives.

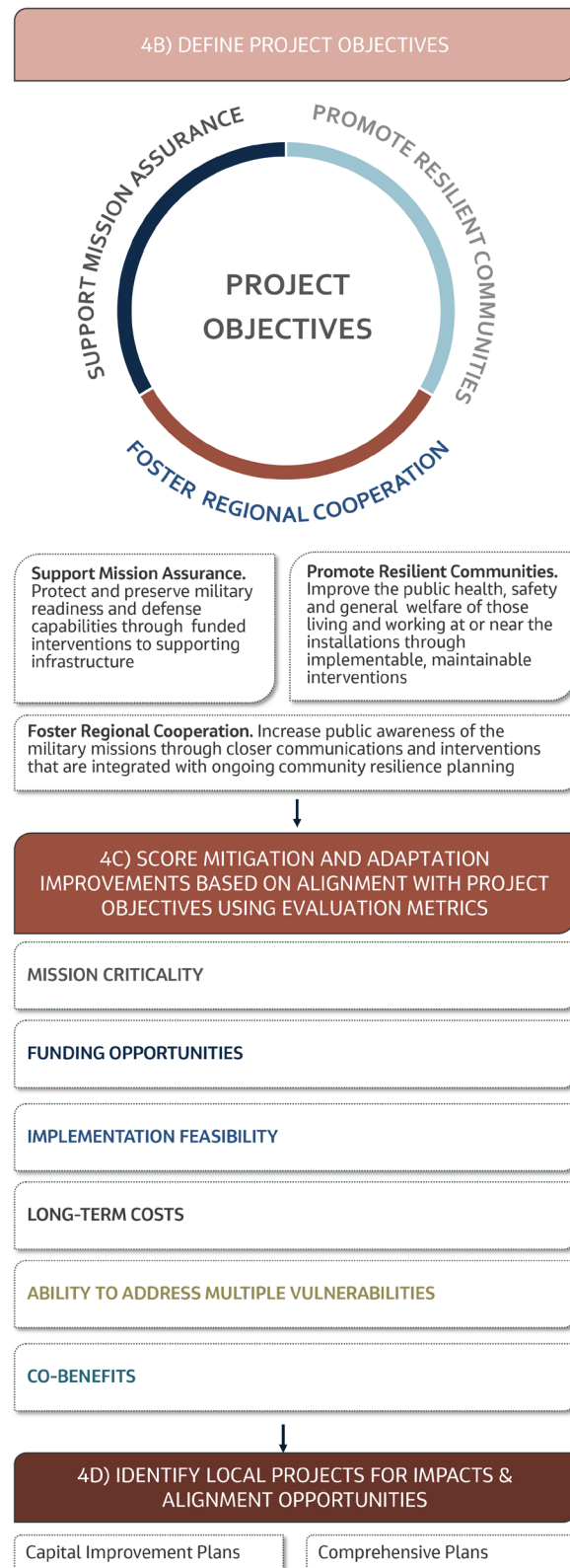
### Evaluation Metrics and Key Performance Indicators

All standards and practices were evaluated first and foremost by their alignment with DoD objectives, followed by their benefits for communities. The evaluation metrics were selected using the standards and best practices discussed in the Planning Guidelines in Section 5. Evaluation criteria should align with project objectives defined in stakeholder meetings (Figure 6-2). When formulating recommendations and projects, the following evaluation metrics were considered:

- Asset criticality related to military mission assurance
- Potential funding opportunities
- Implementation feasibility
- Life cycle costs
- Ability to address multiple vulnerabilities
- Co-benefits

### Asset Criticality for Mission Assurance

Any resilience action or intervention project conducted as part of a MIRR project must support the execution of the primary, secondary, direct, and/or indirect missions of the installation. In addition, interventions should generally be aligned with stakeholder priorities.



**Figure 6-2. Adaptation Methodology Steps 4B Through 4D**



## Funding Opportunities

Potential funding mechanisms for an intervention can influence its implementation viability. Funding resilience and climate adaptation projects traditionally begins at the local level in South Florida, with many municipalities investing in stormwater and coastal defense upgrades. Municipal funding sources include property tax, special increment fees, special taxing districts, state revolving loan funds, public/private partnership, and/or bonds (e.g., general obligation, revenue, green bonds). Some South Florida cities have also evaluated event-based parametric insurance that pays out based on previously agreed-upon terms. An agreed-upon trigger or hazard (such as a hurricane) triggers the payment to provide funding for recovery in a defined area.

Recently, more Federal funding sources or programs have become available, including DoD Office of Local Defense Community Cooperation Critical Infrastructure Pilot Program, DoD Readiness and Environmental Protection Integration, and FEMA Building Resilient Infrastructure and Communities grants. In addition, funding included in the recently passed Inflation Reduction Act and Infrastructure Investments and Jobs Act can help fund resiliency improvements to public infrastructure projects (transportation, energy, and water). The State of Florida also offers funding for resilience infrastructure projects. Match or leveraged funding requirements were identified and assessed, as appropriate.

## Implementation Feasibility

The implementation feasibility of a recommended project describes the ease of developing and implementing the proposed improvement. Implementation can include legislating a new policy in local government, advocating for state/Federal policy changes, or constructing a physical improvement. The following questions were asked when considering implementation feasibility:

- Is the owner of the asset(s) ready to implement the intervention?
- Does the owner of the asset(s) have staff available to implement, operate, and maintain the intervention?
- Are materials readily available to implement the intervention?



Source: FEMA 2018

- Can the project be phased into short-, mid-, and long-terms to improve feasibility?
- Are funds readily available?

## Life Cycle Costs and Project Benefits

As with all projects, the life cycle cost of the proposed improvement should be evaluated when determining priority resilience projects. Particularly, the long-term costs (operations and maintenance [O&M]) resulting from the intervention should be considered on behalf of the owning entity. Other items that can be considered when thinking about life cycle costs include the costs of response and recovery. Because of the nature of some of the proposed projects, a traditional cost-benefit analysis was infeasible. Proposed project costs are Class Five cost estimates (rough order-of-magnitude estimates), while benefits are a combination of the avoided damages, where applicable, and descriptions of additional positive outcomes (co-benefits).

## Ability to Address Multiple Vulnerabilities

An improvement that addresses multiple vulnerabilities, where applicable, may be considered as adding additional value over an improvement that addresses only one vulnerability.

## 6. ADAPTATION STRATEGIES AND PROJECTS

### Co-Benefits

Improvements off-base and outside the fence line can also be evaluated by how much they benefit the surrounding community and/or provide climate mitigation (carbon reduction/sequestration) benefits, such as energy and water conservation and greenhouse gas emission reductions. The most comprehensive improvements provide multiple co-benefits, including economic, environmental, and social benefits. These are discussed in more detail in the following paragraphs.

### Economic Co-Benefits

Defense spending in the State of Florida is responsible for billions of dollars in gross domestic product contributions and is generally in the top two most valuable economic sectors, providing hundreds of thousands of direct and indirect jobs in the neighboring communities. Resilience improvements to a military installation have co-benefits to surrounding communities as critical infrastructure (e.g., energy, water, and

transportation). These services are protected to ensure public safety and military readiness during hazard events. A resilient base can continue to operate and provide benefits to both the mission and the community.

### Environmental Co-Benefits

Some resilience projects can benefit the environment while also improving community resilience. For example, creating a living shoreline to prevent shoreline erosion offers protection for a coastal facility and can also provide environmental benefits that are aligned with local, state, and Federal regulations and priorities, such as habitat creation and carbon sequestration.

### Social Co-Benefits

Implementing resilience projects for the purpose of increasing the resilience of a DoD installation can also benefit the surrounding community. For example, hardening an electric substation to mitigate flood risk can improve

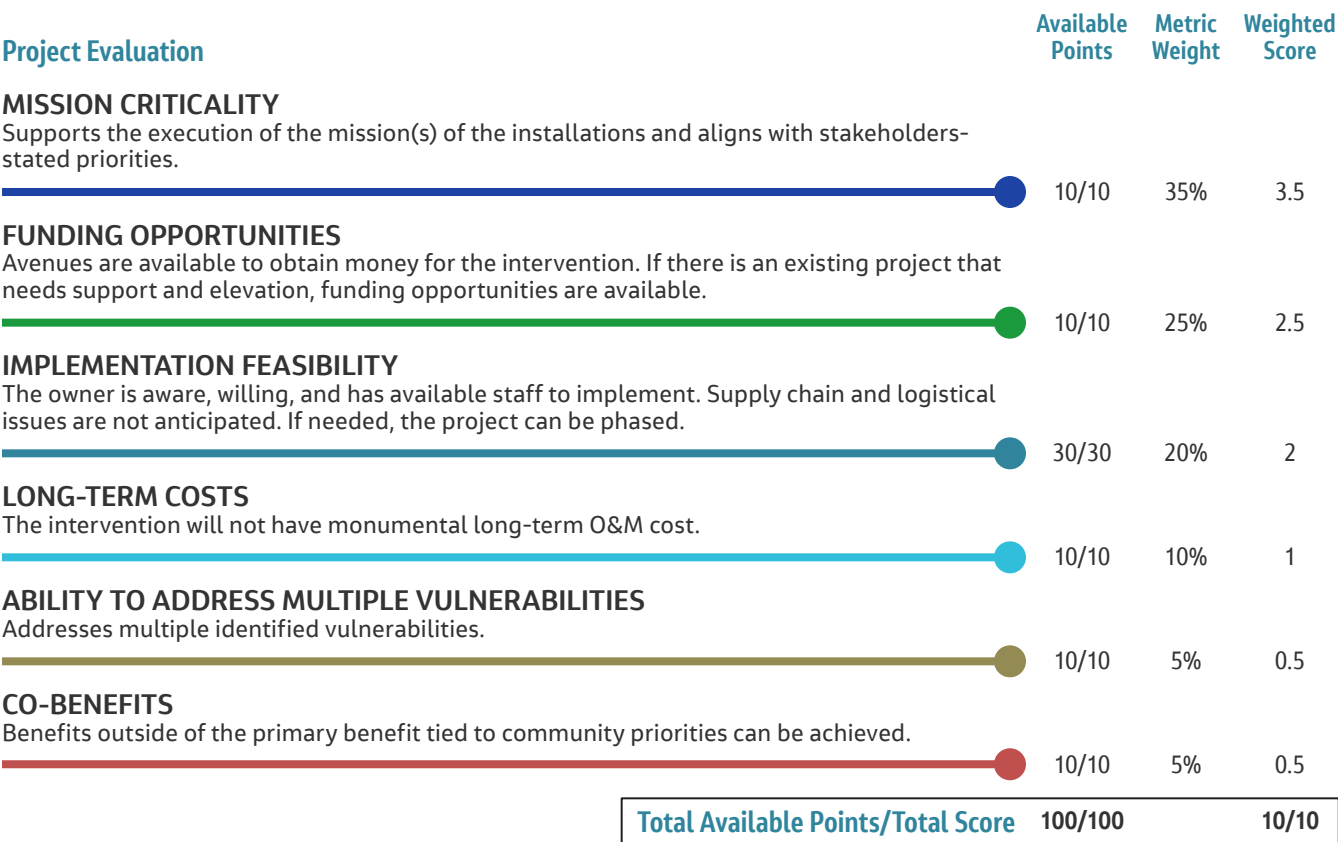


Figure 6-3. Weighted Adaptation Project Metrics



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the quality of electric service to both the base and the surrounding community. Additional social benefits of resilience projects can include improving community resilience, employment, the natural environmental, and potential recreation opportunities.

## **Assigning Weights to Metrics**

Weights were assigned by the project team to reflect the importance of the various evaluation metrics (Figure 6-3). Mission assurance criticality was weighted the highest, followed by funding opportunities, implementation feasibility, and life cycle costs. Co-benefits and the ability to address multiple vulnerabilities, while important and beneficial, were included but not ranked as high as mission assurance.

## **Identifying Priority Resilience Improvements**

Priority outside-the-fence-line resilience improvements are identified by their scoring in the adaptation strategy matrix. The higher the score, the more useful an improvement is in the context of the installation and surrounding community.

## **Identifying Local Projects for Alignment Opportunities**

It is possible that there are existing local projects into which priority improvement projects can be integrated. Leveraging existing projects reduces the effort required to build support for the projects and enhances installation and community resilience. Some local projects can be identified in capital improvement programs, infrastructure master plans, and local mitigation plans. Capital improvement programs, as discussed in the Unified Resilience Assessment Methodology (Section 3), have infrastructure-related projects in sectors such as transportation, utilities, or stormwater. Local mitigation plans identify projects and actions related to disaster preparedness. Integration into existing plans can be a task addressed in the next steps of collaboration and implementation.

### SFOMF

#### Critical Assets and Priorities

Figure 6-4 shows prioritized physical assets for the SFOMF.

#### Vulnerable Assets

##### Primary Mission Critical Assets

- Beach shoreline protecting underwater cables, south of inlet/jetty: *Erosion, Lack of Maintenance*

##### Secondary Mission Critical Assets

- North Ocean Drive road segment: *Tidal Flooding, Storm Surge, and SLR*
- Seawall and jetty adjacent to facility: *Erosion*
- Power transmission lines: *High Wind Speed*

##### Mission Supportive Assets

- Communication junction boxes on Franklin Street: *Aging Infrastructure*
- Shorelines south and east of installation: *Erosion*
- Wetlands and stormwater canal between sites: *Increased Inundation*
- Fuel infrastructure (not assessed)

#### Additional Known Vulnerabilities

- Potential encroachment: *City Parking Expansion*
- Potential encroachment and equipment damage: *Anchor Drops*
- Less clean, clear water: *Increased Water Traffic, Dredging*

#### Adaptation Projects

Four Adaptation Projects were defined and evaluated for the SFOMF.



Joint Participation Agreement



Shoreline Protection

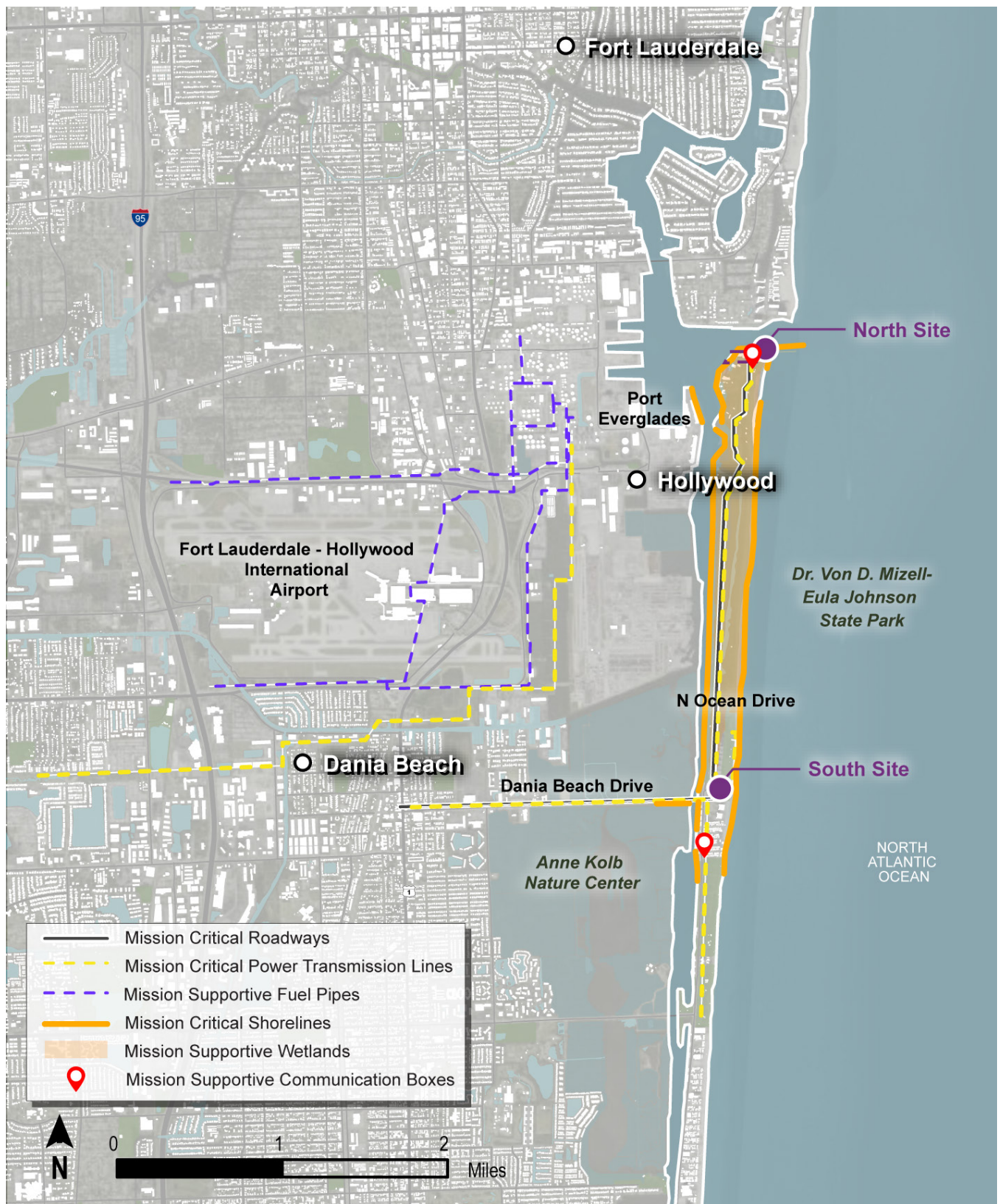


Roadway Improvements



Resilient Utilities





**Figure 6-4. SFOMF Prioritized Physical Assets**

## 6. ADAPTATION STRATEGIES AND PROJECTS



### SFOMF Joint Participation Agreement Project

The purpose of the Joint Participation Agreement (JPA) project is to provide the formal structure and space for planning and coordinating the implementation of the other projects. The JPA is the vehicle for strong leadership and participating members to amplify their joint concerns and implement change (Figure 6-5).

#### Interventions

##### Policy Actions

- **JP-PA-1.** Leverage the existing positive relationships between stakeholders by creating a JPA among the SFOMF, USCG Station Fort Lauderdale, FAU, NSU, Dr. Von D. Mizell-Eula

Johnson State Park, City of Dania Beach, City of Hollywood, Broward County, Port Everglades, and the South Florida Defense Alliance (SFDA). This JPA can advocate for mutually beneficial changes in policy, planning, design, construction and maintenance of the natural and built environment that they share. Advocacy can include pursuit of funding for projects (primarily grant applications), and tracking ongoing maintenance needs within the study area. The SFRPC will be the coordinator that establishes the JPA, convening the participants, and tracking the status of the MIRR projects.

The JPA project achieves high scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.

#### Project Metrics

##### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

10/10

##### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

10/10

##### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

24/30

##### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

10/10

##### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

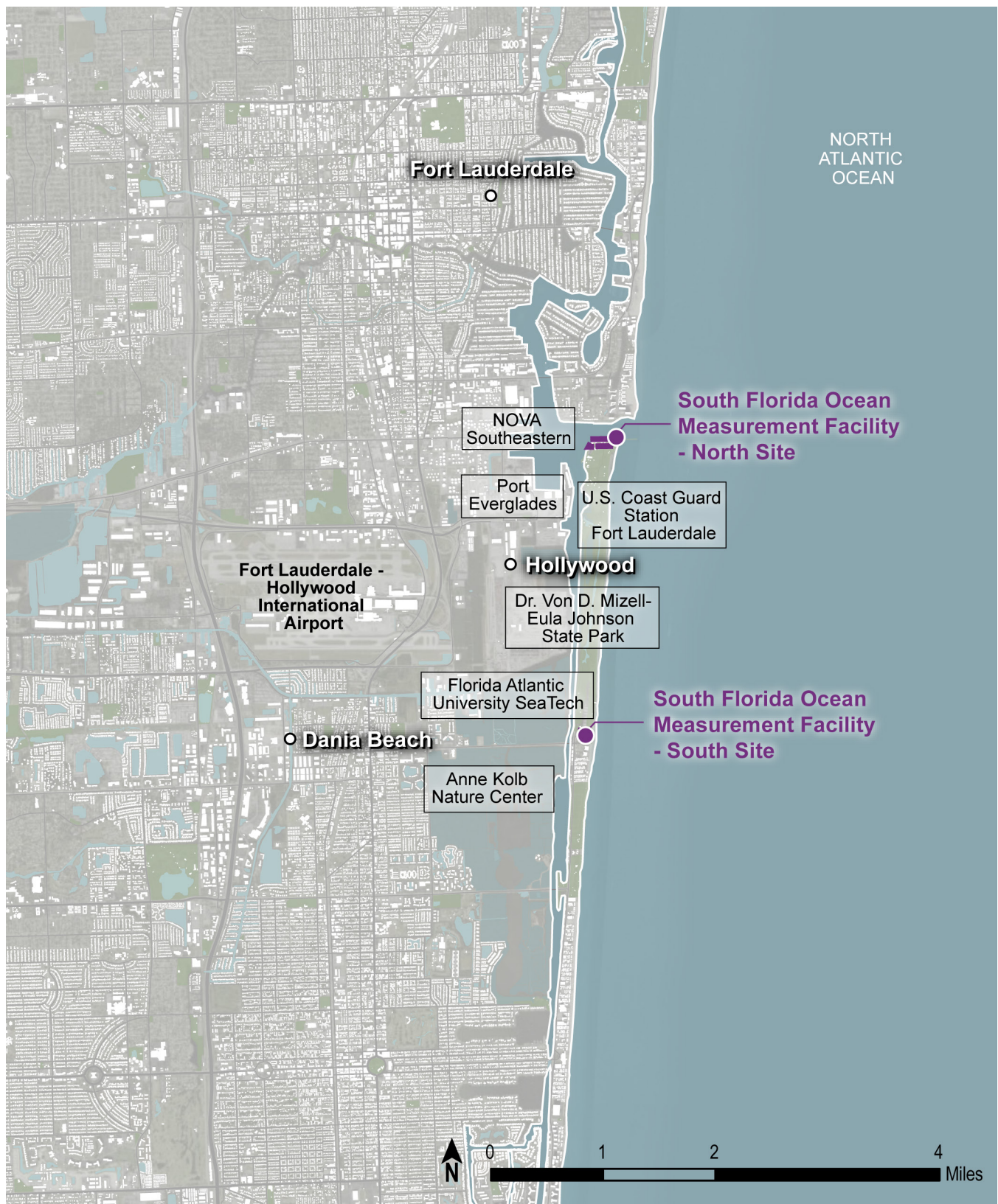
10/10

##### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

0/10





**Figure 6-5. SFOMF Potential Joint Participation Agreement Members**



### SFOMF Shoreline Protection Project

#### Project Need

The purpose of the Shoreline Protection project is to ensure continuation of the SFOMF's primary mission. To achieve this goal, the interventions protect the critical cables between the installation facilities and the testing ranges. This is the most important component for sustained mission assurance. Additionally, the interventions provide installation staff improved access to the jetty and beach, reducing potential for encroachment and equipment damage, and restore habitat for clean, clear water through a hybrid approach of traditional and nature-based solutions (Figure 6-6).

#### Interventions

##### Policy Actions

- **SP-PA-1.** Schedule beach and shoreline renourishment on a consistent basis. Broward County applies for beach renourishment in this area, which is funded by the State of Florida, and constructed by USACE. This application should be done on a recurring basis, potentially with materials from Broward County's Sand Trap project located directly north of the SFOMF.
- **SP-PA-2.** Advocate for and place additional anti-anchor buoys near the critical cables south of the jetty. The JPA can advocate for the buoys, which can be placed by the Port Everglades Authority. This will discourage boats and other watercraft from dropping anchor on the cables, which can cause damage and disruption to the mission.

##### Physical Infrastructure Improvements

- **SP-PI-1.** USACE should implement functional sand beach renourishment at the critical cables under installation staff supervision.
- **SP-PI-2.** USACE should construct restored habitat along the north and east sides of the installation, and enhance the public beach with attractive sand renourishment south of the critical cables and elevated walkway. This habitat, once established, will work to naturally keep water clean and clear. This represents the "nature-based" infrastructure in the hybrid approach.

- **SP-PI-3.** Dr. Von D. Mizell-Eula Johnson State Park should reconstruct the jetty and seawall that have been exposed to erosion along the inlet. The reconstructed elements should be designed to higher standards to increase their resilience to erosion. This represents the traditional "gray" infrastructure in the hybrid approach for the shoreline.
- **SP-PI-4.** Dr. Von D. Mizell-Eula Johnson State Park should install elevated walkway to create levee, improve access to the jetty, and keep public beach users away from critical cables. This brings shared benefits to the state park and the installation.

#### Recommendations for Installation

- **SP-RI-1.** Supervise the placement of the beach renourishment. Renourishment activities in the past have not placed the sand in the critical area where it is most needed. A representative from the installation should oversee the construction to ensure the critical areas are properly addressed without potential damage to the cables.

#### Co-Benefits

In addition to sustaining the Primary Mission Critical infrastructure that SFOMF depends on, other benefits realized by this project include:

- Habitat restoration, carbon sequestration, and cleaner shores and water for the people and wildlife who also call this area home.
- Increased biodiversity of species, resulting in a thriving ecosystem that naturally works to keep the water clean.
- Health and wellness of state park visitors who will have safe access to the fishing jetty.

The Shoreline Protection project achieves high and mid scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.





**Figure 6-6. SFOMF Proposed Shoreline Protection Interventions**

## Project Metrics

### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

10/10

### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

10/10

### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

14/30

### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

6/10

### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

10/10

### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

10/10

## 6. ADAPTATION STRATEGIES AND PROJECTS



### SFOMF Roadway Improvements Project

#### Project Need

This project addresses the inaccessibility of access roads due to flooding. In addition to storm-related flooding and tidal surge, projections indicate future vulnerability to SLR for the SFOMF and its primary access roads. North Ocean Drive is the only road to the north site, which includes the jetty, dock, and critical cables. Dania Beach Boulevard (also known as State Route A1A) is the primary road to the SFOMF. In addition to improving access to SFOMF, the interventions improve access to the universities, USCG, and state park amenities (Figure 6-7).

#### Interventions

##### Policy Actions

- **RI-PA-1.** Designate the SFOMF as a State Facility of Importance. The State of Florida can elevate the installation's status, paving the way for additional funding for improvements. It will also give the SFOMF the authority to maintain North Ocean Drive as its primary access road.
- **RI-PA-2.** JPA to apply to FDOT to prioritize the lifting and widening of North Ocean Drive within Dr. Von D. Mizell-Eula Johnson State Park. Given the importance of the facilities accessed by North Ocean Drive, this roadway should be given priority status for resilience improvements. The JPA can apply.
- **RI-PA-3.** JPA to apply to the Defense Access Road Program for Access Road Authority funding to maintain North Ocean Drive. This will open funding avenues for necessary maintenance and updates.
- **RI-PA-4.** Dr. Von D. Mizell-Eula Johnson State Park should designate the public parking lot as the emergency parking location for state park staff and visitors. Having this designation can help justify the infrastructure project.

##### Physical Infrastructure Improvements

- **RI-PI-1.** Regrade and elevate the public parking lot above SLR projections. If staff are onsite during a storm event, personal vehicles can be parked in this lot, and staff can evacuate in Government Owned Vehicles (GOVs).

- **RI-PI-2.** Dr. Von D. Mizell-Eula Johnson State Park should redesign and construct North Ocean Drive to be elevated above SLR projections, crowned, and widened with a 5-foot-wide pedestrian/cyclist lane. This improves access for all users.
- **RI-PI-3.** Dr. Von D. Mizell-Eula Johnson State Park perform a survey and design a landscape plan for the wetlands within the Dr. Von D. Mizell-Eula Johnson State Park. The wetlands are a key component of stormwater management, and it is important they are highly functional and maintained.
- **PI-PI-4.** FDOT should redesign and construct Dania Beach Boulevard and pedestrian/cyclist lanes to be elevated above SLR projections for 2070. City of Dania Beach to advise.
- **RI-PI-5.** Dr. Von D. Mizell-Eula Johnson State Park should redesign and grade stormwater bioswales on both sides of newly elevated North Ocean Drive. The bioswales work with the wetlands to manage stormwater.
- **RI-PI-6.** Dr. Von D. Mizell-Eula Johnson State Park should construct and maintain the restored wetlands. In addition to providing stormwater management functions, the restored wetlands will attract and house important wildlife like pollinators.

##### Recommendations for Installation

- **RI-RI-1.** Review the Emergency Evacuation Policy, and update with the emergency parking location at the elevated public parking lot.
- **RI-RI-2.** Evaluate the GOVs for ability to operate during flooding.

##### Co-Benefits

In addition to sustaining the Secondary Mission Critical infrastructure that SFOMF depends on, other benefits realized by this project include:

- Habitat restoration for wildlife who also call this area home, and increased biodiversity of species, resulting in a thriving ecosystem that naturally absorbs stormwater.

The Roadway Improvement project achieves high and mid scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.





Figure 6-7. SFOMF Proposed Roadway Improvements

## Project Metrics

### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

6/10

### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

8/10

### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

18/30

### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

8/10

### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

6/10

### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

6/10

## 6. ADAPTATION STRATEGIES AND PROJECTS



### SFOMF Resilient Utilities Project

#### Project Need

The purpose of the Resilient Utilities project is to alleviate current and future potential disruptions to utility services that support the SFOMF's missions. Electrical power transmission lines are vulnerable to high-speed winds, and communications service experiences frequent outages due to aged and exposed equipment boxes. These services connect installation staff onsite with those operating equipment in the underwater range; therefore, resilient services are paramount (Figure 6-8). In addition to addressing current outages, these interventions avoid potential future costs between \$65,000 and \$100,000 to replace a damaged transformer (depending on size).

#### Interventions

##### Policy Actions

- **RU-PA-1.** Apply to AT&T for priority status and improved infrastructure to reduce disruptions during emergencies. Priority status ensures that the facility is among the first entities to recover service during an outage and support infrastructure is prioritized for improvements and repairs.

#### Physical Infrastructure Improvements

- **RU-PI-1.** FPL should identify and elevate or harden critical transformers that support the installation. The critical transformers should be either elevated out of the floodplain or hardened (floodproofed) so they are not impacted by flooding. This reduces vulnerability to flood events and promotes service continuity.
- **RU-PI-2.** FPL should harden or move underground the distribution system from FPL substation to installation, where applicable. The aboveground distribution infrastructure is vulnerable to damage from storm events (high winds). Moving distribution lines and junctions underground removes that vulnerability.
- **RU-PI-3.** AT&T should replace old communications equipment and harden junction boxes on Franklin Street. Replacing the old equipment will remove the aging infrastructure threat. Hardening can include elevating the junction box and changing to a water-resistant model. These items will improve the reliability of communications service, both for regular service and during disruptive events.

#### Project Metrics

##### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

6/10

##### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

8/10

##### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

28/30

##### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

10/10

##### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

8/10

##### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

0/10



**Figure 6-8. SFOMF Resilient Utilities**

### Recommendations for Installation

- **RU-RI-1.** Investigate innovative communications service providers, including those with satellites and dishes designed to withstand 174-mph winds.

The Resilient Utilities project achieves mostly high scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.



## USAG-Miami/SOUTHCOM

### Critical Assets and Priorities

Figure 6-9 shows critical physical assets for USAG-Miami/SOUTHCOM.

### Vulnerable Assets

#### Primary Mission Critical Assets

- Power lines connected and adjacent to installation: *Lightning*

#### Secondary Mission Critical Assets

- Water supply lines: *Flooding*
- Wastewater treatment facilities: *Lightning and Surge*
- Fuel infrastructure (not assessed)

#### Mission Supportive Assets

- 33rd Street, 87th Avenue, 35th Lane, SR 826: *Heat Island Effect*

### Additional Known Vulnerabilities

- High turnover/low workforce availability: *Lack of Attainable Housing, Cost of Living.*
- Typical support amenities are not available inside the fence.
- Improved safe pedestrian infrastructure is needed for health, safety, and welfare.

### Adaptation Projects

Four projects were developed for USAG-Miami/SOUTHCOM to address its vulnerabilities.



Resilient Utilities



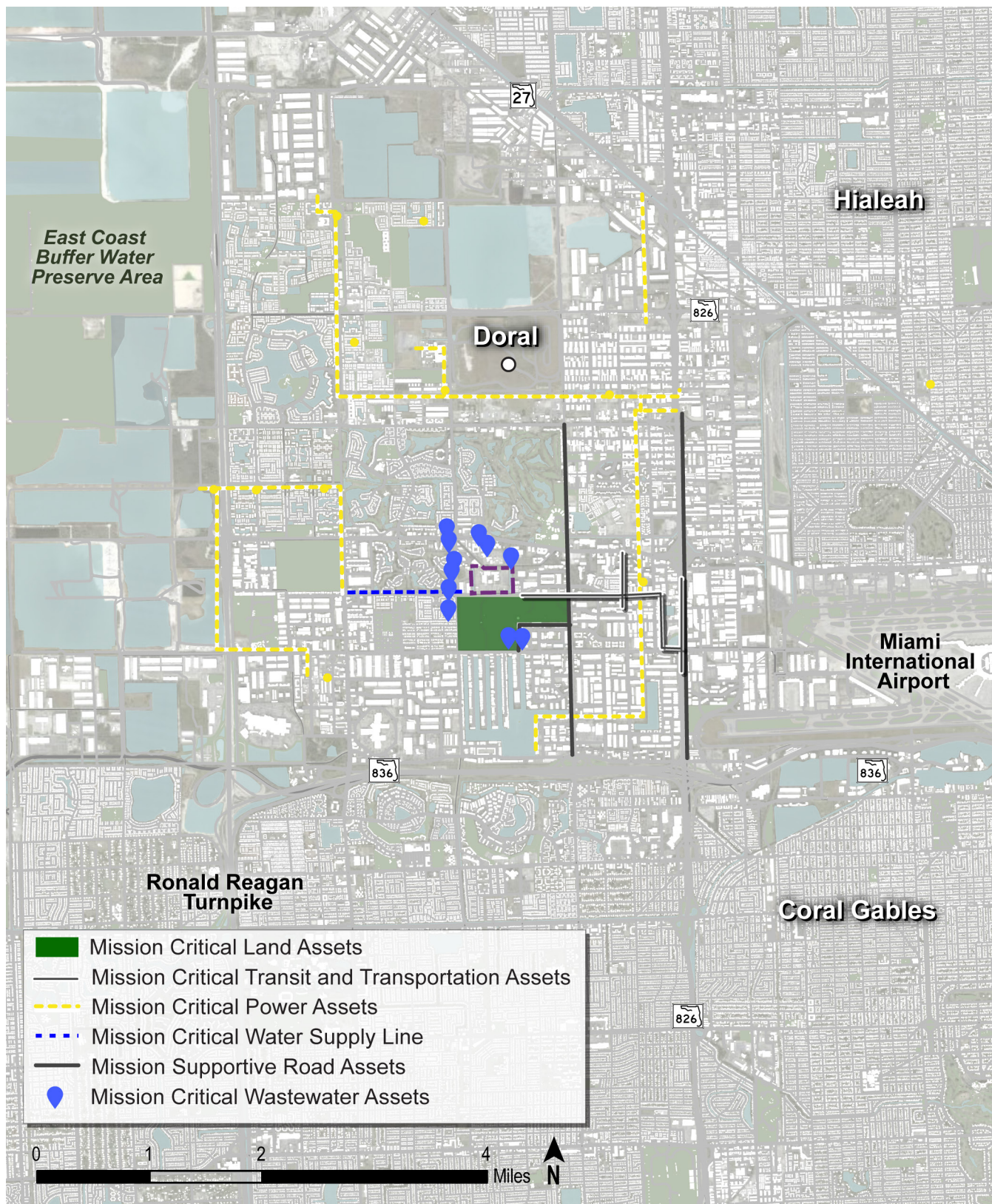
Right-of-Way (ROW) Improvements



Attainable Housing



Opportunity: Resilience Hub



**Figure 6-9. USAG-Miami/SOUTHCOM Prioritized Physical Assets**

## 6. ADAPTATION STRATEGIES AND PROJECTS



### USAG-Miami/SOUTHCOM Resilient Utilities Project

#### Project Need

The purpose of the Resilient Utilities project is to reduce potential for disruption of USAG-Miami/SOUTHCOM's primary mission (Figure 6-10). Continuity can be ensured by reducing the effect of high wind and flooding hazards on mission critical supporting infrastructure (electric power, wastewater service, and water service). Miami-Dade County Emergency Management and FPL have placed USAG-Miami/SOUTHCOM on the Critical Infrastructure Facility list, giving the installation priority for repairs after a disruption (storm event). Additionally, Miami-Dade County Water and Sewer Department (WASD) prioritizes the water and wastewater facilities serving the installation in its risk mitigation plan, and is actively engaged in enhancing service reliability for all communities in its service area. In addition to improving the resilience of the utility systems, these interventions will avoid costs of up to \$100,000 in replacing damaged equipment.

#### Project Metrics

##### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

10/10

##### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

8/10

##### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

24/30

##### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

10/10

##### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

8/10

##### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

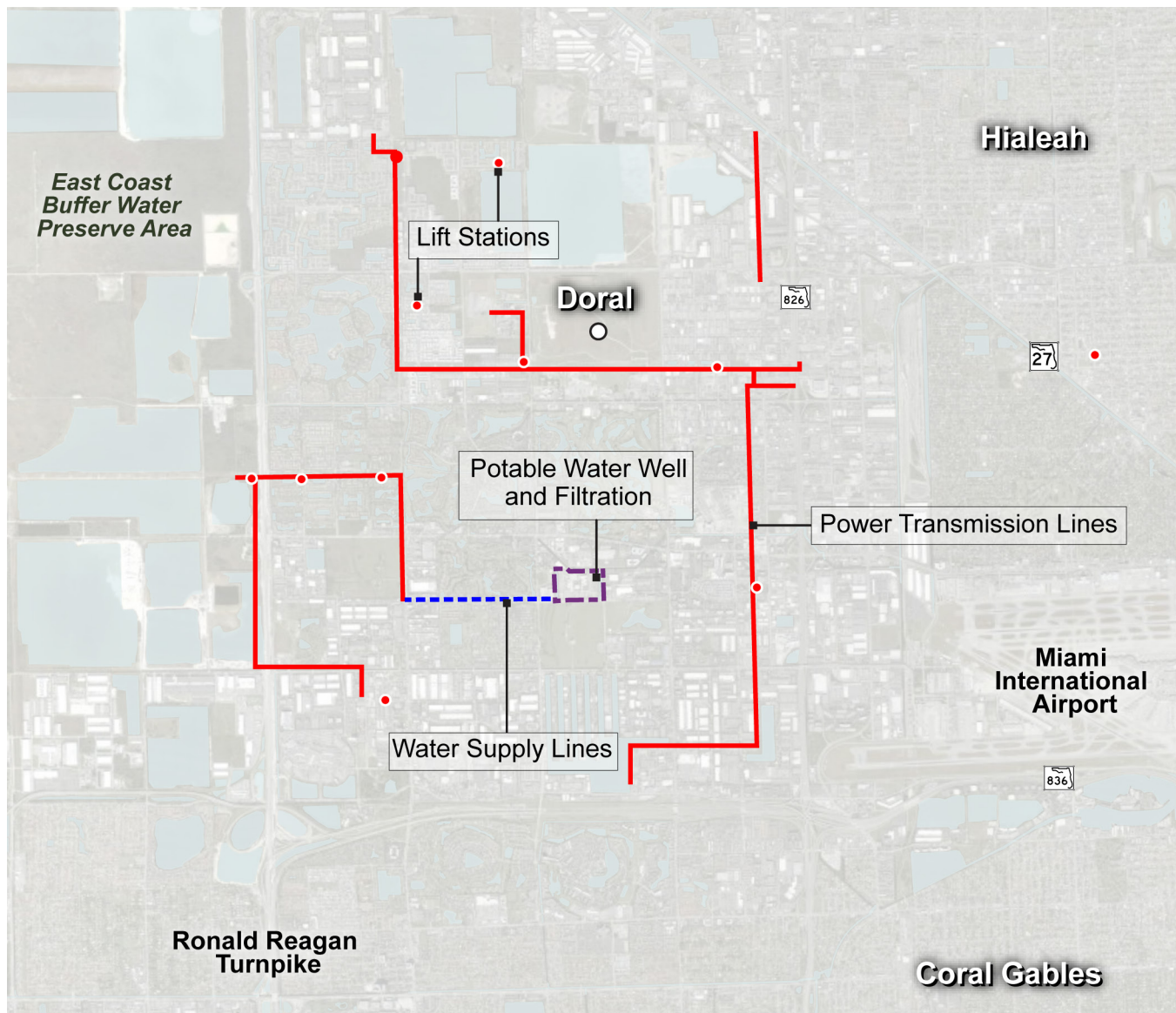
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#### Interventions

##### Physical Infrastructure Improvements

- **RU-PI-1.** FPL should identify and elevate or harden critical transformers that support the installation. The critical transformers should be either elevated out of the floodplain or hardened (floodproofed) so they are not impacted by flooding. This reduces vulnerability to flood events and promotes service continuity.
- **RU-PI-2.** FPL should harden or move underground the distribution system from the FPL substation to the installation, where applicable. There are some locations where the distribution system consists of wood poles, which are susceptible to damage from high winds. Converting these poles to concrete (hardening) or moving them underground can protect these Primary Mission Critical assets.
- **RU-PI-3.** Miami-Dade WASD should harden wet wells and elevate electrical control panels of lift stations that service the installation per their risk mitigation plan. Wet well vents should be sealed to prevent intrusion of floodwaters into the system. Electrical control panels should be elevated above future BFE to prevent flood damage. Together, these actions protect the wastewater lift stations and associated facilities.





**Figure 6-10. USAG-Miami/SOUTHCOM Resilient Utilities**

### Recommendations for Installation

- **RU-RI-1.** Add a redundant potable water source by installing an onsite well and associated treatment. This will help the installation maintain a consistent level of operation during a disruption if WASD is unable to provide service. Filtration can be achieved given the installation's location on the Biscayne Aquifer.
- **RU-RI-2.** Continued use of stormwater as water supply for the onsite chiller plant via the pump station adjacent to the pond is warranted.

The Resilient Utilities project achieves mostly high scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.

## 6. ADAPTATION STRATEGIES AND PROJECTS



### USAG-Miami/SOUTHCOM Right-of-Way Improvements Project

#### Project Need

The purpose of the ROW Improvements project is to increase the safety of transportation infrastructure for pedestrians, cyclists, transit riders, and drivers at USAG-Miami/SOUTHCOM. Unlike most DoD installations, typical support amenities such as grocery shops, restaurants, convenience stores, and health facilities are located outside the fence at SOUTHCOM. This makes safe, easy access to these amenities important for the health and welfare of the staff. The City of Doral operates bus and trolley routes in the study area and is actively undertaking Complete Streets, Streetscape Shading, and Bicycle Network projects in their Transportation Master Plan. Updates to the city's plan will improve access, safety, and air quality, and reduce the urban heat island effect in the area (Figure 6-11).

#### Project Metrics

##### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

2/10

##### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

5/10

##### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

30/30

##### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

8/10

##### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

8/10

##### CO-BENEFITS

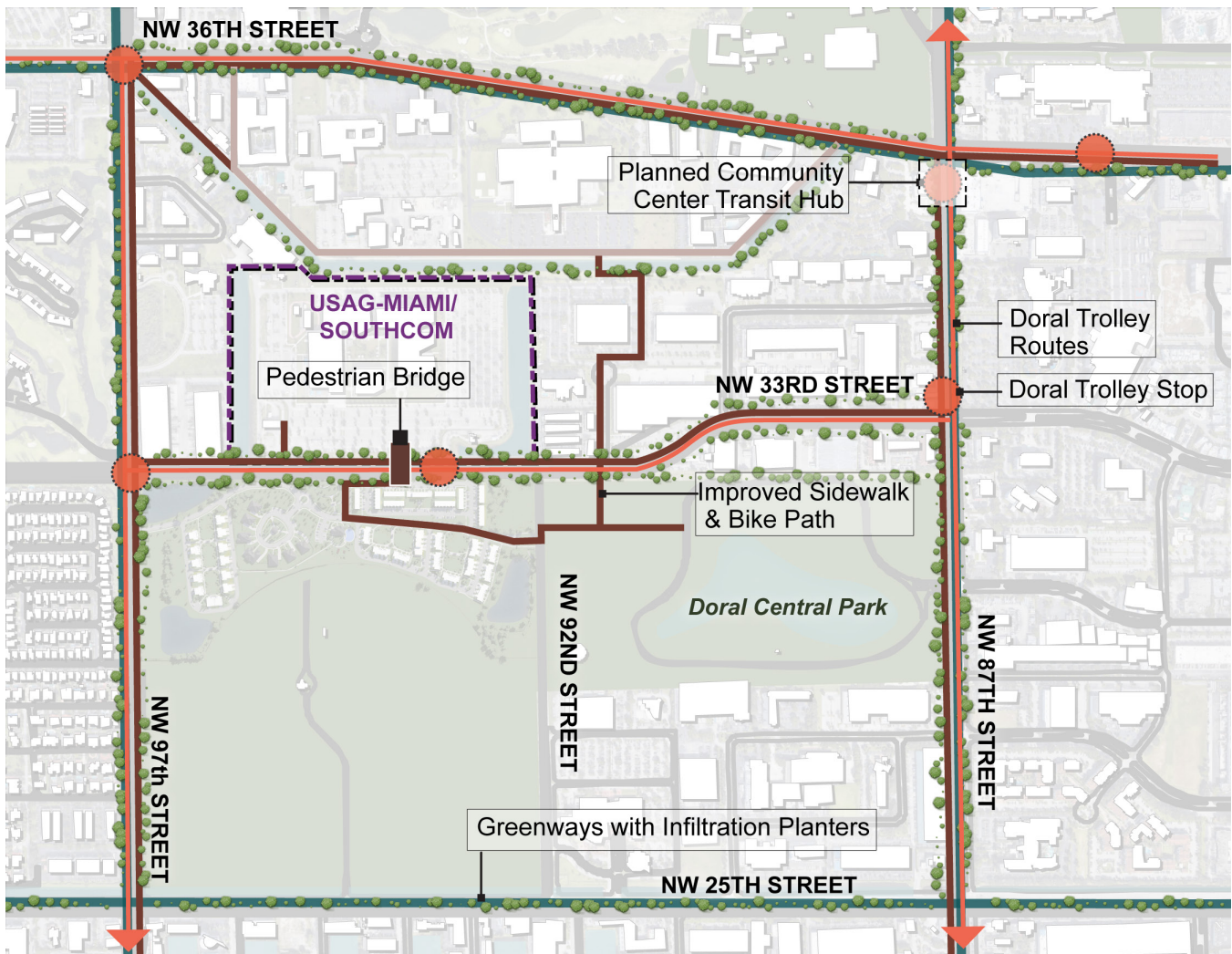
Benefits outside of the primary benefit tied to community priorities can be achieved.

8/10

#### Interventions

##### Physical Infrastructure Improvements

- **RO-PI-1.** Update the City of Doral Transportation Master Plan Bicycle Network project to include multipurpose trails north and south of the installation that connect with existing greenways. This aligns with the city's Parks and Recreation Master Plan principles.
- **RO-PI-2.** Update the City of Doral Transportation Master Plan Complete Streets and Streetscape Shading planning projects to include the road segments on 25th Street, 33rd Street, 36th Street, 87th Street, and 97th Street. Improvements can include dedicated travel lanes for bus and trolley circulation, wider pedestrian and cyclist paths, biofiltration planters, and shade trees. This will also align with the city's Green Design Master Plan and low impact development principles.
- **RO-PI-3.** The City of Doral should install pedestrian crossing/overpass between the new housing development USAG-Miami/SOUTHCOM, Doral Central Park.
- **RO-PI-4.** Design and construct the City of Doral Transportation Master Plan Complete Streets and Streetscape Shading projects on the road segments of 25th Street, 33rd Street, 36th Street, 87th Street and 97th Street. These segments provide primary access to the installation and future housing.



**Figure 6-11. USAG-Miami/SOUTHCOM ROW Improvements**

### Co-Benefits

In addition to sustaining the Mission Supportive infrastructure that USAG-Miami/SOUTHCOM depends on, other benefits realized by this project include:

- Traffic and greenhouse gas reduction from fewer personal vehicles on the road.

The ROW Improvements project achieves high and mid scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.



## 6. ADAPTATION STRATEGIES AND PROJECTS



### USAG-Miami/SOUTHCOM Attainable Housing Project

#### Project Need

This purpose of the Attainable Housing project is improve the availability of attainable housing near the installation for USAG-Miami/SOUTHCOM staff to mitigate the high rate of turnover. Listed as a top priority by installation representatives in the Kickoff Meeting, the growing lack of attainable housing is also noted as a concern from the municipalities and counties in South Florida. The importance of attracting and retaining talented servicemen and servicewomen and civilian staff to carry out the installation's missions cannot be understated. Directly south of the installation, a new housing development is currently under construction that will provide lodging for ranked personnel (Figure 6-12).

#### Interventions

##### Policy Actions

- **AH-PA-1.** Miami-Dade County Department of Public Housing and Community Development should form a partnership with the installation, SFDA, local government, developers, and land owners to make incremental, sustained improvement for workforce housing. Report on level of success with the current Workforce Housing Incentive Program, and develop a pilot. Identify land parcels for military housing development opportunities.
- **AH-PA-2.** The City of Doral should update zoning ordinances to prioritize servicemen, servicewomen, and civilian staff by incentivizing leasing for DoD tenants and reducing permit costs. With developers, explore Public-Private Partnership (P3) pilot opportunities, with density bonuses for workforce and attainable housing solutions. Installation representatives should be included in local planning and resilience efforts.

##### Recommendations to the Installation

- **AH-RI-1.** Internally promote the housing resources available through Miami-Dade County and current loan incentives offered to DoD-employed homebuyers.

#### Project Metrics

##### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

2/10

##### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

10/10

##### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

24/30

##### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

10/10

##### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

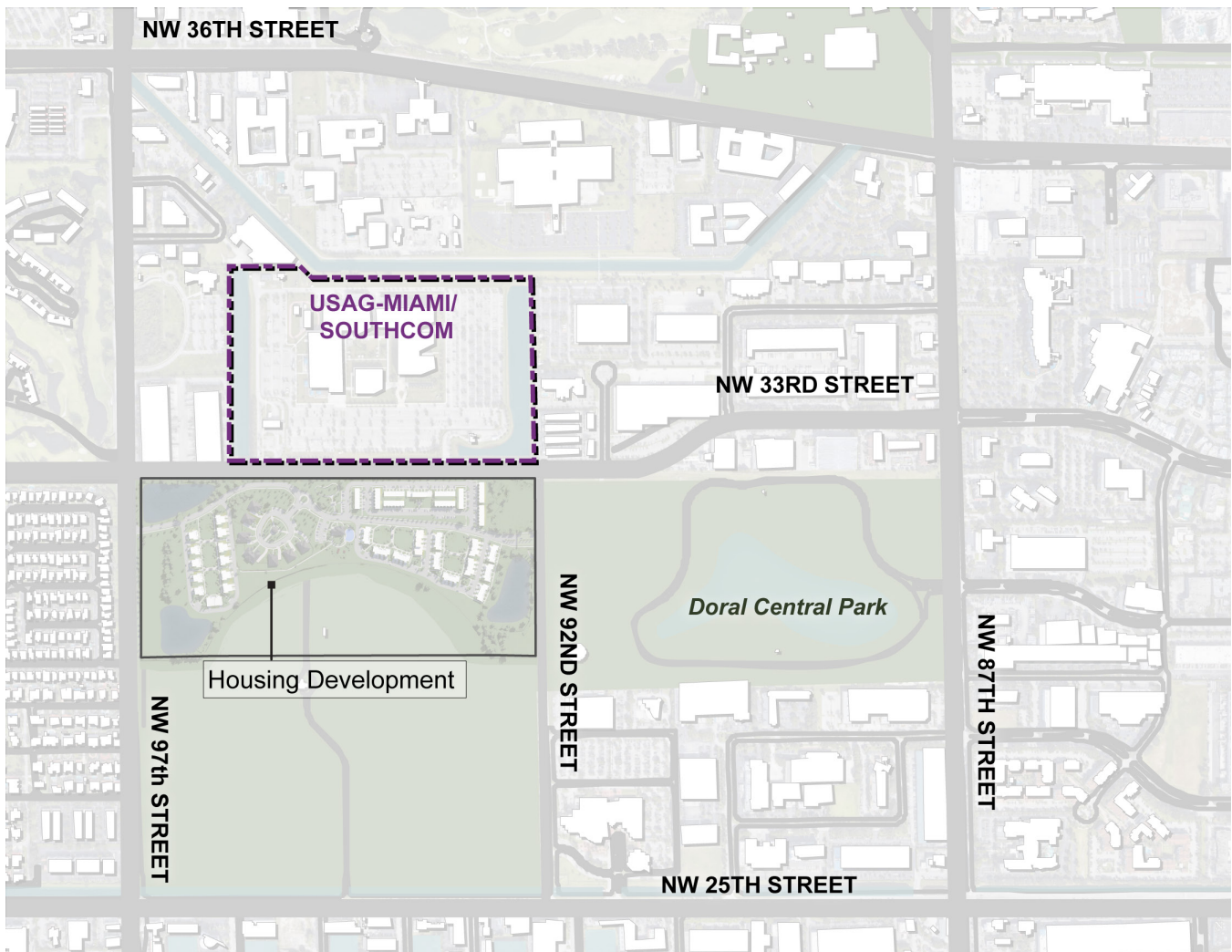
Addresses multiple identified vulnerabilities.

6/10

##### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

8/10



**Figure 6-12. USAG-Miami/SOUTHCOM Proposed Housing Development**

### Co-Benefits

Co-benefits for this effort include additional area jobs for housing support services and additional economic activity in the area.

The Attainable Housing project achieves high and mid scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.



*The FAA-leased parcel on which the DoD housing project will be built*

## 6. ADAPTATION STRATEGIES AND PROJECTS



### USAG-Miami/SOUTHCOM Resilience Hub Project

#### Project Need

The purpose of the Resilience Hub project is to create the Additional Supportive infrastructure that USAG-Miami/SOUTHCOM needs for a resilient workforce population. Adding a resilience hub in the proposed housing development can improve the installation's disaster preparedness and its response to climate events (Figure 6-13).

#### Interventions

##### Policy Actions

- **RH-PA-1.** Coordinate the space programming, services, and operational requirements with the private housing contractor who is building and operating the DoD housing development. The programming should be customized to the needs of those living in the housing development and working at USAG-Miami/SOUTHCOM.

#### Project Metrics

##### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

2/10

##### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

5/10

##### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

14/30

##### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

10/10

##### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

8/10

##### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

10/10

#### Physical Infrastructure Improvements

- **RH-PI-1.** The Housing Developer Team should design and construct the resilience hub to serve as a Disaster Response and Emergency Family Assistance Center (EFAC) as part of the housing development. This will provide shelter, supplies, and Child Development Center services if current agreements for use of the off-base EFAC cease or a non-charter school environment is needed. Consider including potable water source via onsite well.

#### Co-Benefits

Benefits of the resilience hub include:

- Services for residents, such as childcare or emergency shelter
- Additional water sources
- Emergency supply distribution point

The Resilience Hub project achieves high and mid scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.



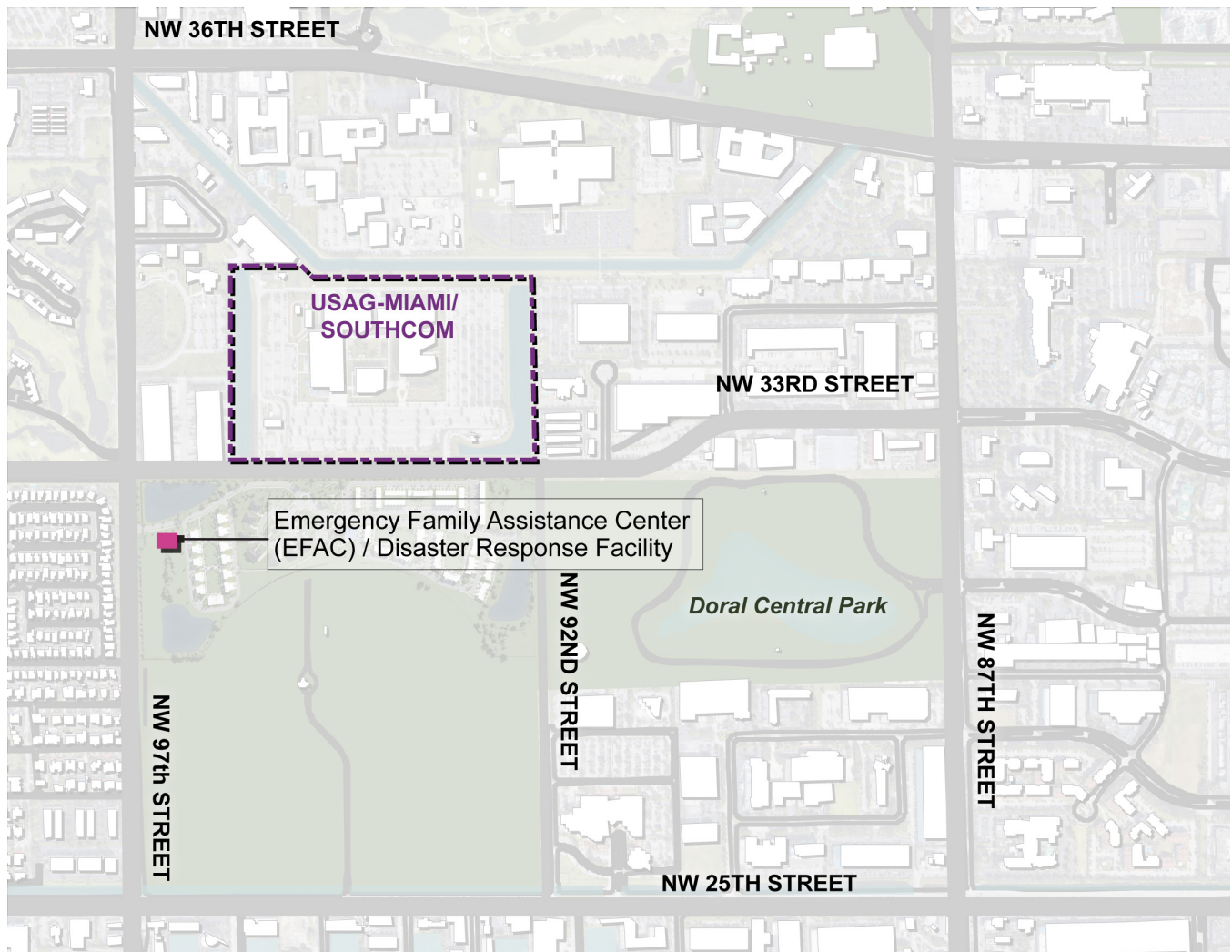


Figure 6-13. USAG-Miami/SOUTHCOM Proposed Resilience Hub Location

### HARB

#### Critical Assets and Priorities

Figure 6-14 shows prioritized physical assets for HARB.

#### Vulnerable Assets

##### Primary Mission Critical Assets

- G-95 Stormwater Canal: *Surge and SLR*
- Biscayne Drive, Tallahassee Road: *Flooding*

##### Secondary Mission Critical Assets

- Power transmission lines: *High Wind Speed*
- South District Wastewater treatment plant (not assessed)
- Turkey Point nuclear power plant (not assessed)
- Naranja Lakes & Leisure City Water treatment plants (not assessed)

##### Mission Supportive Assets

- Wetlands and stormwater canals: *Surge and SLR*

#### Additional Known Vulnerabilities

- High turnover/low workforce availability: *Lack of Attainable Housing, Cost of Living, Long Expensive Commuting*
- Potential encroachment, particularly near APZs
- Lack of redundancy in potable water, wastewater, and power onsite

#### Adaptation Projects

Six projects were developed for HARB to address its vulnerabilities.



Joint Participation Agreement



Transit & Transportation



Natural Infrastructure



Power Utilities

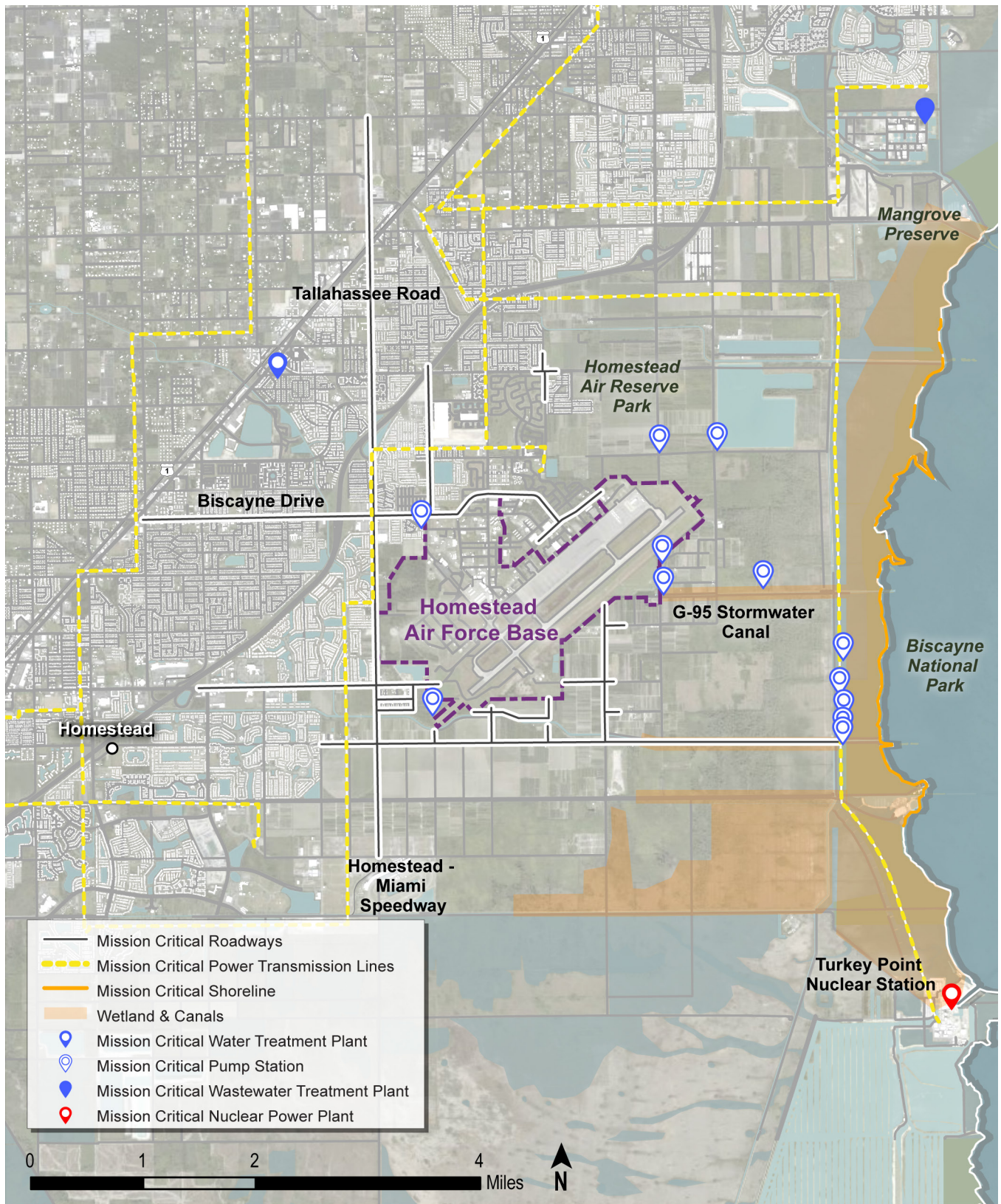


Water & Wastewater Utilities



Land Management





**Figure 6-14. HARB Prioritized Physical Assets**



## 6. ADAPTATION STRATEGIES AND PROJECTS



### HARB Joint Participation Agreement Project

#### Project Need

The purpose of the JPA project is to provide the formal structure and space for planning and coordinating the implementation of the other projects. The JPA is the vehicle for strong leadership and participating members to amplify their joint concerns and implement change (Figure 6-15).

#### Interventions

##### Policy Actions

- **JP-PA-1.** Leverage the existing positive relationships between stakeholders by creating a JPA among HARB, City of Homestead, Miami-Dade County, and SFDA. This JPA can advocate

for mutually beneficial changes in policy, planning, design, construction, and maintenance of the natural and built environment that they share. Advocation can include pursuit of funding for projects (primarily grant applications), and tracking ongoing maintenance needs within the study area. The SFRPC will be the coordinator that establishes the JPA, convening the participants, and tracking the status of the MIRR projects.

#### Co-Benefits

There are no anticipated costs for physical infrastructure improvements; however, funding for staff coordination must be addressed. There are no co-benefits identified for this project.

*The JPA project achieves high scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.*

#### Project Metrics

##### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

10/10

##### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

5/10

##### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

24/30

##### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

10/10

##### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

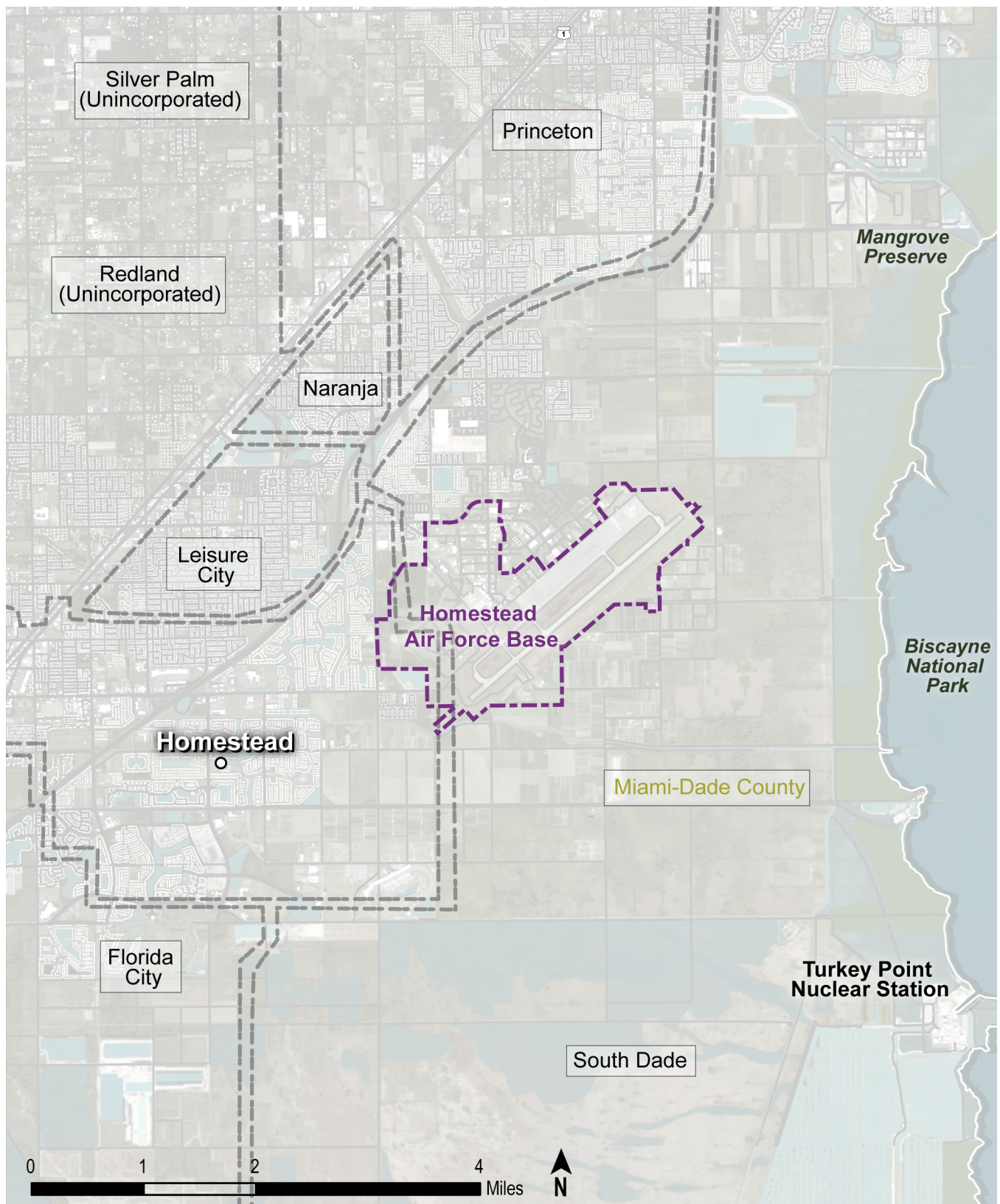
Addresses multiple identified vulnerabilities.

10/10

##### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

0/10



**Figure 6-15. HARB Potential Joint Participation Agreement Members**

## 6. ADAPTATION STRATEGIES AND PROJECTS



### HARB Transit and Transportation Project

#### Project Need

The purpose of the Transit and Transportation project is twofold: to address the inaccessibility of primary access roads due to flooding, and provide safe, connected alternative transit options for those with long commutes. To achieve this, the interventions will mitigate flood-related risks on Biscayne Drive and Tallahassee Road and connect to Miami-Dade County transit corridors (Figure 6-16). The transit corridors include the SMART Program with bus rapid transit (BRT) on U.S. Route 1, and the Bus Express Rapid Transit (BERT) Network on the Homestead Extension Florida Turnpike.

In addition to improving these Primary Mission Critical and Additional Supportive assets, these interventions will reduce traffic congestion around the installation.

#### Interventions

##### Policy Actions

- **TT-PA-1.** Apply to the Defense Access Road Program for Access Road Authority funding to maintain Biscayne Boulevard and Tallahassee Road. HARB is identified as a State Facility of

Importance and as such, is eligible for state and Federal funding that can be used to upgrade and maintain its primary access roads.

#### Physical Infrastructure Improvements

- **TT-PI-1.** Miami-Dade County should commission a planning study for Biscayne Boulevard and Tallahassee Road focused on flood risk mitigation and Complete Streets design.
- **TT-PI-2.** Miami-Dade County should redesign and construct roadway improvements based on the recommendations from the planning study. These should include restriping for shuttle and multi-modal lanes; elevation of roads as needed; improvements to stormwater management with bioswales, infiltration planters, and upgraded pipes; and streetscaping with shade trees, transit shelters, and street lights to improve the temperature and safety.
- **TT-PI-3.** Miami-Dade County should add a BRT stop at Biscayne Drive and U.S. Route 1 on the South Dade TransitWay corridor.

#### Recommendations for Installation

- **TT-RI-1.** Add shuttle at Entry Control Point to circulate inside the fence. This will improve connectivity within the base and make transit more useful for personnel.

#### Project Metrics

##### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

10/10

##### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

8/10

##### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

26/30

##### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

8/10

##### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

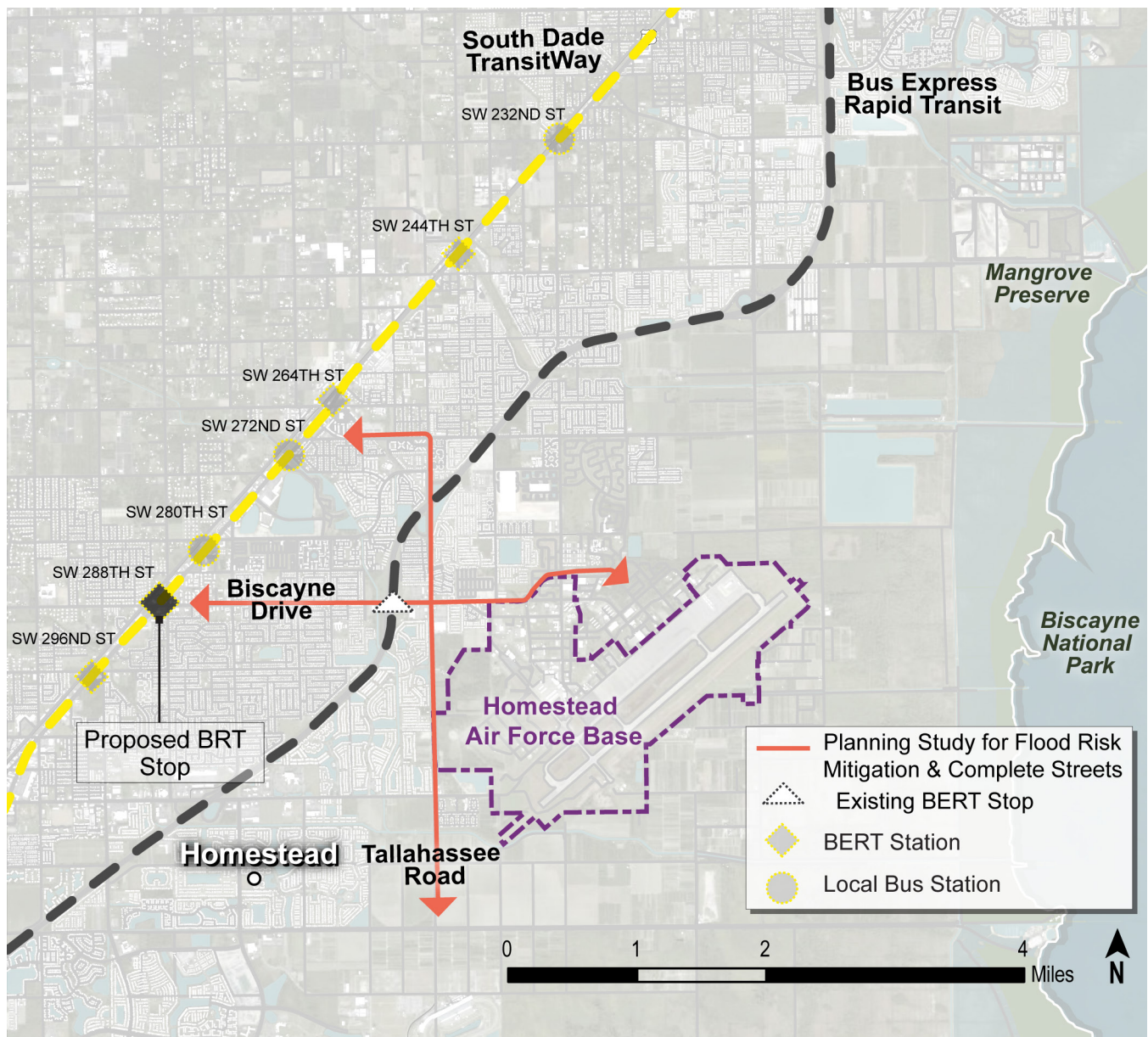
8/10

##### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

8/10





**Figure 6-16. HARB Proposed Transit and Transportation Interventions**

- **TT-RI-2.** Allow for the commissioned planning study to include roads inside the fence, so improvements can be coordinated.

### Co-Benefits

In addition to sustaining the mission critical infrastructure that HARB depends on, other benefits realized by this project include:

- Improved transportation access for the community through the improvement of Biscayne Drive and Tallahassee Drive.
- Reduction in greenhouse gas emissions due to use of transit and shuttle.

The Transit and Transportation project achieves high scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.

## 6. ADAPTATION STRATEGIES AND PROJECTS



### HARB Natural Infrastructure Project

#### Project Need

The Natural Infrastructure project will address the mission critical stormwater flooding in canals and the health of the mission supportive natural wetlands infrastructure (Figure 6-17). The listed interventions assist in elevating HARB's representation when decisions are being made of the watershed as well as reduce its dependency on water providers.

#### Interventions

##### Recommendations for Installation

- **NI-RI-1.** Gain a seat at the BBSEER study, which is developing plans to restore parts of the South Florida ecosystem in wetland and coastal areas. Participating in the study will ensure that HARB is represented when decisions concerning its area are made.

- **NI-RI-2.** Communicate and participate with SFWMD and USACE as they improve canals. The installation is located in the SFWMD C-103 watershed, where WASD is implementing projects to improve watershed resilience. HARB should be in touch with SFWMD and USACE so its voice can be heard and protection of the installation can be prioritized.
- **NI-RI-3.** Store stormwater and use as vehicle wash, irrigation, and fire suppression water. Using stormwater for additional uses can reduce the installation's potable water use, which is beneficial for times when potable water may be scarce (i.e., when there's a service disruption).

The Natural Infrastructure project achieves high and mid scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.

#### Project Metrics

##### MISSION CRITICALITY

Supports the execution of the mission(s) of the Installations and aligns with stakeholders-stated priorities.

10/10

##### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

10/10

##### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

20/30

##### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

10/10

##### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

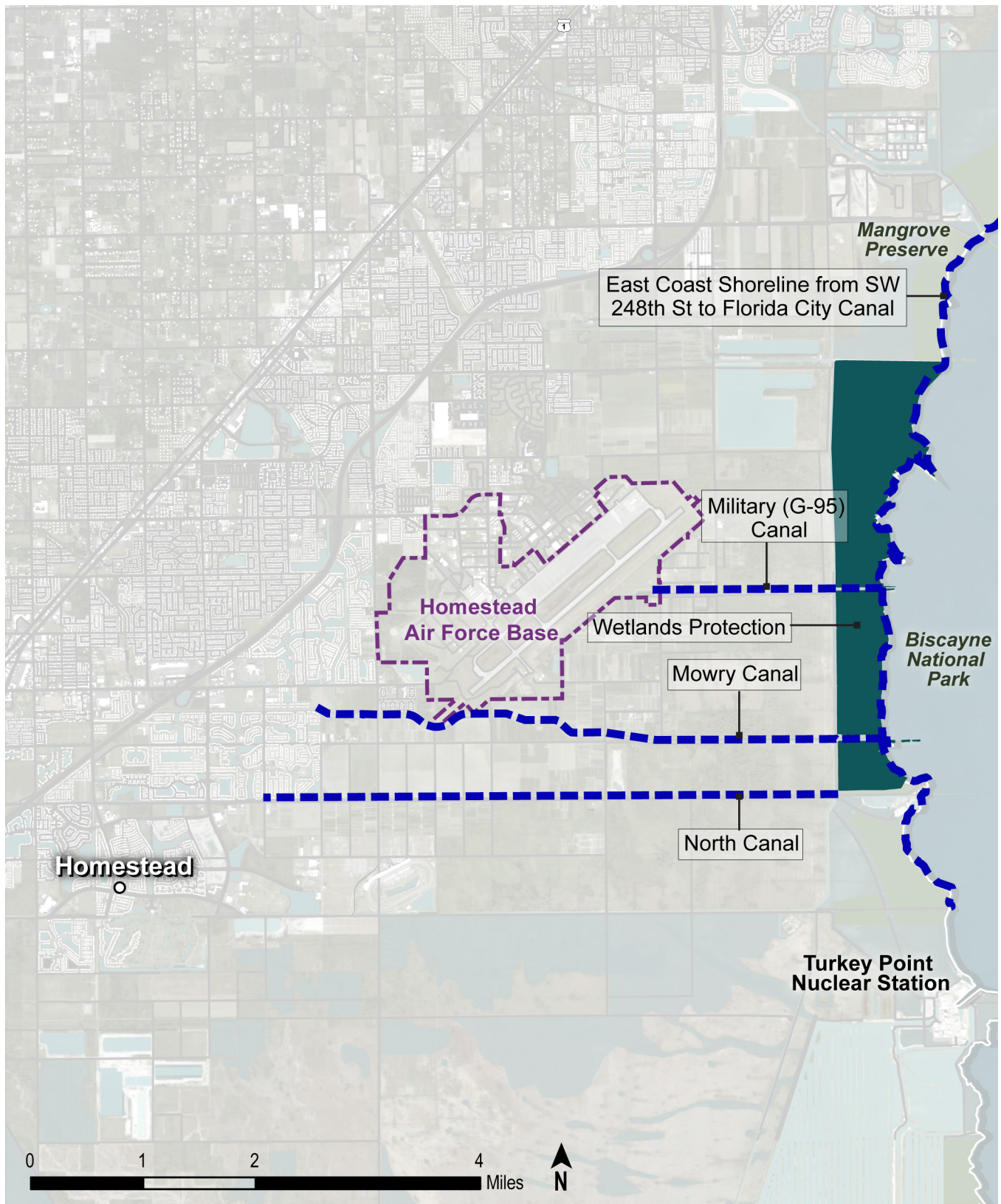
6/10

##### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

0/10





**Figure 6-17.** HARB Mission Critical and Supportive Canals, Wetlands, and Shorelines





### HARB Power Utilities Project

#### Project Need

The purpose of the Power Utilities project is to reduce potential for disruption of the mission critical infrastructure on which HARB relies. Continuity can be ensured by reducing the effect of high wind and flooding hazards on mission critical electric power and communications systems (Figure 6-18). Miami-Dade County Emergency Management and FPL have placed some HARB facilities on the Critical Infrastructure Facility (CIF) list, giving the installation priority for repairs after a disruption (storm event). In addition to improving the resilience of the utility systems, these interventions will avoid costs of up to \$100,000 in replacing damaged equipment.

#### Interventions

##### Policy Actions

- **PU-PA-1.** FPL should develop a Cooperative Funding Agreement and identify what equipment at substations and transformers must be elevated and hardened. Costs for protecting the infrastructure can be shared among entities.
- **PU-PA-2.** AT&T should provide HARB priority status and improve infrastructure serving the installation to reduce disruptions during emergencies.
- **PU-PA-3.** Miami-Dade County Emergency Management should coordinate with FPL to elevate remaining HARB facilities to the CIF list. Infrastructure on the CIF list receives repairs first after a disruption (storm event), enhancing service reliability.
- **PU-PA-4.** FPL should confirm with HARB that the aboveground transmission lines and belowground distribution infrastructure is prioritized in its Risk Mitigation Plan.

- **PU-PA-5.** Miami-Dade County should conduct alternative energy study for battery storage farms within APZs. These facilities would provide a source of electric power for the installation.

#### Physical Infrastructure Improvements

- **PU-PI-1.** FPL should install an automated switch at the offsite substation. In the event of an outage at the substation, power will be automatically redirected to a different facility without manual intervention. This intervention will improve electric service reliability for the installation.
- **PU-PI-2.** FPL should harden or move underground the distribution system from the substation to installation. Hardening can include converting wood to concrete poles, while undergrounding protects infrastructure from aboveground hazards.
- **PU-PI-3.** FPL should identify and elevate or harden critical transformers that support the installation. The transformers should be elevated out of the floodplain or hardened so they are not impacted by flooding.

#### Recommendations for Installation

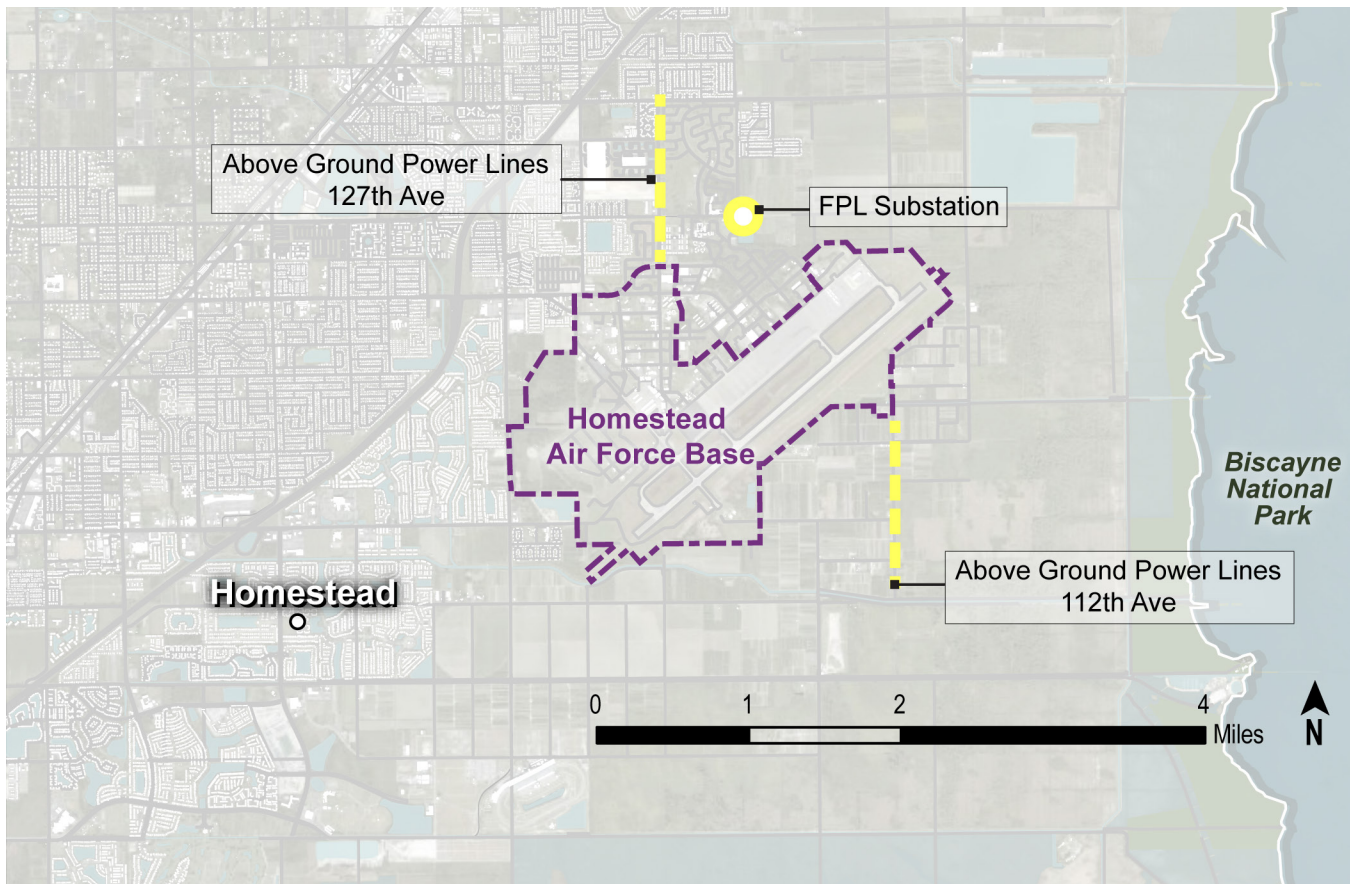
- **PU-RI-1.** Obtain a secondary fuel source for onsite power generators (such as natural gas). This will provide additional redundancy for backup power at the installation.

#### Co-Benefits

Project benefits include:

- Improved power service reliability for community

The Power Utilities project achieves high scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.



**Figure 6-18. HARB Critical Electric Infrastructure**

## Project Metrics

### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

10/10

### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

3/10

### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

26/30

### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

8/10

### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

8/10

### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

8/10

## 6. ADAPTATION STRATEGIES AND PROJECTS



### HARB Water and Wastewater Utilities Project

#### Project Need

The purpose of the Water and Wastewater Utilities project is to address additional known vulnerabilities for HARB stemming from a lack of redundant water and wastewater service. The listed interventions have environmental benefits by reducing water use and promoting water recycling (Figure 6-19).

#### Interventions

##### Physical Infrastructure Improvements

- **WW-PI-1.** Miami-Dade County WASD should connect HARB to wastewater line that will run south past the installation. This will add a redundant option for wastewater service.

##### Recommendations for Installation

- **WW-RI-1.** Store stormwater and use it as vehicle wash and/or irrigation water. Recycling of stormwater frees up use of potable water.

- **WW-RI-2.** Stockpile bottled drinking water for emergencies. If water service is off, the installation can still run.
- **WW-RI-3.** Use non-potable water (greywater, stormwater) for non-potable demands, such as toilet flushing. Greywater recycling can reduce potable water use, saving it for purposes that require it (such as drinking).
- **WW-RI-4.** Look at short-term solutions for alternative drinking water sources (onsite rainwater collection cisterns and chlorination systems).
- **WW-RI-5.** Use onsite well as backup potable water source. A well could be a potential backup water source that will improve water service resilience by providing a redundant water source.

#### Co-Benefits

Potential benefits for this project include:

- Improved water service reliability for the community

The Water and Wastewater Utilities project achieves mid scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.

#### Project Metrics

##### MISSION CRITICALITY

Supports the execution of the mission(s) of the installation(s) and aligns with stakeholders-stated priorities.

4/10

##### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

5/10

##### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

26/30

##### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

8/10

##### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

8/10

##### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

4/10



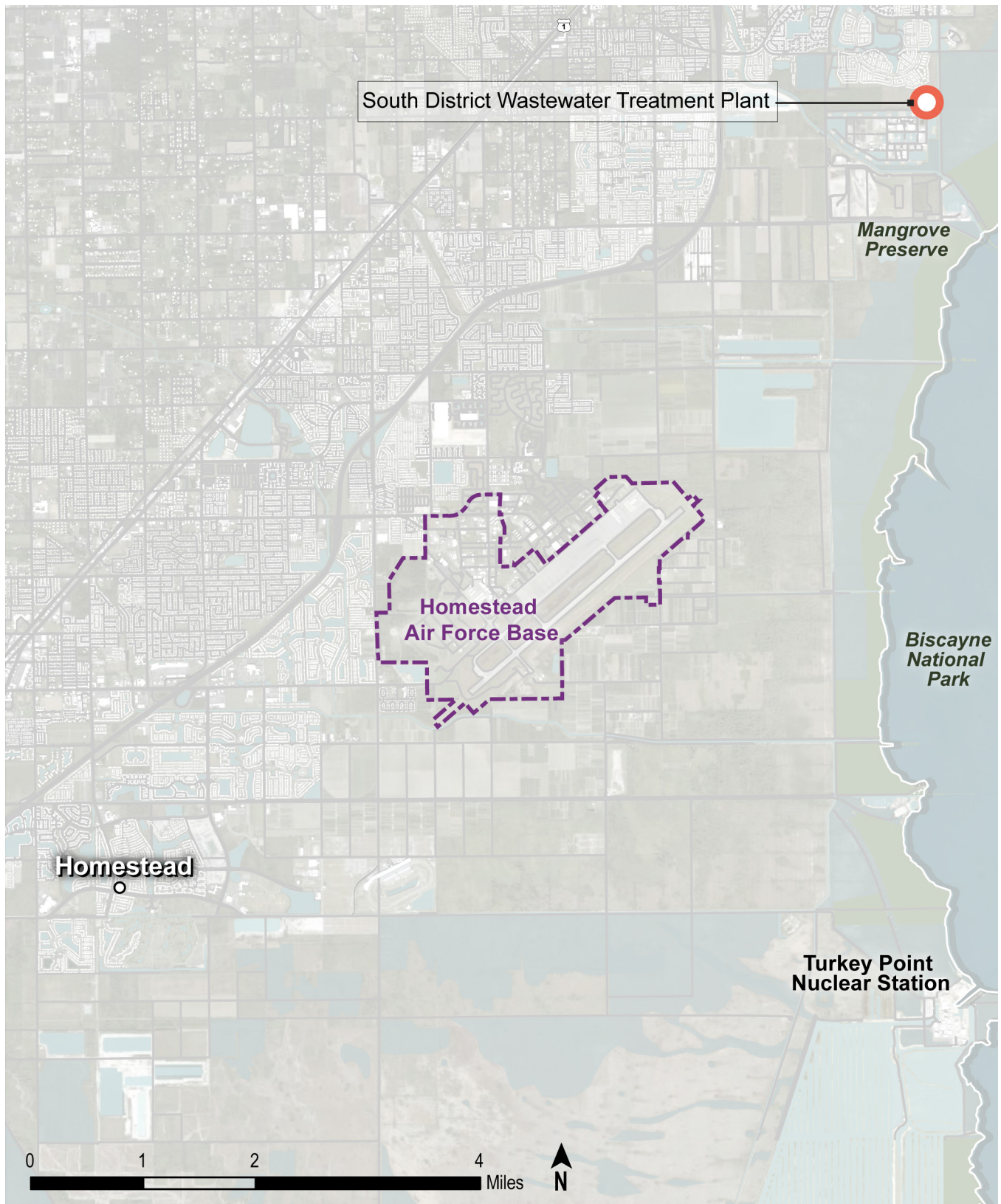


Figure 6-19. HARB Nearby Wastewater Facility

## 6. ADAPTATION STRATEGIES AND PROJECTS



### HARB Land Management Project

#### Project Need

This project will mitigate mission supportive land use and encroachment concerns around the installation. The potential for commercial development in the areas around the installation is causing encroachment concerns for HARB (Figure 6-20). The interventions will establish the basis for combating encroachment through policy, such as the zoning code or master planning.

#### Interventions

##### Policy Actions

- **LM-PA-1.** Miami-Dade County, along with HARB, should continue developing parameters for the study that defines encroachment in all its forms. This study will provide the support for actions that can protect the base from land management and encroachment.

#### Recommendations for Installation

- **LM-RI-1.** Continue to work with Miami-Dade County to develop the study to define encroachment. Defining encroachment specifically for HARB, which is located in a rapidly growing community, will help the County incorporate that definition in its land use plans and codes. In addition, establishing a definition for encroachment can help HARB pursue funding to purchase land to protect the installation.

The Land Management project achieves mid scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.

#### Project Metrics

##### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

4/10

##### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

2/10

##### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

26/30

##### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

8/10

##### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

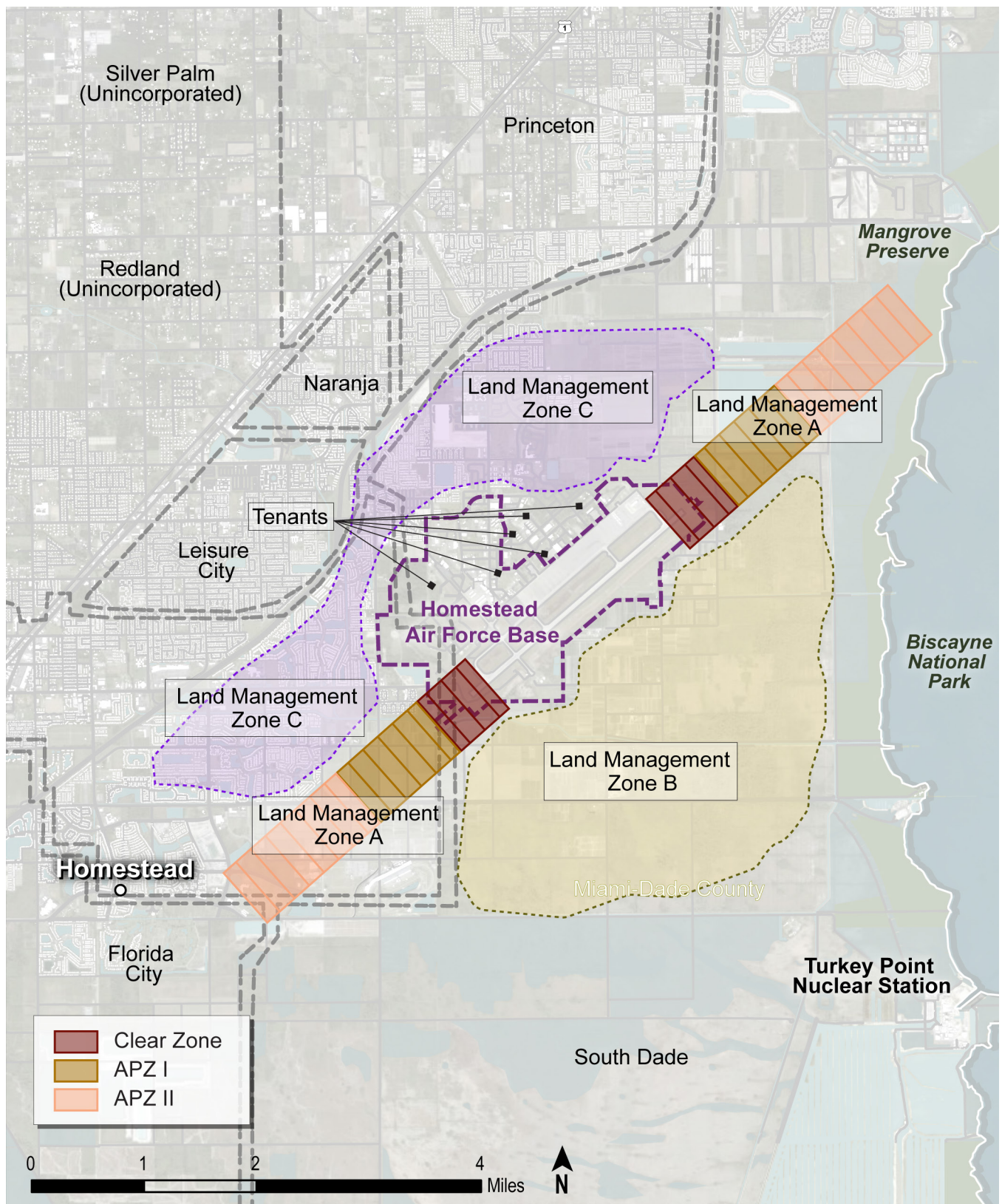
8/10

##### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

4/10





**Figure 6-20. HARB Regions Requiring Land Management Interventions**



## 6. ADAPTATION STRATEGIES AND PROJECTS

### NASKW

NASKW is closely connected and well coordinated with the City of Key West and Monroe County. The limited amount of space on the island necessitates strong partnerships and sharing of resources within this close-knit community. In the same manner, they all face the shocks and stresses to their environment together.

With this in mind, it is imperative to acknowledge that Key West relies on power, water, wastewater, transportation, and communication infrastructure from mainland Florida through 120 miles of pipelines. Therefore, the city and county are actively engaged in strengthening the resilience of their shared infrastructure. There is greater need and more positive impact to be gained by supporting these current efforts that the installation depends on than identifying additional projects.

Figure 6-21 shows critical assets for NASKW.

### Critical Assets and Priorities

The vulnerability assessment showed the following Primary Mission Critical, Secondary Mission Critical, and mission supportive assets and their accompanying threats within the study area.

#### Primary Mission Critical Assets

- Shorelines south of runway on Boca Chica: *Erosion, Surge and SLR*
- Power transmission lines: *High Wind Speed*

#### Secondary Mission Critical Assets

- Palm Avenue entrance to Trumbo Point: *Flooding*
- US1, Roosevelt Boulevard, and White Street: *Flooding*
- Fuel pipes (not assessed)
- Florida Keys Aqueduct Authority wastewater storage facility: *Flooding*

### Mission Supportive Assets

- Shorelines on North Boca Chica, Fleming Key, Dredgers Key, and Truman Annex: *Erosion*
- Local roads adjacent to installation boundaries: *Flooding*
- Local fire station: *Surge and SLR*
- Communications facilities: *Flooding Due to Surge*

### Additional Known Vulnerabilities

- High turnover/low workforce availability: *Lack of Attainable Housing, Cost of Living, Long Expensive Commuting*
- Security of shorelines and boundaries: *Nearby Tourist Attractions*
- Sustained viability of community airports: *SLR*
- Electric Vehicle Fleet Mandate: *Supply, Demand, and Infrastructure*
- Fuel dock on Pier 3

### Adaptation Projects

Six projects were developed for NASKW to address its vulnerabilities.



Joint Participation Agreement



Shoreline Stabilization and Security



Resilient Utilities



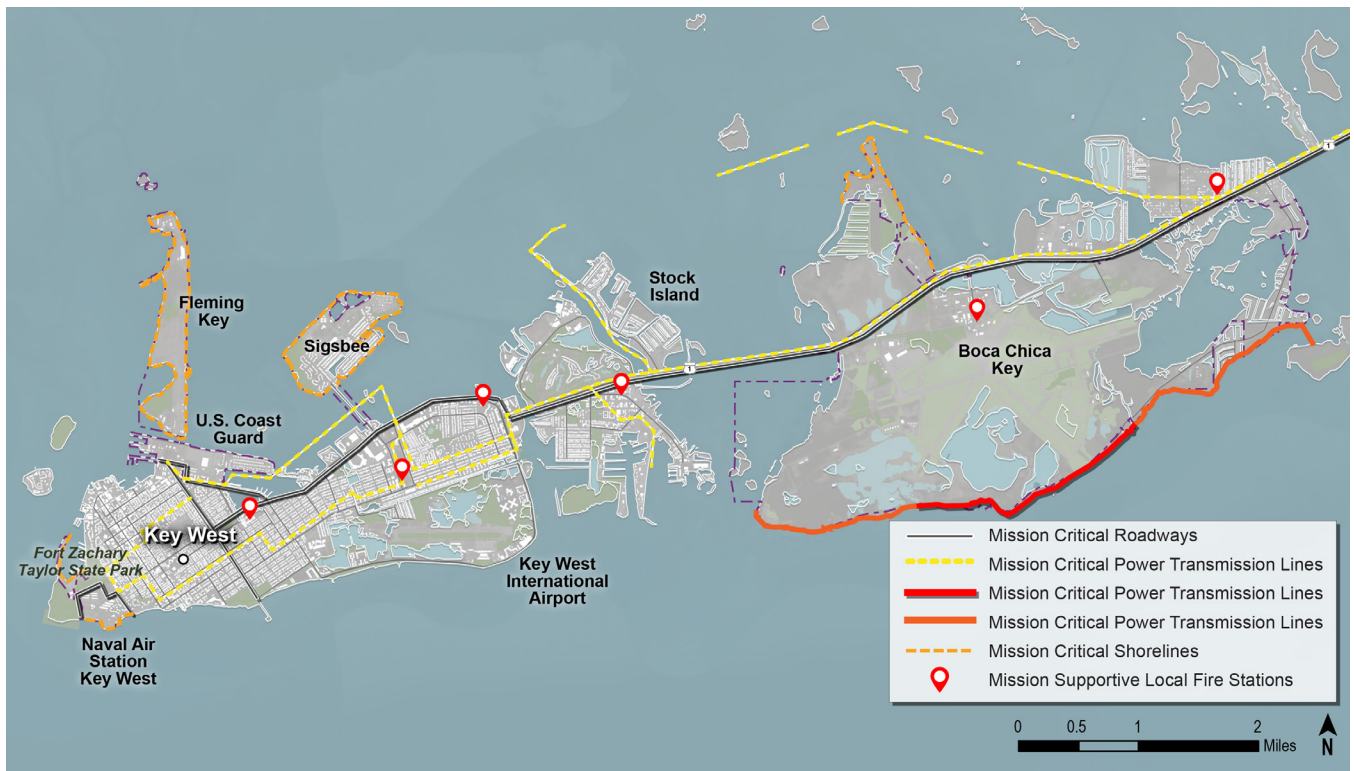
Stormwater Infrastructure



Roadway Improvements



Attainable Housing and Resilience Hub



**Figure 6-21. NASKW Prioritized Physical Assets**

## 6. ADAPTATION STRATEGIES AND PROJECTS



### NASKW Joint Participation Agreement Project

#### Project Need

NASKW is currently in a participation agreement and works closely with the City of Key West and Monroe County. The purpose of the JPA project is to provide the formal structure and space for planning and coordinating the implementation of the other projects. The JPA is the vehicle for strong leadership and participating members to amplify their joint concerns and implement change (Figure 6-22).

#### Interventions

##### Policy Actions

- **JP-PA-1.** Amend the existing JPA among NASKW, the City of Key West, and Monroe County to include the USCG Sector Key West, Fort Zachary Taylor State Park, and SFDA. This JPA can advocate for mutually beneficial changes in policy, planning, design, construction, and maintenance of the natural and built environment that they share. Advocacy can include pursuit of funding for projects (primarily grant applications), and tracking ongoing maintenance needs within the study area. The SFRPC will be the coordinator that establishes the JPA, convening the participants, and tracking the status of the MIRR projects.

The JPA project achieves high scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.

#### Project Metrics

##### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

10/10

##### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

10/10

##### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

24/30

##### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

10/10

##### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

8/10

##### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

0/10





Figure 6-22. NASKW Potential Joint Participation Agreement Membership



### NASKW Shoreline Stability and Security Project

#### Project Need

Shorelines at every installation location are at risk of erosion, and many are adjacent to tourist destinations. The shoreline of Boca Chica Key are Primary Mission Critical as it directly supports the airfield. With these locations occurring on multiple islands, implementation of shoreline stabilization will be a highly coordinated effort between city, county, state, and installation. Engineering With Nature (EWN) and Defense Advanced Research Projects Agency (DARPA) are familiar with the conditions in this study area and are actively engaged in innovative resilience projects. Additionally, visual designations and incorporation of security elements are needed to reinforce boundaries between the installation and tourist destinations in the City of Key West (Figure 6-23).

#### Interventions

##### Policy Actions

- **SS-PA-1.** JPA should leverage EWN and DARPA's layered defense strategy at Key West shorelines by inviting them to partner on this project.

##### Physical Infrastructure Improvements

- **SS-PI-1.** EWN and DARPA should bring innovative hybrid design solutions to address the stabilization of critical shorelines based on their familiarity with the subject matter and the area. A comprehensive approach including hardening the gray infrastructure and restoring the nature-based infrastructure is needed. The nature-based infrastructure should include living shorelines with seagrass and coral restoration to promote a thriving biodiverse ecology that will help mitigate erosion.
- **SS-PI-2.** Monroe County should construct improvements to mission critical shorelines south of Boca Chica.

- **SS-PI-3.** The City of Key West should construct improvements to shorelines on Fleming Key.
- **SS-PI-4.** The City of Key West should develop a Landscape Master Plan as a complement to the Strategic Plan and Bicycle and Pedestrian Plan. This plan should include an Installation Perimeter typology – a new roadway classification for streetscape treatment around the installation boundary. This typology should have its own security-focused theme that will visually indicate that one is on U.S. Navy property. The visual indication, along with additional security elements, will reduce some trespassing risk with a coordinated aesthetic aligned with the rest of the city.
- **SS-PI-5.** The City of Key West should design and construct the streetscape improvements of the Installation Perimeter segments in the Landscape Master Plan.

#### Recommendations for Installation

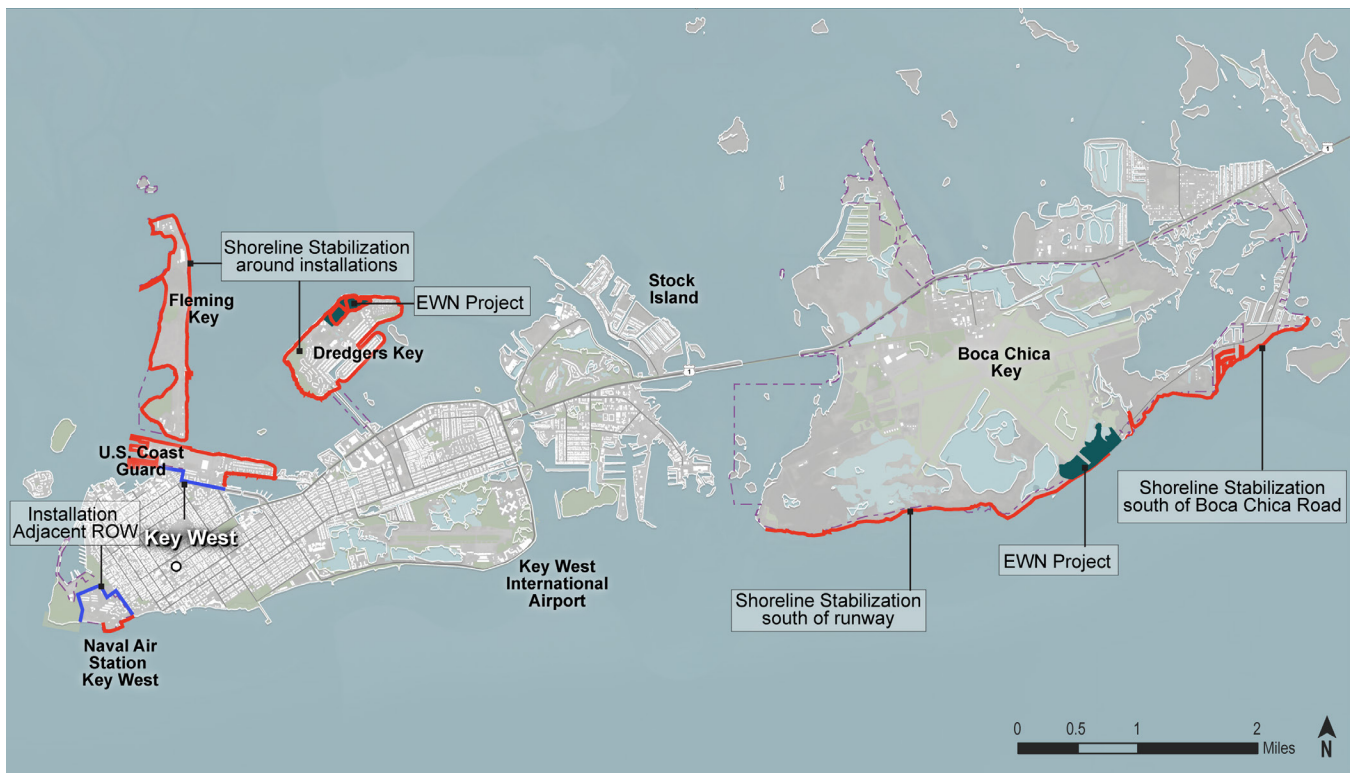
- **SS-RI-1.** Review security concerns with the City of Key West.
- **SS-RI-2.** Conduct shoreline assessment along Fleming and Dredgers Keys to justify reconstruction/maintenance needs.
- **SS-RI-3.** The U.S. Navy should construct improvements to mission critical shorelines at Trumbo Point and Dredgers Key.

#### Co-Benefits

Project benefits include:

- Increased biodiversity and habitat creation through restored shorelines and updated streetscapes
- Carbon sequestration

The Shoreline Stability and Security project achieves high and mid scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.



**Figure 6-23. NASKW Proposed Shoreline Stabilization and Protection Projects**

## Project Metrics

### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

10/10

### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

10/10

### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

26/30

### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

8/10

### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

8/10

### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

6/10





### NASKW Resilient Utilities Project

#### Project Need

The purpose of the Resilient Utilities project is to ensure continuation of the primary missions executed at NASKW. To achieve this goal, the interventions protect the electric transmission infrastructure between the installation facilities and power sources in Key West. This is the most important component for sustained mission assurance. In addition, the interventions improve the reliability of water and communications services, which support NASKW's mission (Figure 6-24). Based on USACE Norfolk District's 2021 Florida Keys Coastal Storm Risk Management Study's *Final Integrated Feasibility Report and Environmental Impact Statement* (USACE 2021d), OLDCC is funding a project to dry floodproof the OMI Trumbo Wastewater Treatment Plant.

#### Interventions

##### Policy Actions

- **RU-PA-1.** The City of Key West should commission a Backup Energy Feasibility study to explore alternative power generation opportunities. Critical facilities should be prioritized for backup power implementation. The study should explore multiple dispersement scenarios and innovative waste-to-energy options. This could also alleviate the challenge of removing solid waste when bridges or pipes are disrupted, lower greenhouse gases, and reduce hauling costs.
- **RU-PA-2.** The City of Key West should commission a Cistern Feasibility Study to explore opportunities for cistern creation, and stormwater reuse with filtration. The entire water system is currently being delivered at a lower pressure to avoid additional mainline breaks, as happened in April 2023.

#### Physical Infrastructure Improvements

- **RU-PI-1.** Keys Energy should elevate and harden substations and transformers with identified high and medium risk. This will improve electrical service reliability by reducing flood impacts.
- **RU-PI-2.** AT&T should harden communications infrastructure. This can include installing a fiber backbone and creating a redundant and separate service for the DoD, and elevating ground transformers.
- **RU-PI-3.** Keys Energy should move distribution lines underground in areas where lines are traveling through a heavily vegetated area. This will protect distribution infrastructure from being damaged by vegetation and other flying debris during storm events.
- **RU-PI-4.** The City of Key West should design and construct backup energy projects from the feasibility study.
- **RU-PI-5.** The City of Key West should design and construct stormwater storage and filtration projects from the feasibility study.

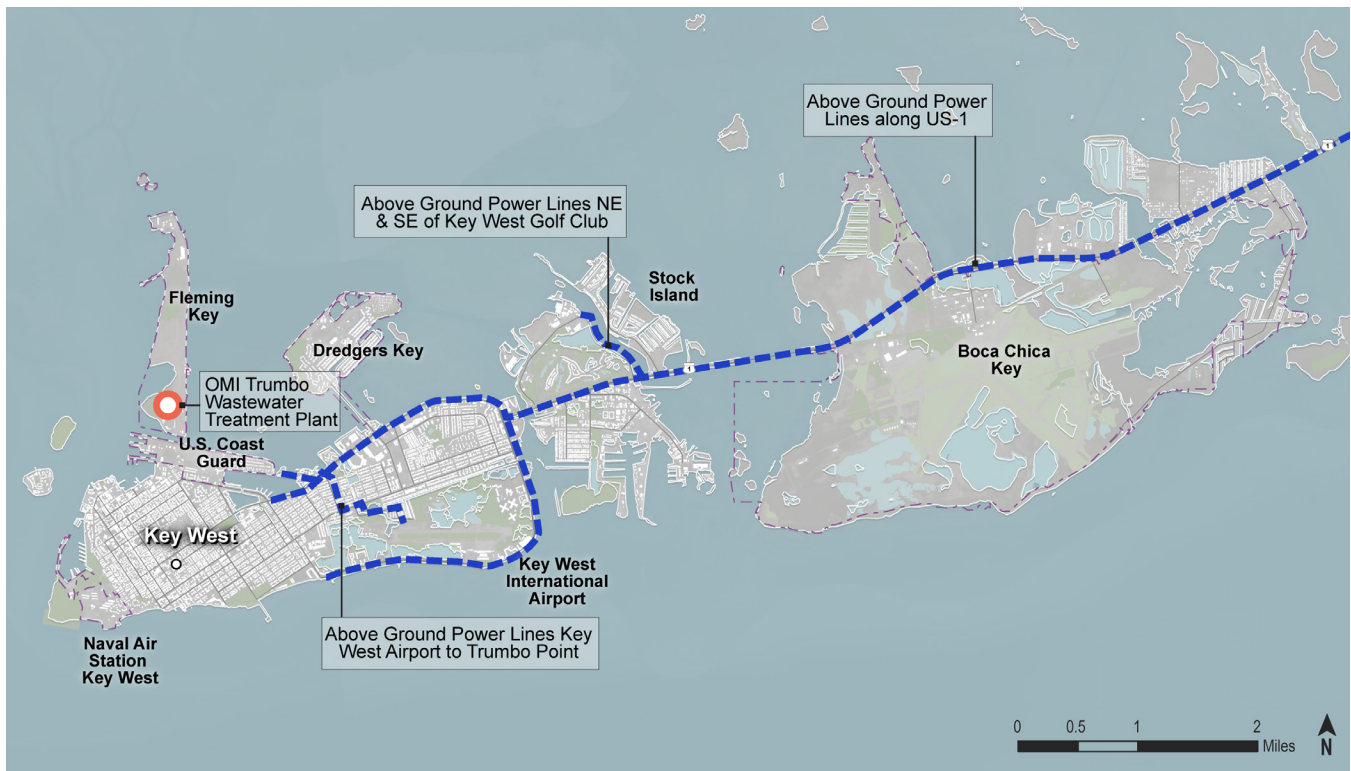
#### Recommendations for Installation

- **RU-RI-1.** Develop an understanding of how other installations are dealing with energy issues and funding. NASKW is not facing its power challenges in a vacuum; across the country, other installations are also dealing with the challenges of utility service and how to fund projects.
- **RU-RI-2.** Partner with the City of Key West to develop alternative backup source of potable water. This can provide redundancy for the installation in the event of a disruption.
- **RU-RI-3.** Explore backup communications protocol or service to provide redundancy in communications service.

#### Co-Benefits

- Co-benefits for this project include increased energy and communications service reliability for the surrounding community.

The Resilient Utilities project achieves high and mid scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.



**Figure 6-24. Aboveground Power Lines Servicing NASKW**

## Project Metrics

### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

10/10

### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

10/10

### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

14/30

### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

8/10

### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

8/10

### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

6/10

## 6. ADAPTATION STRATEGIES AND PROJECTS



### NASKW Stormwater Infrastructure Project

#### Project Need

This project will address inaccessibility of mission critical roads due to storm-related flooding, surge, and SLR. Palm Avenue serves as the primary access road at Trumbo Point for NASKW, USCG Sector Key West, the Key West Housing Authority, and Peary Court Apartment Complex. North Roosevelt Boulevard (also known as State Route A1A) feeds into Palm Avenue and is the only road that connects Key West to mainland Florida (Figure 6-25). Flooding of these roads is primarily due to lack of capacity in the stormwater system. The City of Key West has identified a project for a pump station to address it, but it will require construction on multiple properties to be successful. There are already positive relationships between various entities in Key West – key to bringing forward momentum and coordination to these interventions.

#### Project Metrics

##### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

10/10

##### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

8/10

##### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

14/30

##### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

8/10

##### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

4/10

##### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

4/10

#### Interventions

##### Policy Actions

- **SI-PA-1.** JPA should invite Monroe County School District Board and Key West Housing Authority to a partnership agreement (e.g., Memorandum of Understanding) for the pump station project. This agreement will bring stakeholders to the table to define the components of the pump station project such as ownership, responsibility, financial contributions, and O&M.

##### Physical Infrastructure Improvements

- **SI-PI-1.** The City of Key West should design and construct a stormwater pump station, piping, and outfall to alleviate flooding on Palm Avenue at Trumbo Point. This will reduce disrupted access to Trumbo Point.

##### Recommendations for Installation

- **SI-RI-1.** Participate in the coordinated effort to implement the pump station project.





**Figure 6-25. NASKW Proposed Conceptual Site Location for Palm Avenue Pump Station**

### Co-Benefits

This project improves access for the surrounding residents and businesses.

The Stormwater Infrastructure project achieves high and mid scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.

## 6. ADAPTATION STRATEGIES AND PROJECTS



### NASKW Roadway Improvements Project

#### Project Need

NASKW is accessible by only one road spanning 120 miles from mainland Florida. US-1 is a complex network of bridges and road running through the Keys and is also used as an evacuation route during an emergency. Monroe County has completed the US-1 Transportation Study, and USACE is in progress on a Coastal Storm Feasibility Study to identify areas of vulnerability. Additionally, other critical roads in the city, such as Flagler Street and Whitehead Street have been identified that require flood mitigation, especially during king tides. The transportation infrastructure can also be improved to support electric vehicles (Figure 6-26).

#### Project Metrics

##### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

6/10

##### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

10/10

##### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

26/30

##### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

6/10

##### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

8/10

##### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

8/10

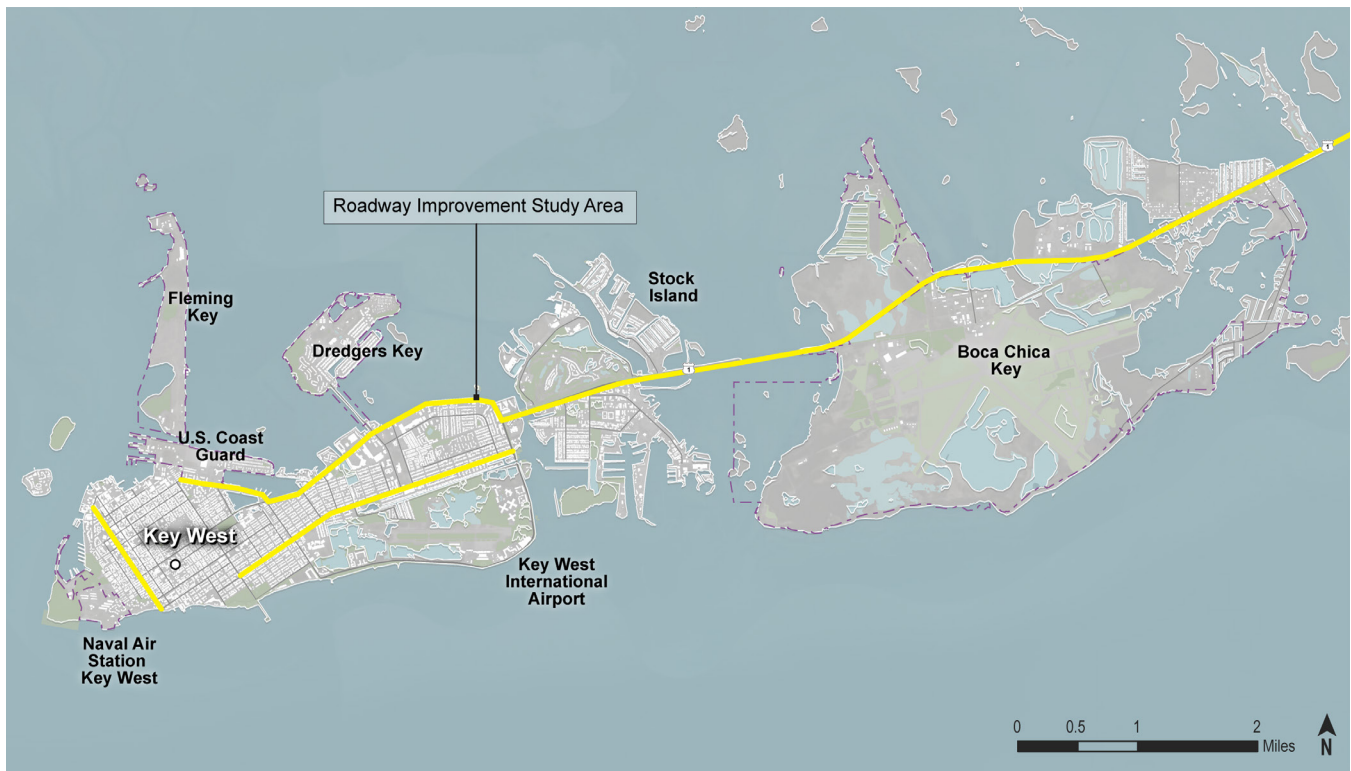
#### Interventions

##### Policy Actions

- **RI-PA-1.** JPA should consult transportation studies completed by Monroe County, USACE and the City of Key West. Amend the projects within the studies so the timelines can be aligned in a complementary order, add additional segments of critical roads that were not previously included, and add the mission criticality to the project need descriptions. This will assist in streamlining construction and open additional funding opportunities.
- **RI-PA-2.** The City of Key West should include infrastructure components to support electric and alternative fuel vehicles in the Landscape Master Plan. These provisions align with the city's initiatives and support the installation with its compliance efforts for the Federal Electric Vehicle Fleet Mandate.

##### Physical Infrastructure Improvements

- **RI-PI-1.** Design and construct segment updates in a phased manner per the JPA's amendments.



**Figure 6-26. NASKW Critical Access Roads**

### Co-Benefits

Benefits for this project include:

- Improved community transportation access
- Improved emergency response times

The Roadway Improvements project achieves high and mid scores, indicating that it will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.





### NASKW Attainable Housing and Resilience Hub Projects

#### Project Need

This purpose of the Attainable Housing project is improve the availability of attainable housing near the installation for NASKW staff to mitigate the high rate of turnover. Listed as a top priority by installation representatives in the Kickoff Meeting, the growing lack of attainable housing is also noted as a concern from the municipalities and counties in South Florida. The importance of attracting and retaining talented servicemen and service women and civilian staff to carry out the installation's missions cannot be understated. Four prevalent factors influencing the affordability of living in the Keys include limited land availability, a robust tourism economy that competes for land, a housing supply that is limited by the Rate of Growth Ordinance, and a constricted supply chain that raises the cost of living. The Keys are a designated Area of Critical State Concern, which requires that the population must be able to evacuate within 24 hours during times of emergency. The City of Key West and Monroe County are actively engaged in efforts to alleviate the housing crisis.

As of August 2023, the U.S. Navy has applied for approval to issue an enhanced-use lease (EUL) for parcels on Dredgers Key that could be used for military housing. Because development of this project would occur inside the NASKW fence, the South Florida MIRR offers recommendations for next steps.

#### Interventions

##### Policy Actions

- **AH-PA-1.** The U.S. Navy should issue EUL for mixed-use affordable military housing on Dredgers Key.

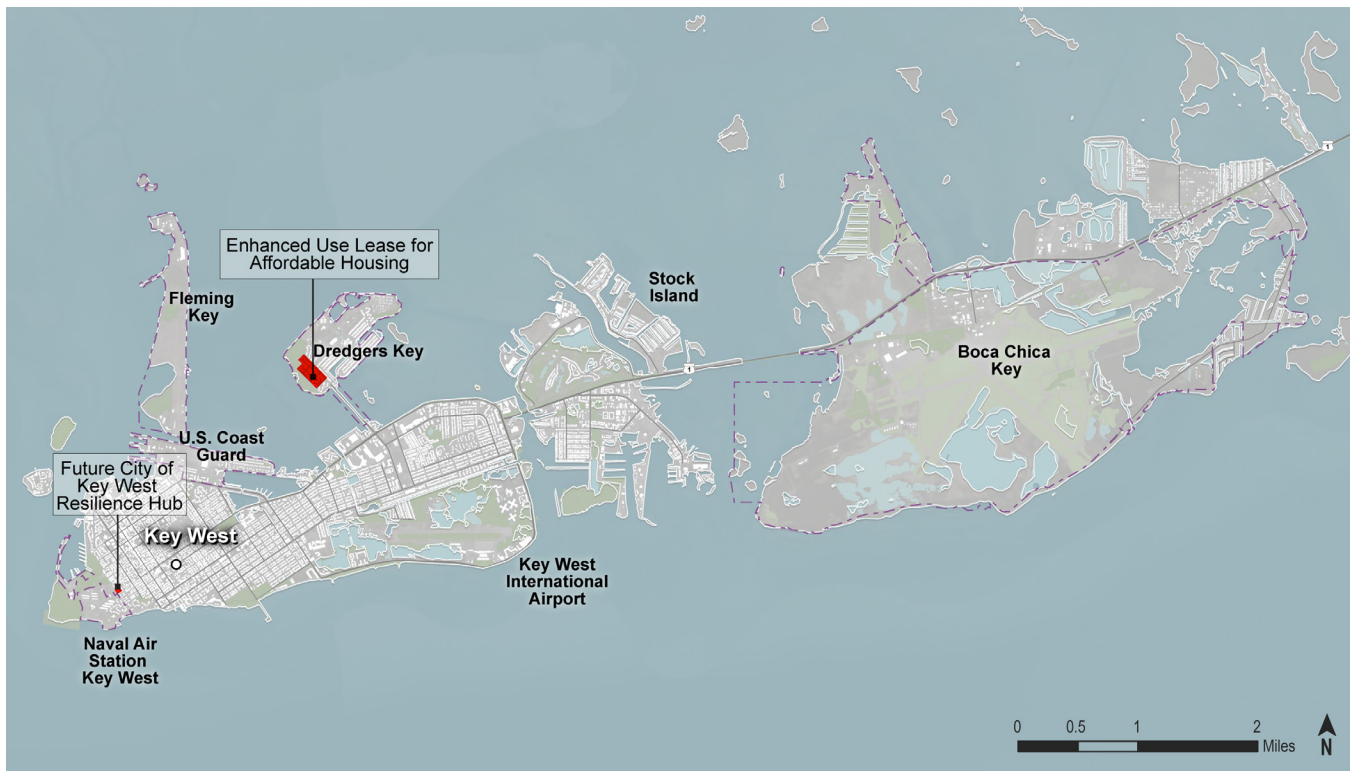
##### Physical Infrastructure Improvements

- **AH-PI-1.** The City of Key West should design and construct the planned resilience hub in Bahama Village to support residents, including civilian staff and families for post-disaster support.

##### Recommendations for Installation

- **AH-RI-1.** Keep JPA apprised of Federal decision to approve EUL.
- **AH-RI-2.** Develop a program for Dredgers Key property for affordable military housing on the EUL site. The program should include a narrative and rough order-of-magnitude density, co-benefits, and compatibility with city and county priorities.
- **AH-RI-3.** Stay in communication with EWN regarding their nature-based projects at Sigsbee Causeway.
- **AH-RI-4.** Design and construct mixed-use affordable military housing on Dredgers Key.
- **AH-RI-5.** Partner with the City of Key West Community Development Office on new housing projects.
- **AH-RI-6.** Consider additional parcels inside the fence that could be utilized as mixed-use housing EUL opportunities to support staff and residents.

The Attainable Housing and Resilience Hub projects achieves mid scores, indicating that they will support the South Florida MIRR objectives for Mission Assurance through Community Resilience.



**Figure 6-27. NASKW Location of Attainable Housing Project**

## Project Metrics

### MISSION CRITICALITY

Supports the execution of the mission(s) of the installations and aligns with stakeholders-stated priorities.

2/10

### FUNDING OPPORTUNITIES

Avenues are available to obtain money for the intervention. If there is an existing project that needs support and elevation, funding opportunities are available.

2/10

### IMPLEMENTATION FEASIBILITY

The owner is aware, willing, and has available staff to implement. Supply chain and logistical issues are not anticipated. If needed, the project can be phased.

24/30

### LONG-TERM COSTS

The intervention will not have monumental long-term O&M cost.

6/10

### ABILITY TO ADDRESS MULTIPLE VULNERABILITIES

Addresses multiple identified vulnerabilities.

6/10

### CO-BENEFITS

Benefits outside of the primary benefit tied to community priorities can be achieved.

8/10

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