APPENDIX F
REAL ESTATE PLAN

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

C&SF	Central and Southern Florida
C&SF Project	Central and Southern Florida Project
DEM	digital elevation model
FRM	flood risk management
GIS	geographic information systems
HTRW	hazardous, toxic, and radioactive waste
LERRD	Lands, Easements, Rights-of-Way, Relocations, and Disposal Areas
PED	Preconstruction Engineering and Design
REP	Real Estate Plan
ROW	right-of-way
Section 203 Study	Central and Southern Florida Flood Resiliency Study for Broward Basins
SFWMD	South Florida Water Management District
Study Area	Approximately 420 square miles in eastern Broward County and southern Palm Beach County, encompassing 15 watershed basins, 7 primary canals, and 9 water control structures
TSP	Tentatively Selected Plan
USACE	U.S. Army Corps of Engineers
WCS	water control structure

F.1 Statement of Purpose and Compliance

This Real Estate Plan (REP) appendix is presented in support of the Central and Southern Florida (C&SF) Flood Resiliency (Section 203) Study for Broward Basins (hereafter referred to as the Section 203 Study) and describes the real estate requirements necessary to implement the Tentatively Selected Plan (TSP). The REP identifies the Lands, Easements, Rights-of-Way, Relocations, and Disposal Areas (LERRDs) required to support construction, operation, and maintenance of the TSP features, and outlines associated costs and real estate considerations. This REP reflects a TSP developed through the Section 203 Study process and addresses the specific real estate actions needed to implement the flood risk management and resiliency measures identified for Broward Basins. Additional information on related or concurrent studies is provided in **Section 1, Introduction,** of the main report. This REP is prepared at a planning-level of detail consistent with the feasibility report. Final real property boundaries, acquisition areas, and land value estimates are subject to refinement during the Preconstruction Engineering and Design phase, at which time adjustments to acquisition areas and administrative or land costs may occur.

As the non-federal sponsor, the South Florida Water Management District (SFWMD) is responsible for acquiring the necessary LERRDs in accordance with federal requirements, including securing ownership interests, easements, or other rights as identified in this REP. The U.S. Army Corps of Engineers (USACE), as the federal partner, provides oversight to ensure compliance with applicable laws, regulations, and policy, and is responsible for review and approval of all real estate actions. Together, SFWMD and USACE coordinate to ensure that all acquisitions support the authorized project goals, protect the public interest; and allow for the successful construction, operation, and long-term maintenance of the project.

Preparation of this Real Estate Plan is consistent with the requirements of ER 405-1-12, *Real Estate Handbook* (Change 31, May 1, 1998), Sections 12 through 16, which prescribe the content, format, and level of detail for feasibility-level Real Estate Plans. The information herein is sufficient for planning purposes and will be updated during the Preconstruction Engineering and Design (PED) phase in accordance with current USACE policy and guidance.

F.2 Study Authority and Scope

The SFWMD prepared the Section 203 Study for submission to the Assistant Secretary of the Army (Civil Works). The Assistant Secretary of the Army (Civil Works) will review and determine recommendations for Congress for authorization of the TSP under the authority of Section 216 of the Flood Control Act of 1970.

The Section 203 Study builds on the C&SF Section 216 Study, which authorizes the Secretary of the Army, through the Chief of Engineers, to review completed USACE projects when significant physical or economic changes occur. The Secretary may then recommend modifications to project structures or operations to Congress, aiming to improve navigation, flood control, water supply, and environmental quality in the public interest.

The Section 203 Study focuses on enhancing the resilience of the water control structures (WCS) and adjacent primary canals in Broward Basins Reach A, a reach of the ongoing USACE C&SF Section 216

Study, where hydrologic, hydraulic, and hydrodynamic modeling identified infrastructure within the C&SF system as highly vulnerable to flood risk. Broward Basins Reach A is referred to in this report as the Section 203 Study Area. The Section 203 Study Area consists of approximately 420 square miles within eastern portion of Broward County and a small portion of southern Palm Beach County, Florida. The Section 203 Study Area encompasses nine upstream and six downstream watershed basins with a network of seven primary canals managed by nine WCS (seven of which are coastal structures), in addition to other existing WCS not directly relevant in the Section 203 Study. **Figure F-2.1** illustrates the Section 203 Study Area.

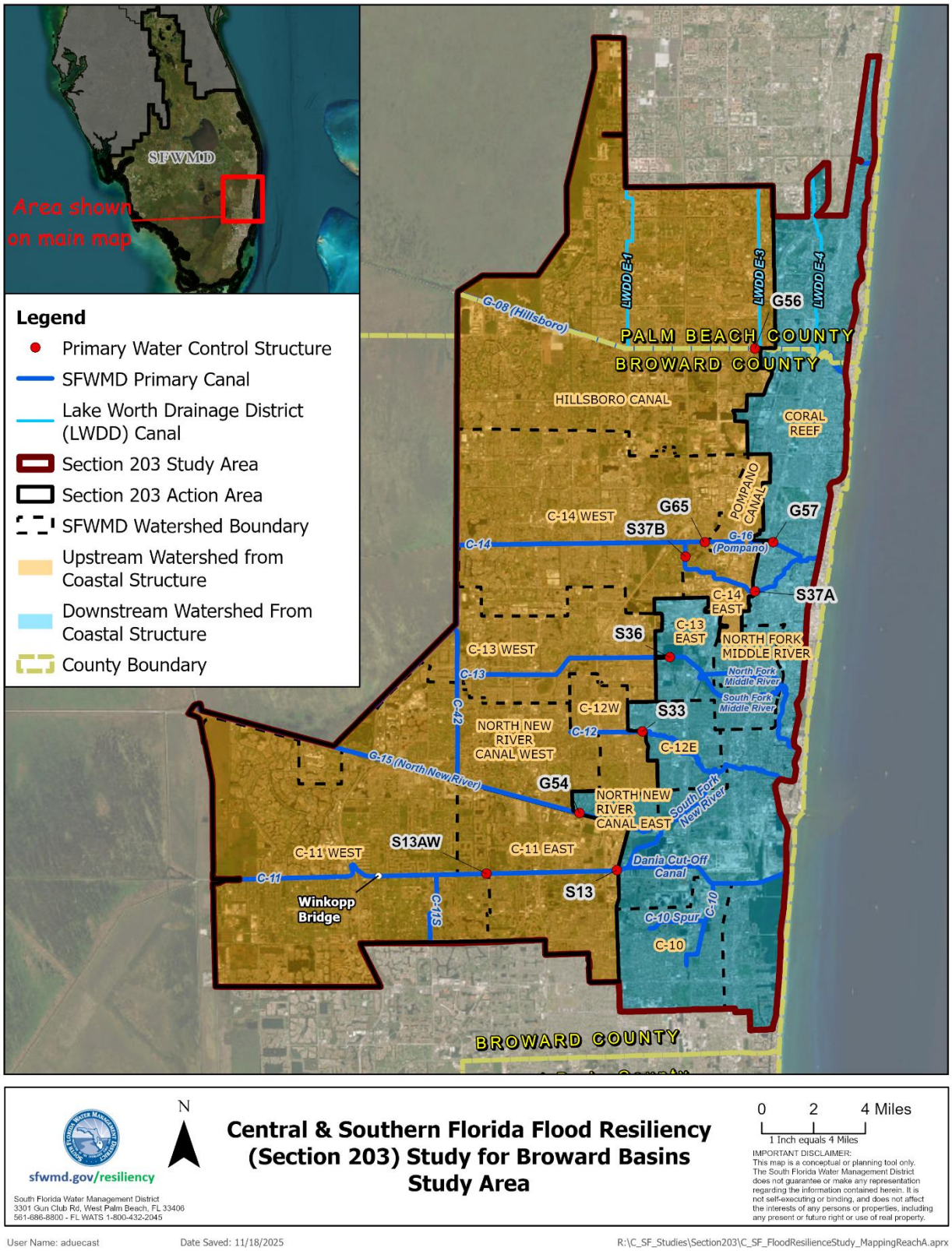

Figure F.2-1. Section 203 Study Area.

F.3 Summary of Study, Alternatives, and Tentatively Selected Plan

The Section 203 Study evaluates continued and enhanced flood risk management (FRM) and resiliency measures for the existing C&SF Project over a 50-year period of analysis (2035-2085). The C&SF Project is a federally authorized, multipurpose water resource project that has been constructed and is operated and maintained by the SFWMD and the USACE. The Section 203 Study is critical to identifying and recommending measures that strengthen FRM performance to protect public safety, reduce economic damage, support community resilience, and preserve environmental values.

The purpose of the Section 203 Study is to develop, evaluate, and recommend flood risk management measures and adaptation strategies that increase resiliency for vulnerable areas served by the C&SF system. The study specifically focuses on enhancing the functionality and capacity of existing water control structures to reduce flood damage and improve system performance under conditions of inland inundation, sea level rise, and other changed circumstances expected within Broward County over the 50-year planning horizon.

Three alternatives were developed to address flood risk and improve resiliency within the Section 203 Study Area. Alternative A is the least intrusive, focusing on minimal modifications to existing infrastructure and requiring relatively few LERRDs. Alternative B represents a moderate level of intervention, incorporating additional structural improvements and operational enhancements, and requiring a greater amount of real estate acquisition than Alternative A. Alternative C is the most complex and comprehensive, involving extensive modifications to WCS, canal improvements, and operational changes, and consequently requires the largest amount of LERRDs to support construction, operation, and maintenance. The three alternatives plus a Future Without Project (i.e., No Action) Alternative were compared and evaluated using a structured approach based on four key areas: economic development, regional benefits, environmental quality, and social effects. Planners applied a tool called C-BEST to identify measurable criteria and organized these into a table of effects, which helped assess how Alternatives A through C performed compared to the Future Without Project Alternative.

This process allowed for a clear evaluation of trade-offs and impacts, leading to the selection of the TSP. The TSP consists of a compilation of features from Alternatives A and B with slight modifications to optimize performance. A full description of the TSP is found in **Section 6, The Tentatively Selected Plan**, of the main report.

F.4 Real Estate Requirements

The real estate interests and lands identified below are required for the construction, operation, and maintenance of the flood risk management and resiliency measures proposed under the Section 203 Study's TSP. These real estate requirements are necessary to ensure the proper siting of project features, long-term operability of flood control works, and continued access for inspection and maintenance activities. Under the various project alternatives, and carried through to the TSP, three types of real estate actions are proposed: (1) Temporary Easement, (2) Perpetual Easement, and (3) Fee Estate. These acquisition types are defined below and reflect the specific property interests needed to construct, operate, and maintain the proposed flood risk management and resiliency measures in a manner that ensures compatibility with federal and state project objectives, minimizes impacts to private property, and supports the long-term public benefits of the TSP.

F.4.1 Definition of Terms

Right-of-Way (ROW). A ROW is a strip of land designated for transportation, utilities, or infrastructure, providing legal access for activities such as roadway use, utility placement, or canal maintenance. Within the SFWMD, ROWs are owned or controlled by the SFWMD to support the operation and upkeep of flood control works, including canals, levees, and water control structures. ROW permits are required for any private use to ensure these activities do not interfere with flood protection, water management, or environmental objectives.

SFWMD classifies ROW lands along its canals into five operational zones, each with specific guidelines to balance land use, maintenance needs, and environmental protection. These five operational zones are illustrated in **Figure F.4-1**. Zone 1 encompasses the canal itself, extending from one bank to the opposite, and is strictly reserved for flood control and unobstructed water flow. Zone 2 is a narrow 5-foot strip adjacent to the top of the bank, primarily used for inspection and limited maintenance. Zone 3 spans from 5 to 20 feet from the top of the bank and allows certain maintenance activities while preserving vegetation for environmental purposes. Zone 4, located from 20 to 40 feet landward, provides space for maintenance equipment and emergency access. Finally, Zone 5 covers areas more than 40 feet from the bank, often used for utilities or other activities that do not interfere with canal operations or flood control. These zones allow SFWMD to maintain operational flexibility while accommodating certain land uses that align with maintenance and environmental criteria.

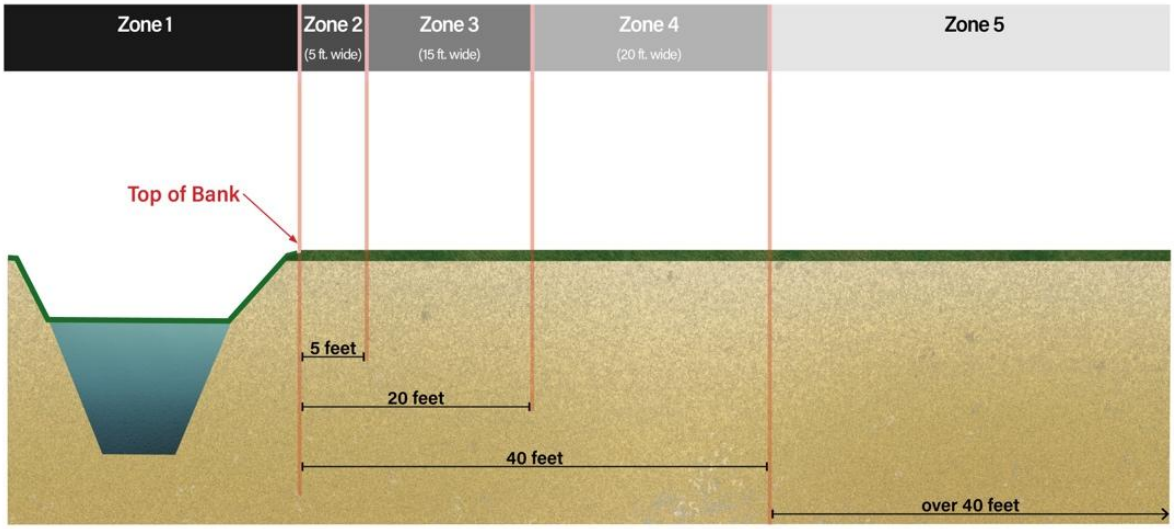

Figure F.4-1. South Florida Water Management District Right-of-Way Zones.

Easement. An easement is the grant of a nonpossessory property interest that provides the easement holder permission to use another person's land for a specific purpose(s). There are two types of easements, affirmative and negative.

- An affirmative easement gives the easement holder the right to do something on the grantor of the easement's land, such as travel on a road through the grantor's land.

- A negative easement allows the easement holder to prevent the grantor of the easement from doing something on their land that is lawful for them to do, such as building a structure that obscures light or a scenic view.

Easements can be created in a variety of ways. They can be created by an express grant, by implication, by necessity, and by adverse possession. Easements are transferable and can also be terminated. An easement can be terminated if it was created by necessity and the necessity ceases to exist, if the servient land is destroyed, or if it was abandoned. Easements allow the United States or the non-federal sponsor to perform construction, operation, maintenance, repair, replacement, or rehabilitation of authorized water-resources projects, consistent with the minimum interest in real property required under ER 405-1-12 and the Real Estate Policy Guidance Letter No. 35 (Approved Standard Estates, October 27, 2023). The types of easements proposed under this project are described below.[1]

- **Temporary Easement. Temporary Work Area Easement (Standard Estate No. 15).** A temporary and assignable easement and ROW in, on, over, and across the described land for a specified period, used for construction, staging, or related activities necessary to complete the project. This estate permits the placement of equipment, materials, and temporary facilities, and authorizes all actions incidental to the performance of the work. Upon expiration or completion, the temporary rights terminate, and the premises are restored to the agreed condition.
- **Perpetual Easement. Flood Protection and Maintenance Easement (Standard Estate No. 8 or 9).** A perpetual and assignable easement and ROW in, on, over, and across the land for the construction, operation, maintenance, repair, and replacement of flood-risk-management and drainage features. The easement includes the continuing right of ingress and egress for authorized personnel and equipment and to remove or control vegetation, obstructions, or improvements that may interfere with project purposes. Landowners retain the right to use the property in any manner that does not interfere with or abridge the easement holder's rights. The appropriate estate, Channel Improvement Easement (No. 8) or Flood Protection Levee Easement (No. 9), is determined by the nature of the feature and required maintenance access.
- **Fee Estate Acquisition (Standard Estate No. 1).** A complete and permanent acquisition of real property in fee simple, subject only to existing public-utility or transportation easements. This estate transfers all rights, title, and interest to the acquiring entity and is used where full ownership is required to construct, operate, and maintain permanent project facilities such as pump stations, gated spillways, or control structures.

F.5 Ownership

For the purposes of this study, lands are generally categorized as either public or private. Public lands are those owned by a governmental entity at the federal, state, or local (county/municipal) level and are typically held for public purposes such as infrastructure, transportation, water management, or conservation. Private lands are those owned by non-public entities, including individuals, corporations, or

[1] Definitions of the real property interests described in this section, along with other approved estate types, are provided in the U.S. Army Corps of Engineers Real Estate Policy Guidance Letter No. 35, "Approved List of Standard Estates" (October 27, 2023), Enclosure 2, pages 1–11. This guidance supersedes prior estate descriptions and implements the requirements of ER 405-1-12, Chapter 12 ("Real Estate Roles and Responsibilities for Civil Works Projects"), and ER 405-1-11, Paragraph 3-18 ("Preparation and Use of Estate Forms").

other organizations, and are held for residential, commercial, agricultural, or other private uses. For the TSP, both public and private lands will be required, and acquisition processes will vary depending on the ownership type, necessitating coordination across federal, state, local, and private stakeholders to secure all necessary real estate interests.

F.5.1 Public Lands

These lands are typically held for public purposes such as transportation infrastructure, flood control, water management, utilities, conservation, or recreation. When public lands are required for project implementation, acquisition is generally accomplished through intergovernmental agreements, memoranda of understanding, or transfers of jurisdiction rather than traditional purchase. Because these transactions occur between public agencies, the process is often more streamlined, with compensation determined by statute, administrative policy, or mutual agreement. However, coordination with the owning agency is essential to ensure that the transfer of rights is consistent with the agency's mission, statutory authorities, and long-term planning objectives.

F.5.2 Private Lands

These properties are typically used for residential, agricultural, industrial, or commercial purposes and are acquired through direct purchase, negotiated easements, or, when necessary, the exercise of eminent domain. Unlike public-to-public transactions, acquisitions from private owners follow a defined appraisal and compensation process consistent with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 and other applicable federal and state requirements. This ensures that fair market value is established and that landowners receive just compensation, along with relocation assistance when applicable.

F.5.3 Canals

In Broward and Palm Beach counties, the primary water management system, comprised of canals, levees, and flood control structures, is operated and maintained by the SFWMD. These components were originally designed and constructed by the USACE under the C&SF Project. Today, SFWMD serves as the local operating agency, with the USACE maintaining a federal oversight and planning role. Freeing major canals from local management responsibility enables efficient flood protection and water resource management. Additionally, many secondary or smaller canal systems remain under the authority of local water control districts or municipalities, which tie into the larger SFWMD-managed system.

F.6 Zoning

The proposed project locations are situated within Broward and Palm Beach counties, encompassing a mix of residential, commercial, and public land uses governed by local zoning ordinances. While zoning regulates how private property may be developed or used, the acquisition of LERRDs for the proposed action will be carried out in accordance with federal and state requirements. No application or modification of local zoning ordinances is anticipated to facilitate project implementation, nor will zoning restrictions supersede the federal real estate acquisition process required to support construction, operation, and maintenance of the project. More information on zoning in Broward County can be found

on Broward County's Urban Planning Division Zoning page, and additional details for Palm Beach County are available through the Palm Beach County Planning, Zoning and Building websites.

F.7 Real Estate Mapping

Real estate mapping for the Section 203 Study for parcels identified in the TSP occurred using GIS tax parcel data and ownership information that was obtained from Broward County Property Appraiser records in September 2025. The tax parcel boundaries depicted on the maps are for the 2025 tax year and were the currently published statewide parcel composite at the time the maps were prepared.

The parcel data set retrieved are not intended for use as tax maps. The lot boundaries delineated in the real estate maps do not represent legal boundaries and should not be used to provide a legal determination of land ownership. The parcel boundaries are not survey data and should not be used as such. There may be boundary discrepancies between what is shown on the real estate maps and the property's actual deeded boundary. The GIS tax parcel data obtained is intended for planning purposes only to provide a reasonable representation of parcel boundaries and project features.

Tract Register. A preliminary tract register will be developed during the PED phase to document the individual parcels required for acquisition or easement. The register will identify each tract by parcel identification number, ownership, acreage, type of estate (fee, permanent easement, or temporary easement), and the associated project feature. This table will be maintained as a living document and refined as title research and survey information are completed.

Figure F.7-1 through **Figure F.7-5** illustrate the general location of the real estate parcels required under the TSP.

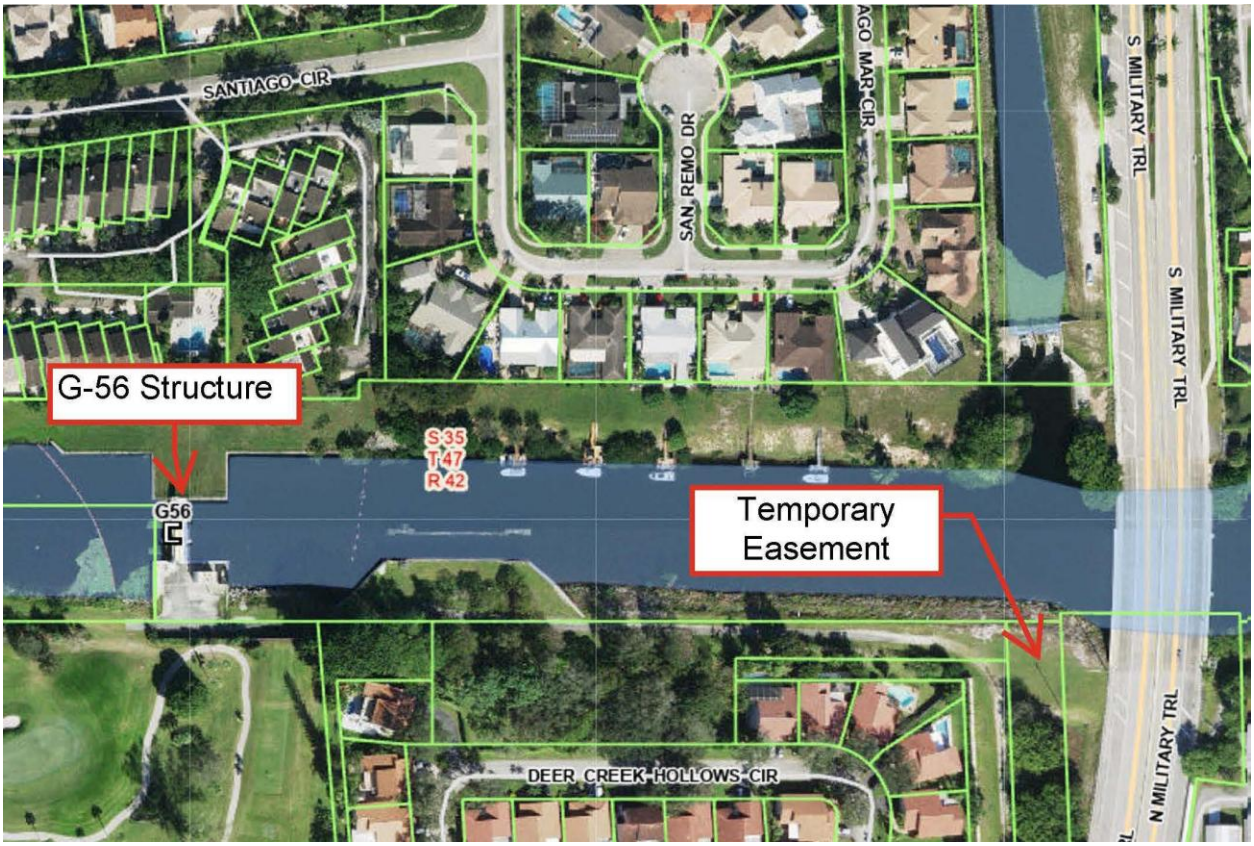

Figure F.7-1. General Location of Real Estate Parcels under the Tentatively Selected Plan: G-56 Gated Spillway.

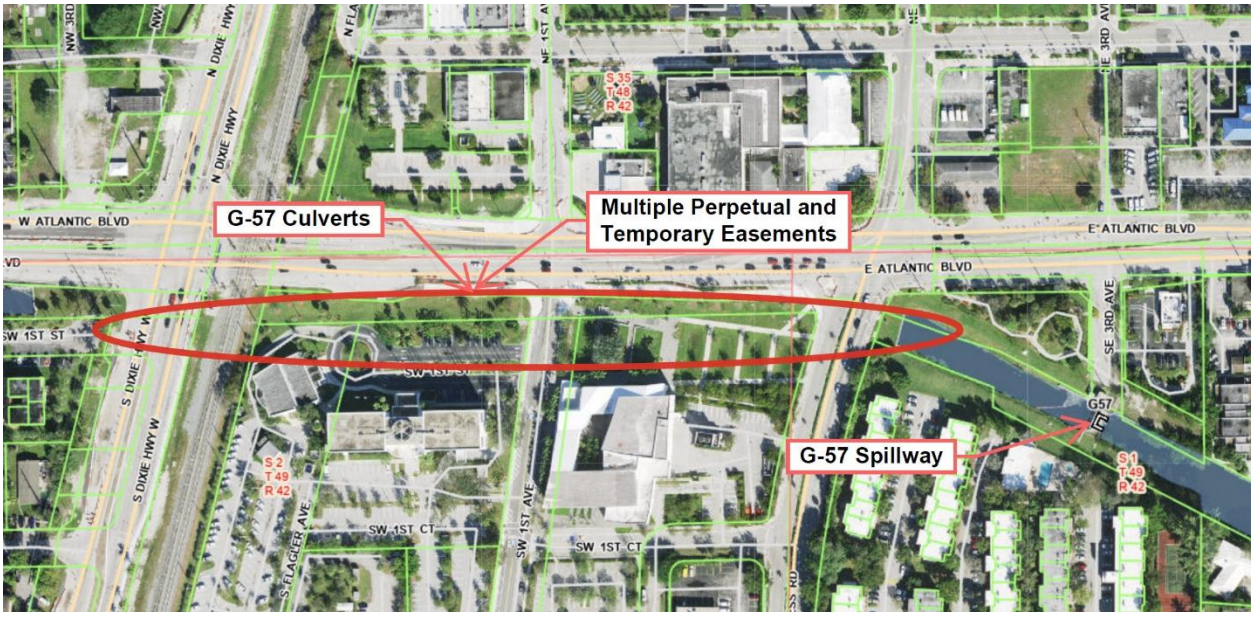

Figure F.7-2. General Location of Real Estate Parcels under the Tentatively Selected Plan: G-57 Culverts and Gated Spillway.

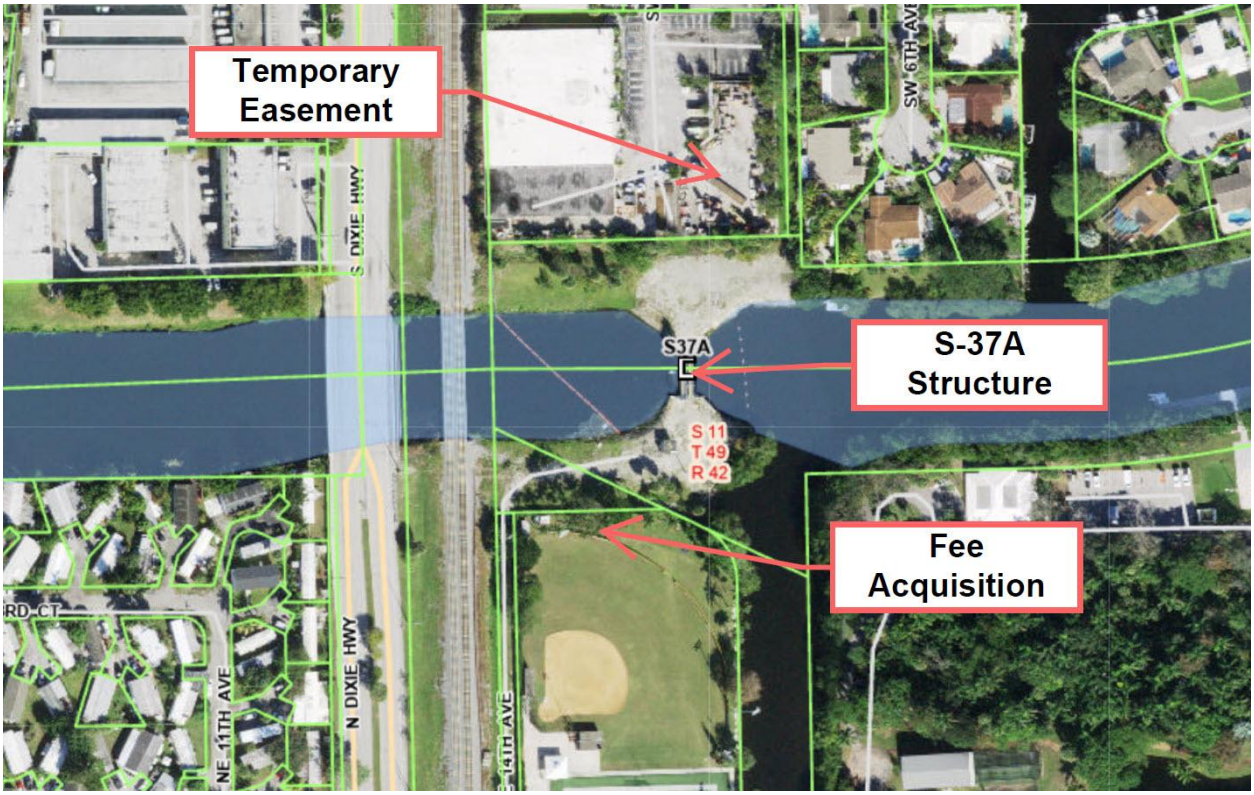

Figure F.7-3. General Location of Real Estate Parcels under the Tentatively Selected Plan: S-37A Gated Spillway.

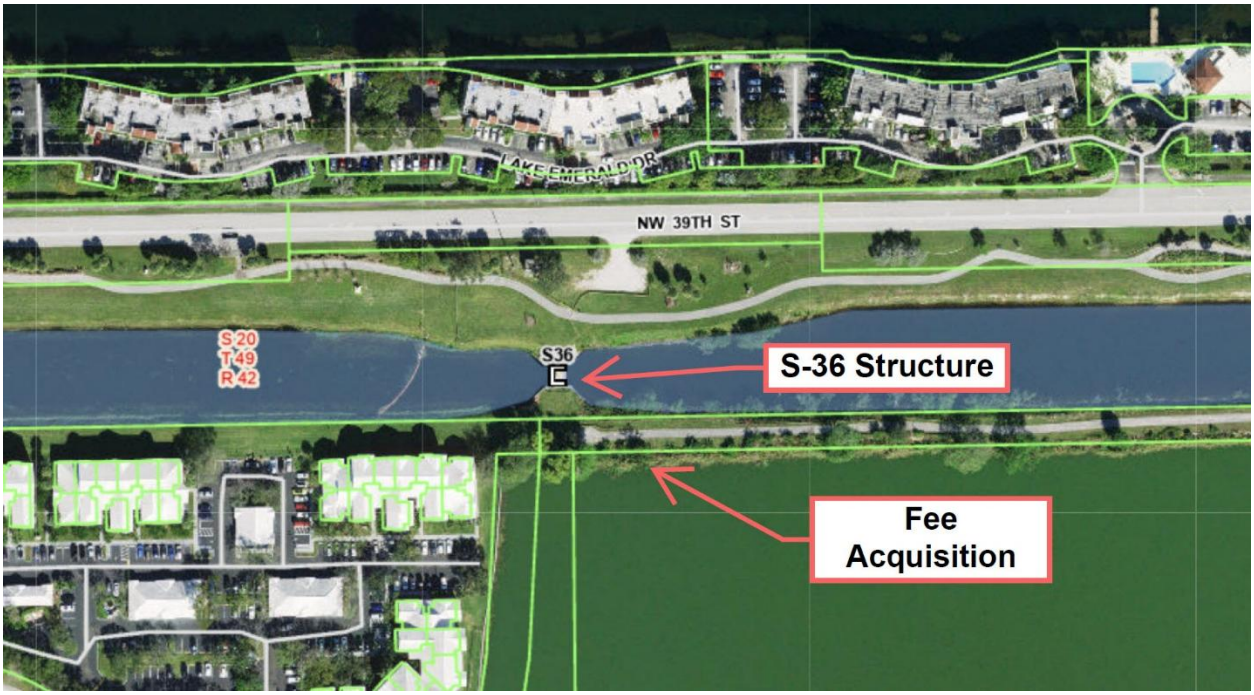

Figure F.7-4. General Location of Real Estate Parcels under the Tentatively Selected Plan: S-36 Gated Spillway.

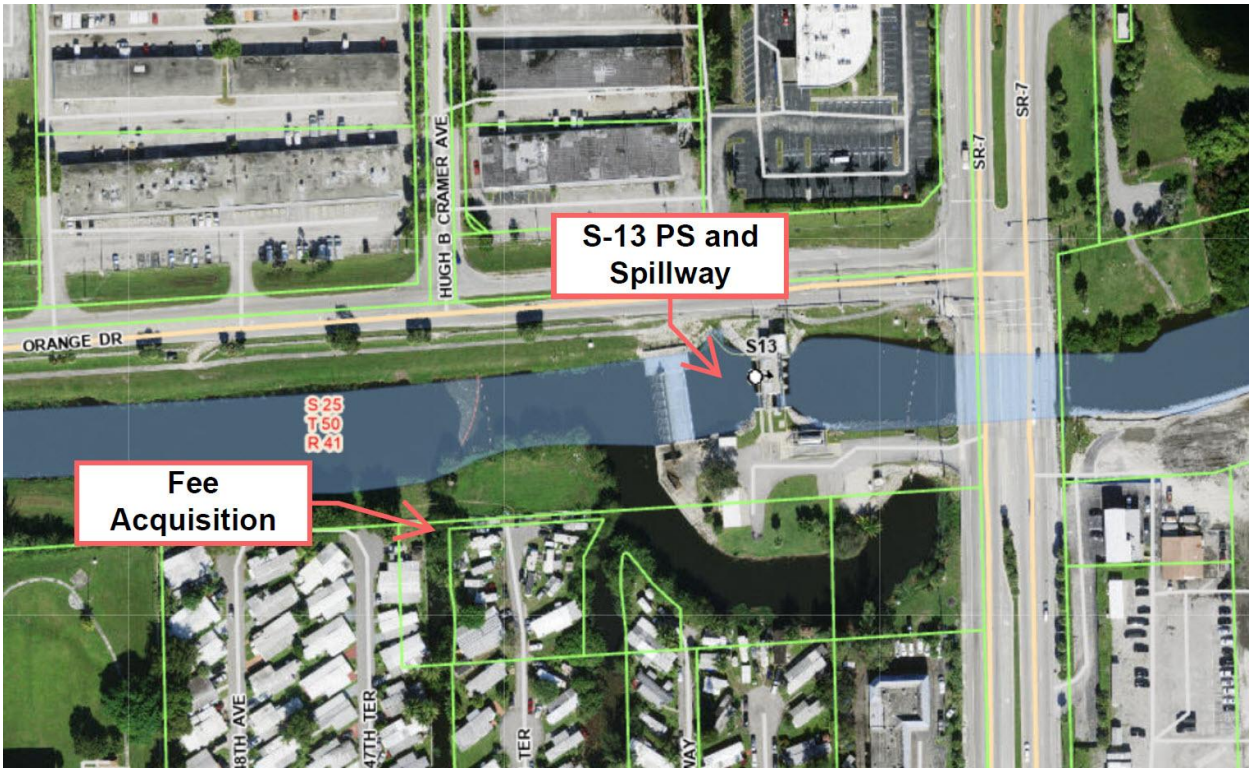

Figure F.7-5. General Location of Real Estate Parcels under the Tentatively Selected Plan: S-13 Pump Station and Gated Spillway.

F.8 Real Estate Requirements

This section identifies the specific sites where real estate easements and/or acquisitions are required to support implementation of the TSP. The information is organized by watershed basin and WCS and specifies the type of action necessary for each location along with the corresponding area or quantity of land involved. For Temporary Easements, the duration of the easement, in years, is also provided to indicate the temporary nature of the interest. Watershed basins and WCS that are not listed in this section do not require any LERRDs. Real Estate Acquisition and Incidental Costs associated with each site are listed in **Section F.9** of this appendix.

F.8.1 Hillsboro Canal Basin – G-56 Gated Spillway

A Temporary Easement of 3,923 square feet is required from public lands owned by the City of Deerfield Beach for a period of 2 years. The estimated costs for the Temporary Easement reflect the permanent removal of five boat docks within the easement area. No other acquisition types are proposed for this site.

F.8.2 Pompano Canal Basin – Culvert Upstream of the G-57 Gated Spillway

To support expansion of the culvert system upstream of the G-57 Gated Spillway, a 67,469-square-foot Perpetual Easement is required from the City of Pompano Beach, a 9,871-square-foot Perpetual Easement is required from Florida East Coast Railway, and a 12,515-square-foot Perpetual Easement is required from an unknown owner. In addition, a 6,213-square-foot Temporary Easement is required from the City of

Pompano Beach, a 2,558-square-foot Temporary Easement is required from Florida East Coast Railway, and a 2,786-square-foot Temporary Easement is required from an unknown owner, each for a duration of 1 year. The estimated costs for the Perpetual Easement and Temporary Easement reflect the potential loss in revenue to Florida East Coast Railway if the portion of the railroad within the Perpetual Easement is temporarily taken out of service for culvert installation. Costs for the City of Pompano Beach also include construction and later removal of a temporary parking area to replace stalls that will be out of service during construction, as well as replacement of landscaping impacted by the temporary parking area. No other acquisition types are proposed for this site. No LERRDs are required associated with the G-57 Gated Spillway.

F.8.3 C-14 East Basin – S-37A Gated Spillway

To support construction of a new pump station and gated spillway, a 12,315-square-foot Fee Estate acquisition is required from Pine Crest School, along with a 14,767-square-foot Temporary Easement from KD Realty Holdings of Pompano for a duration of 7 years. The estimated costs in for the Fee Estate acquisition and Temporary Easement reflect the reconfiguration and relocation of the softball field and associated structures at the school, as well as reconstruction of the outfield wall. No other acquisition types are proposed for this site.

F.8.4 C-13 West Basin – S-36 Gated Spillway

To support construction of a new pump station and gated spillway, a 1,364-square-foot Fee Estate acquisition is required from Cyprus Lakes Owner, LLC, along with a 15,030-square-foot Fee Estate acquisition from the City of Oakland Park. In addition, a 13,226-square-foot Temporary Easement is required from the City of Oakland Park for a duration of 5 years. The estimated costs in for the Fee Estate acquisition and Temporary Easement reflect the permanent and temporary impacts associated with these acquisitions. No other acquisition types are proposed for this site.

F.8.5 C-11 East Basin – S-13 Pump Station and Gated Spillway

To support construction of a new pump station and gated spillway, a 425-square-foot Fee Estate acquisition is required from Swaying Palms, LLC. The estimated costs of the Fee Estate acquisition reflect the permanent impact associated with this acquisition. No other acquisition types are proposed for this site.

F.8.6 Summary of Tentatively Selected Plan Real Estate Requirements

Table F.8-1 below summarizes the real estate requirements for the TSP. The table identifies the type of easement and/or acquisition (Fee Estate, Perpetual Easement, Temporary Easement), the area or quantity of land required, and, for Temporary Easements, the duration in years. The table is intended to provide a clear overview of all LERRDs necessary to implement the TSP.

Table F.8-1. Tentatively Selected Plan Real Estate Requirements.

Watershed Basin	Water Control Structure	Proposed Fee Estate Acquisition (area[a/])	Proposed Perpetual Easement (area)	Proposed Temporary Easement	
				Area	Duration (years)
Hillsboro Canal Basin	G-56 Gated Spillway	-	-	3,923	2
Pompano Canal Basin	Culvert upstream of G-57 Gated Spillway	-	89,855	11,557	1
C-14 East Basin	S-37A Gated Spillway	12,315	-	14,767	7
C-13 West Basin	S-36 Gated Spillway	16,394	-	13,226	5
C-11 East Basin	S-13 Pump Station and Gated Spillway	425	-	-	-
Totals		**29,134**	**89,855**	**43,473**	-

a/ Area is provided in square feet

F.9 Real Estate Acquisition and Incidental Costs

Real estate acquisition costs for the TSP are estimated at $15,679,813 comprising $5,542,000 in Fee Estate acquisition costs, $7,426,981 in Perpetual Easement costs, and $2,710,832 in Temporary Easement costs. These costs are detailed below in **Table F.9-1**.

A key factor across all alternatives considered in the Section 203 Study and the ultimate selection of the TSP is that no residential homes would be acquired or displaced as part of the project. The majority of costs are associated with Fee Estate acquisitions, Perpetual Easements, and Temporary Easements, which provide access and work areas to support construction and long-term project needs. Because designs remains preliminary, the estimates also include contingencies to address uncertainties such as temporary easement needs or access challenges and potential litigation costs. These allowances help ensure sufficient funding as the project advances and site-specific requirements are refined.

Table F.9-1. Tentatively Selected Plan Real Estate Costs.

Watershed Basin	Water Control Structure	Proposed Fee Estate Acquisition		Proposed Perpetual Easement		Proposed Temporary Easement		Total Real Estate Cost
		Area[a/]	Cost[b/]	Area	Cost	Area	Cost	
Hillsboro Canal Basin	G-56 Gated Spillway	-	-	-	-	3,923	$1,300,000	$1,300,000
Pompano Canal Basin	Culvert upstream of G-57 Gated Spillway	-	-	89,855	$7,426,981	11,557	$ 135,832	$7,562,813
C-14 East Basin	S-37A Gated Spillway	12,315	$4,270,000	-	-	14,767	$775,000	$5,045,000
C-13 West Basin	S-36 Gated Spillway	16,394	$1,240,000	-	-	13,226	$500,000	$1,740,000
C-11 East Basin	S-13 Pump Station and Gated Spillway	425	$32,000	-	-	-	-	$32,000
Totals		**29,134**	**$5,542,000**	**89,855**	**$7,426,981**	**43,473**	**$2,710,832**	**$15,679,813**

a/ Area is provided in square feet
b/ Cost is provided in 2025 US dollars

F.10 Real Estate Acquisition Schedule

The real estate acquisition schedule for the Section 203 Study follows a sequence of administrative and legal steps needed to provide the USACE and the non-federal sponsor with the necessary rights to access and improve existing WCS along the canal system. The process begins with securing temporary rights-of-entry from landowners, which allows project teams to perform the investigations needed to evaluate site conditions. These preliminary efforts include title research; hazardous, toxic, and radioactive waste (HTRW) assessments; structural inspections; and survey work. Together, these tasks establish the baseline conditions of the properties and inform the design of improvements to the WCS.

Following these investigations, formal agreements between landowners and the non-federal sponsor are executed to ensure access and provide the legal framework for construction activities. This step may include the preparation of curative documents and the filing of completed agreements. Since the Section 203 Study does not involve acquisition of residential properties or relocation of tenants, impacts to communities are minimized, and real estate requirements are focused strictly on securing access for construction and long-term operation of the improved facilities.

The schedule for these tasks is spread across multiple years and allows for overlap to accelerate progress. While the anticipated timeframes are outlined below, they remain subject to refinement as the TSP advances through design and implementation. Additional contingencies are built in to account for site-specific challenges that may require adjustments to the schedule.

A summary of the anticipated real estate acquisition schedule is provided in **Table F.10-1**.

Table F.10-1. Tentatively Selected Plan Real Estate Acquisition Schedule.

Task	Anticipated Timeframe	Potential Contingencies / Factors
Obtain Right-of-Entry for Investigations	6-9 months	Delays if landowner coordination is slow or site access is limited
Title Research	3-6 months	Complex ownership, easements, or liens may extend timeframe
Preliminary Investigations (HTRW, structural inspections, surveys, etc.)	12-18 months	Site conditions, dense development, or difficult access may require additional time
Execution of Agreement between Landowner and non-federal sponsor (including curative documents)	12-24 months	Legal review, negotiations, or property-specific issues could delay execution
Filing of Agreements	3-6 months	Administrative processing delays or corrections to documents may occur

F.11 Hazardous, Toxic, and Radioactive Waste Certification and Disposal Areas

In accordance with ER 405-1-12, the non-federal sponsor will perform HTRW investigations for all properties to be acquired prior to acquisition. The results of these investigations will be certified by the District Real Estate Office and incorporated into the final Real Estate Plan to ensure that no hazardous, toxic, or radioactive waste conditions are present that could affect construction, operation, or maintenance of the project.

No land will be acquired or designated specifically for disposal of dredged or excavated material under the TSP. All construction dredged material will be managed within existing rights-of-way or returned to

authorized disposal areas already operated by the SFWMD. If disposal areas are later identified as necessary during detailed design, their locations, acreage, and estate types will be added to the updated Real Estate Plan.

F.12 Real Estate Construction Drawings

Figure F.12-1 through **Figure F.12-6** illustrate the specific real estate actions that are required for the various features of the TSP.

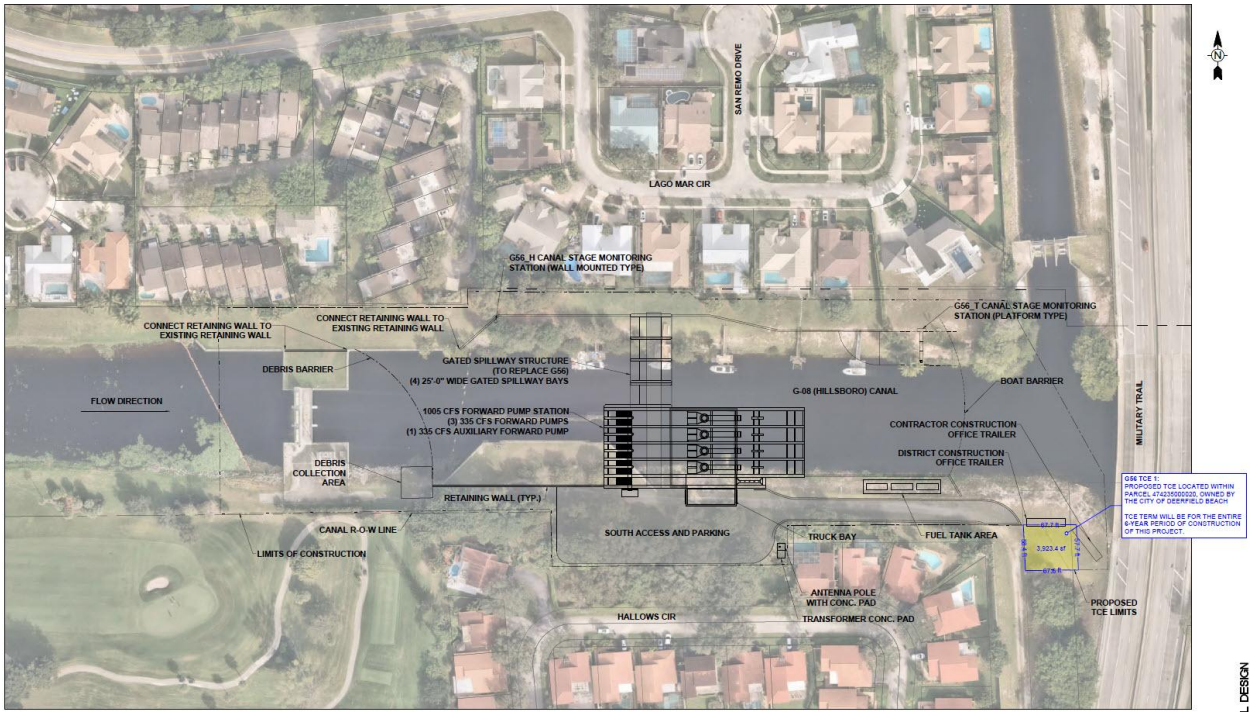

Figure F.12-1. Real Estate Requirements: G-56 Gated Spillway.

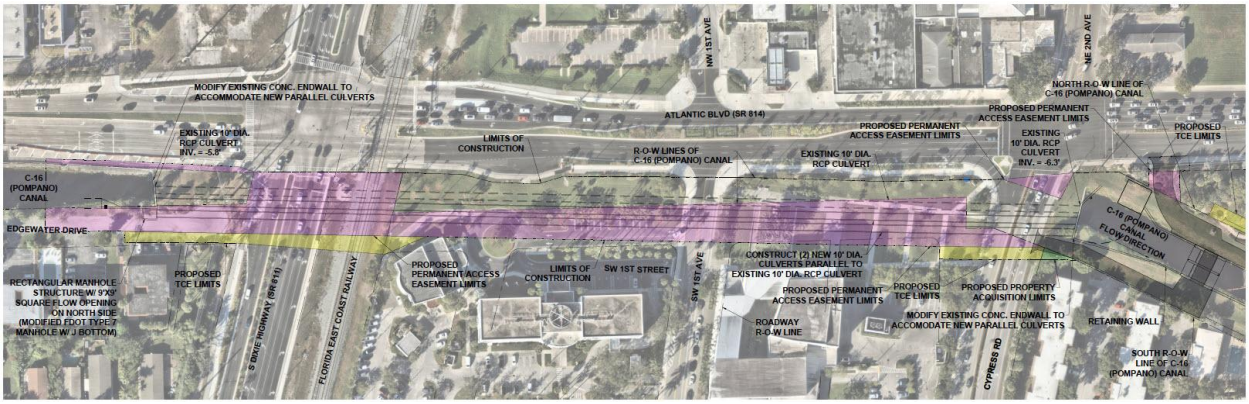

Figure F.12-2. Real Estate Requirements: Culvert Upstream of the G-57 Gated Spillway.

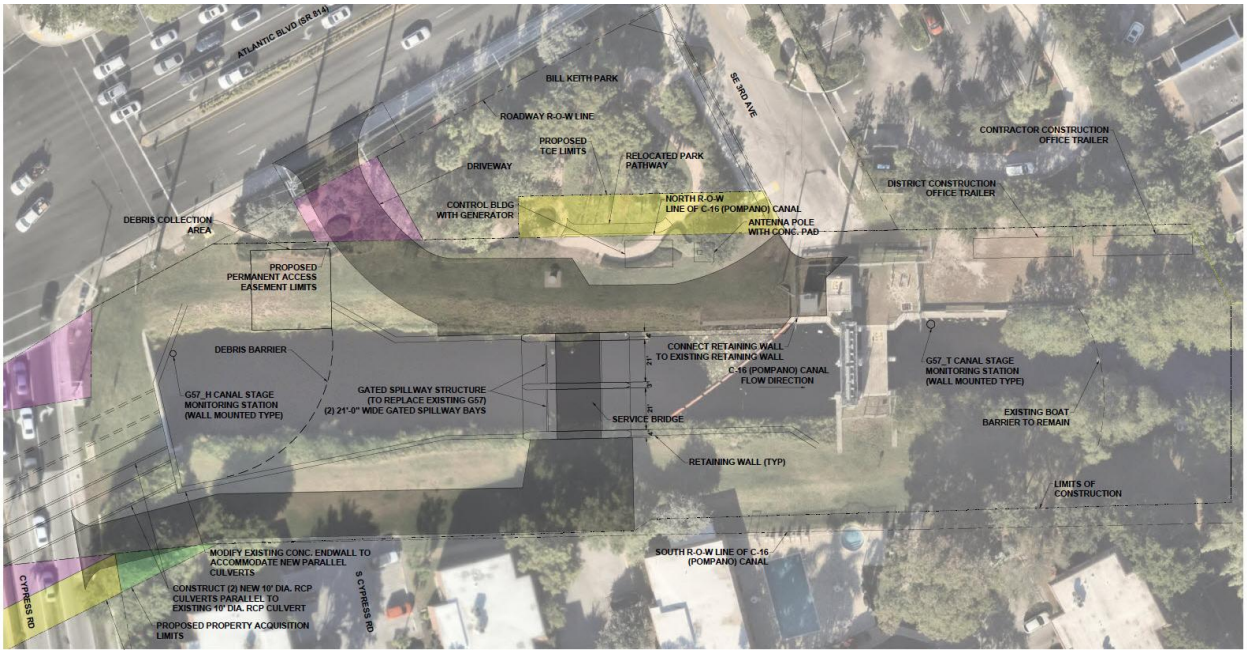

Figure F.12-3. Real Estate Requirements: G-57 Gated Spillway

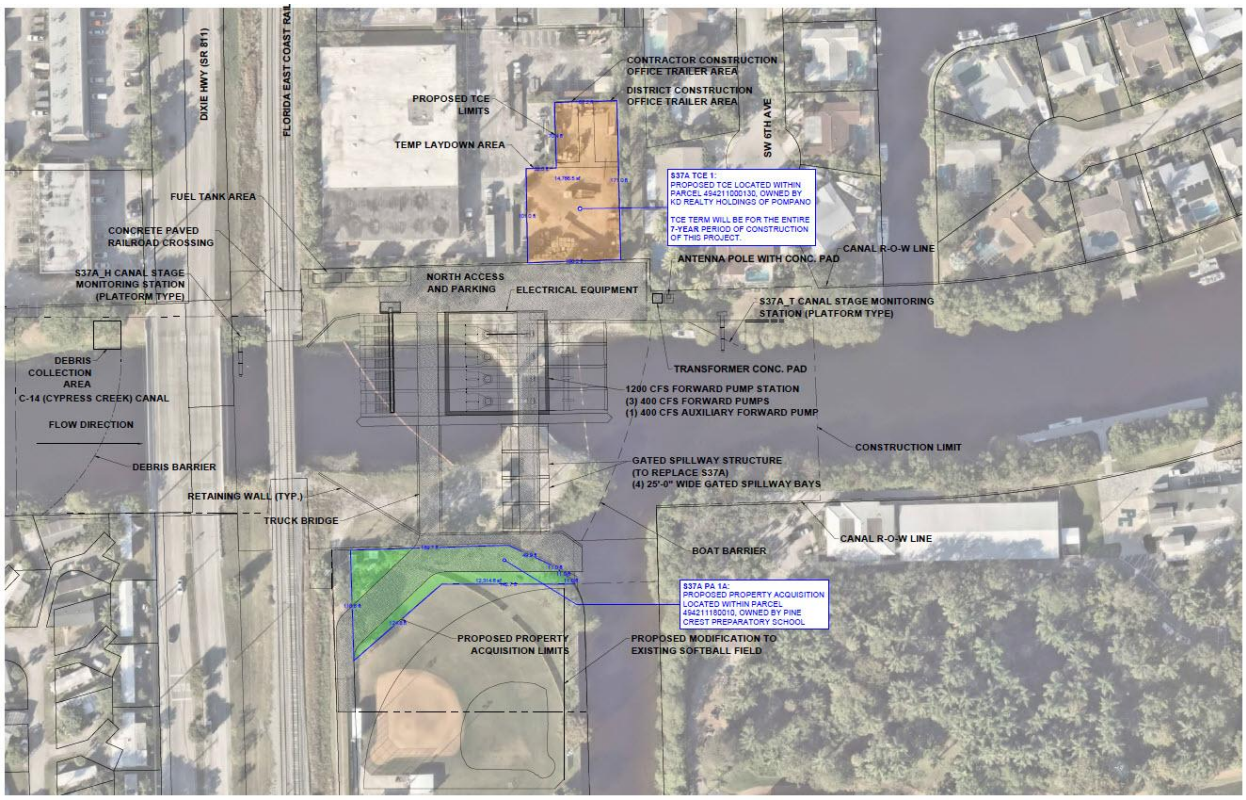

Figure F.12-4. Real Estate Requirements: S-37A Gated Spillway.

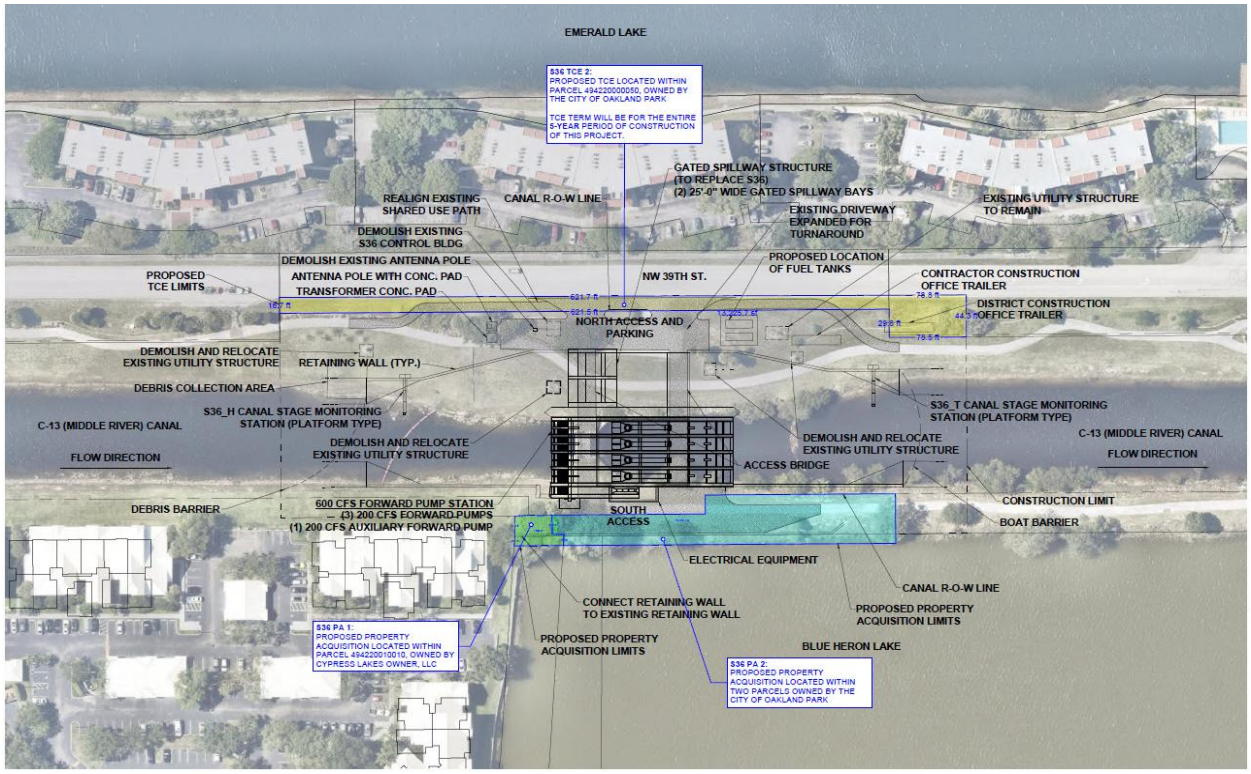

Figure F.12-5. Real Estate Requirements: S-36 Gated Spillway.

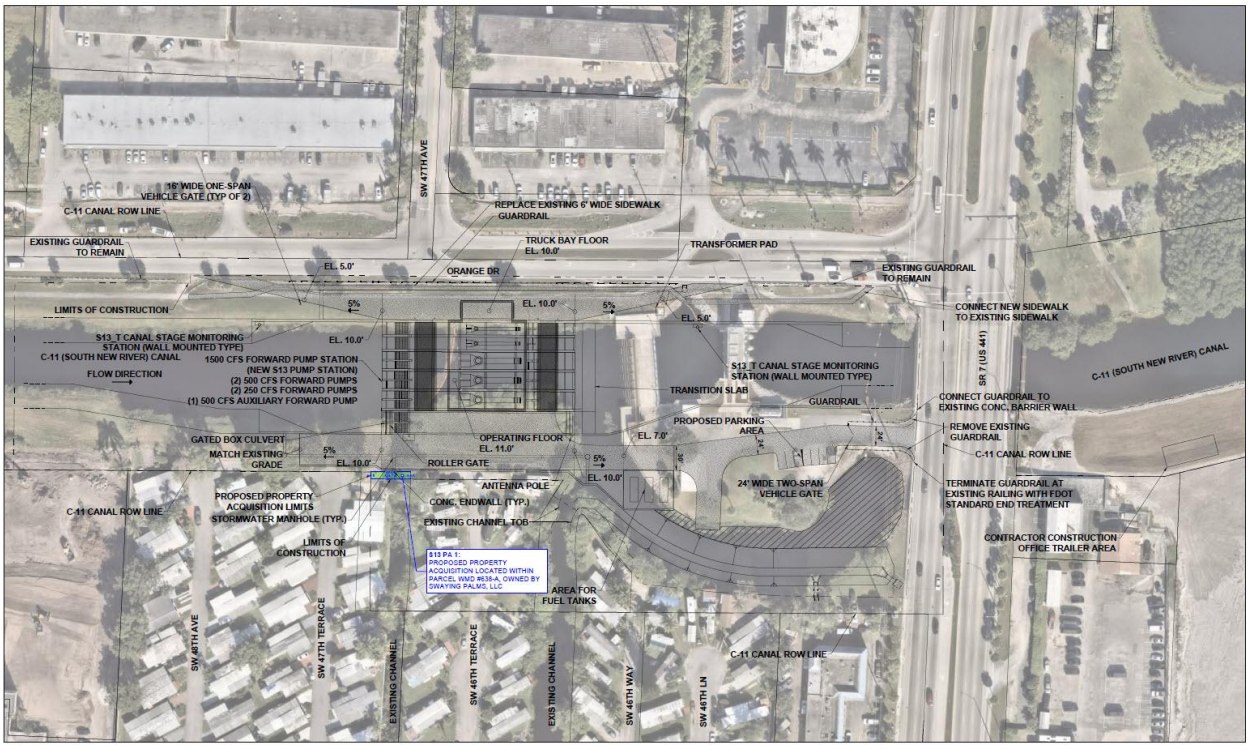

Figure F.12-6. Real Estate Requirements: S-13 Pump Station and Gated Spillway.

F.13 New Canal Stage Monitoring Locations

South Florida topology is extremely flat and elevation gradient limits drainage by gravity to the coast. In compound flooding events, when both rainfall and coastal flooding drivers occur simultaneously, tidal elevations heavily dictate the capacity of inland water to be discharged past the coastal structures. As the TSP proposed project features relies on increased pumping capacity to improve conditions upstream, the tidal stage elevation must be monitored closely throughout the storm event period to understand overall system conditions. Therefore, downstream stages are to be monitored to improve the operations of the coastal structures by discharging water during more favorable downstream conditions without causing adverse impacts and also maintaining associated drainage benefits from the proposed system improvements. Monitoring station locations are proposed below in locations that most effectively record the downstream canal stages along with the real estate considerations for public/government parcels that could be used for staging monitoring sensors. Assuming a small footprint needed for the installation of the monitoring gauges, and the recommended sites are in public/government owned parcels, SFWMD will negotiate use agreements at no cost, including installation and access to monitoring sites.

The first location (26.3225563, -80.1040593) proposed is downstream of the G-56 Gated Spillway, which is anticipated to increase capacity with the TSP. Pioneer Park is a prime parcel owned by the City of Deerfield Beach that is adjacent to the G-08 (Hillsboro) Canal and shares a significant shoreline and marina to establish a staging location for the sensor. **Figure F.13-1** shows the location of this canal stage monitoring station.

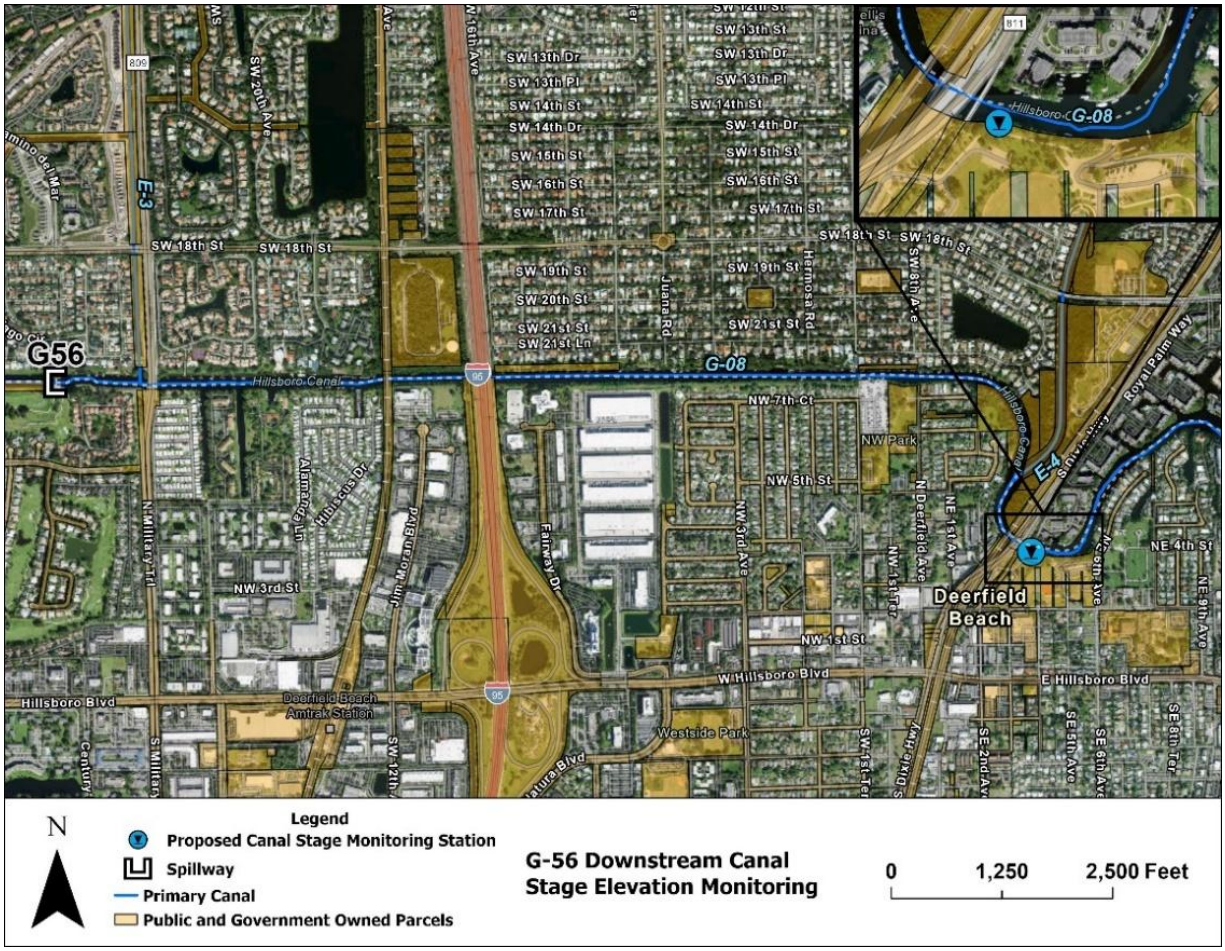

Figure F.13-1. New Monitoring Station Proposed Location to Record G-56 Gated Spillway Downstream Stages.

The second location (26.2245874, -80.1008729; **Figure F.13-2**) proposed is downstream of the S-37A Gated Spillway and G-57 Gated Spillway where the C-14 (Cypress Creek) Canal and G-16 (Pompano) Canal confluence as the C-14 (Cypress Creek) Canal discharges into the Intracoastal Waterway. Lake Santa Barbara Park offers access to the C-14 (Cypress Creek) Canal after this confluence point and is owned by the City of Pompano Beach.

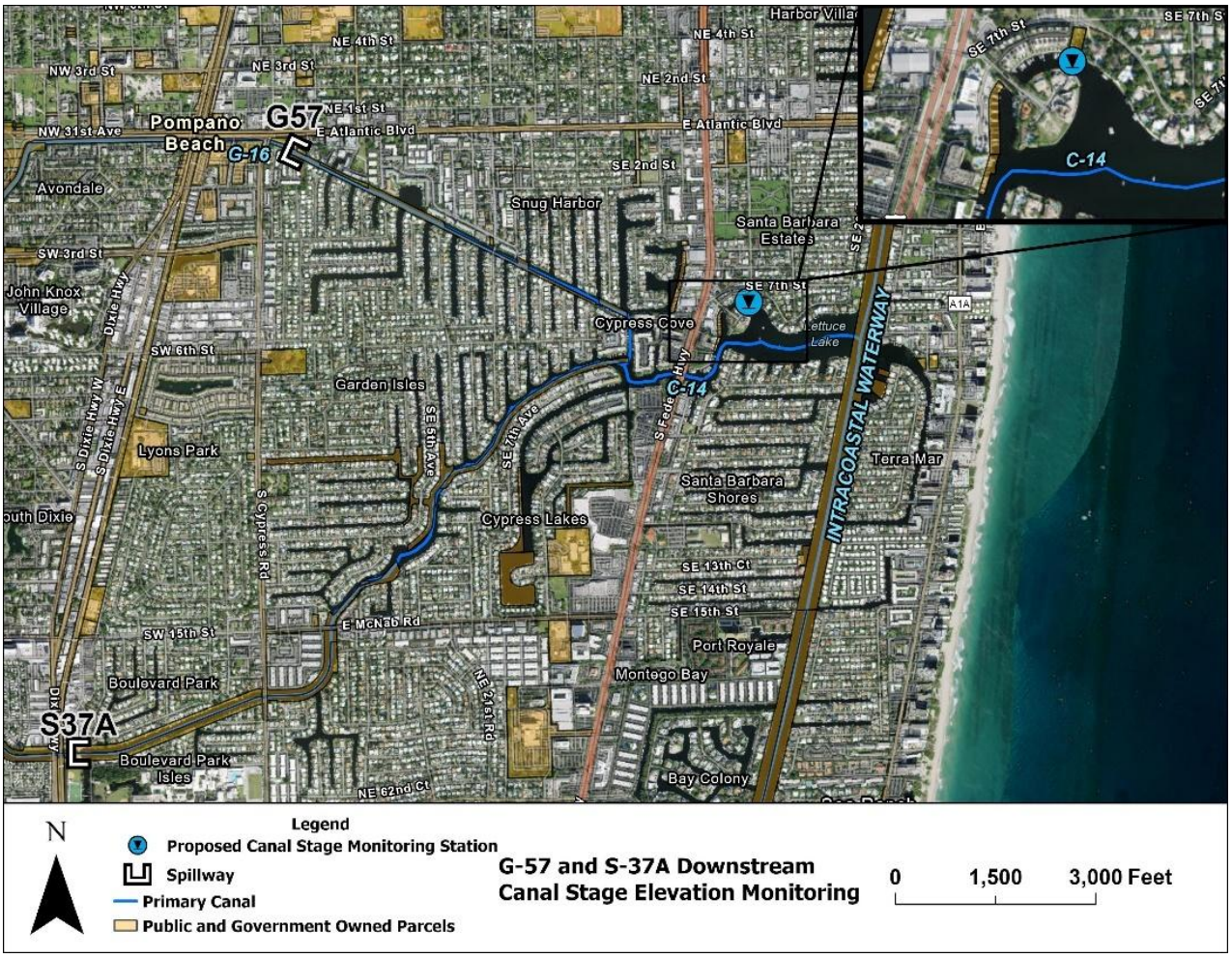

Figure F.13-2. New Monitoring Station Proposed Location to Record G-57 Gated Spillway and S-37A Gated Spillway Downstream Stages.

The next location (26.1511644, -80.1462831) proposed is downstream of the S-36 Gated Spillway, which conveys the C-13 (Middle River) Canal. It is on a parcel owned by the City of Fort Lauderdale that appears to be a ROW at the end of N. Andrews Square and is adjacent to the C-13 (Middle River) Canal, just upstream of N. Andrews Avenue. **Figure F.13-3** illustrates this location.

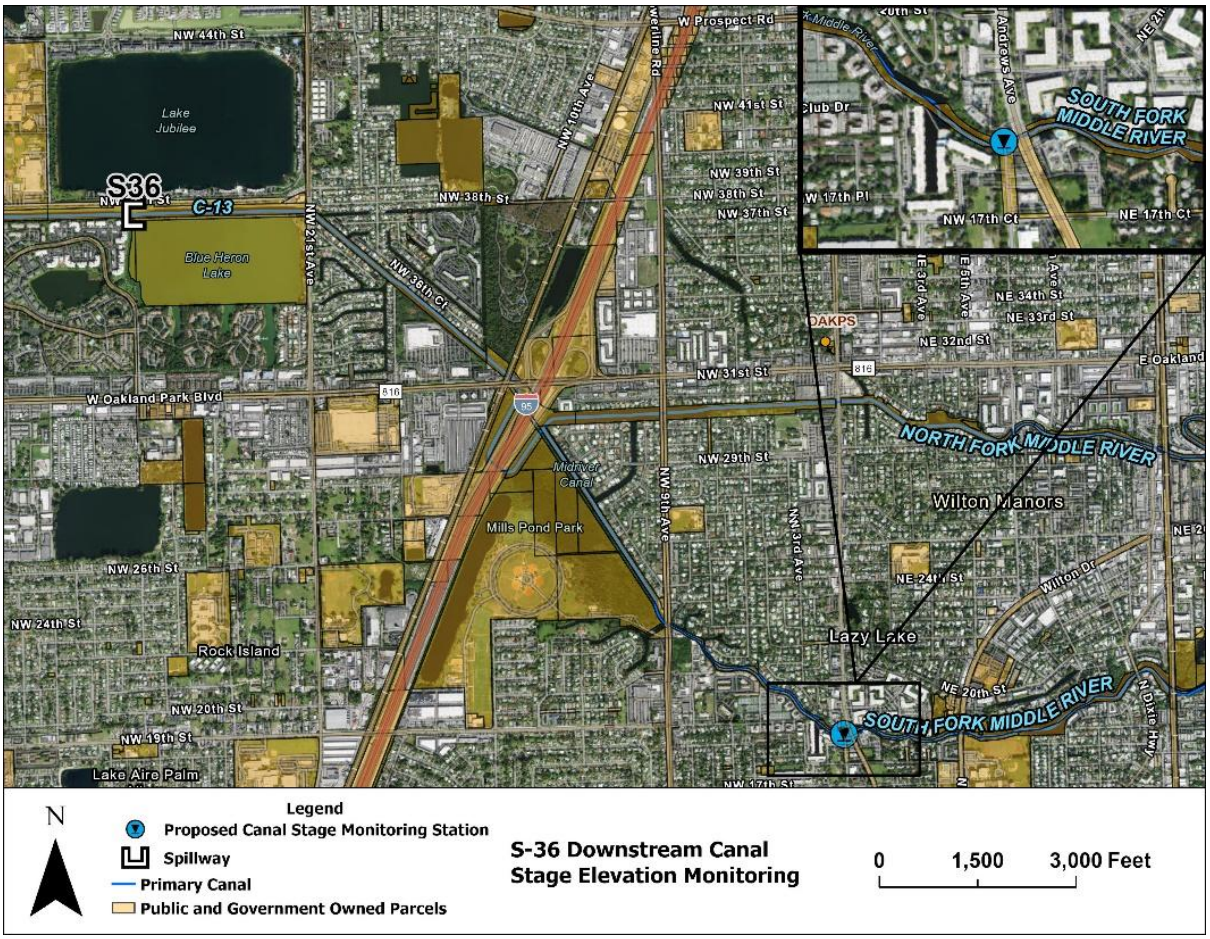

Figure F.13-3. New Monitoring Station Proposed Location to Record S-36 Gated Spillway Downstream Stages.

Figure F.13-4 and **Figure F.13-5** show the location of the proposed monitoring stations downstream of the S-33 Gated Spillway and G-54 Gated Spillway. The S-33 Gated Spillway monitoring station would be in the North Fork of the New River at Major William Lauderdale Park, approximately 3.5 miles downstream of the existing S-33 Gated Spillway. The G-54 Gated Spillway monitoring station would be in the South Fork of the New River at Lewis Landing Park, approximately 6.1 miles downstream of the existing G-54 Gated Spillway, within the C-12 East Watershed.

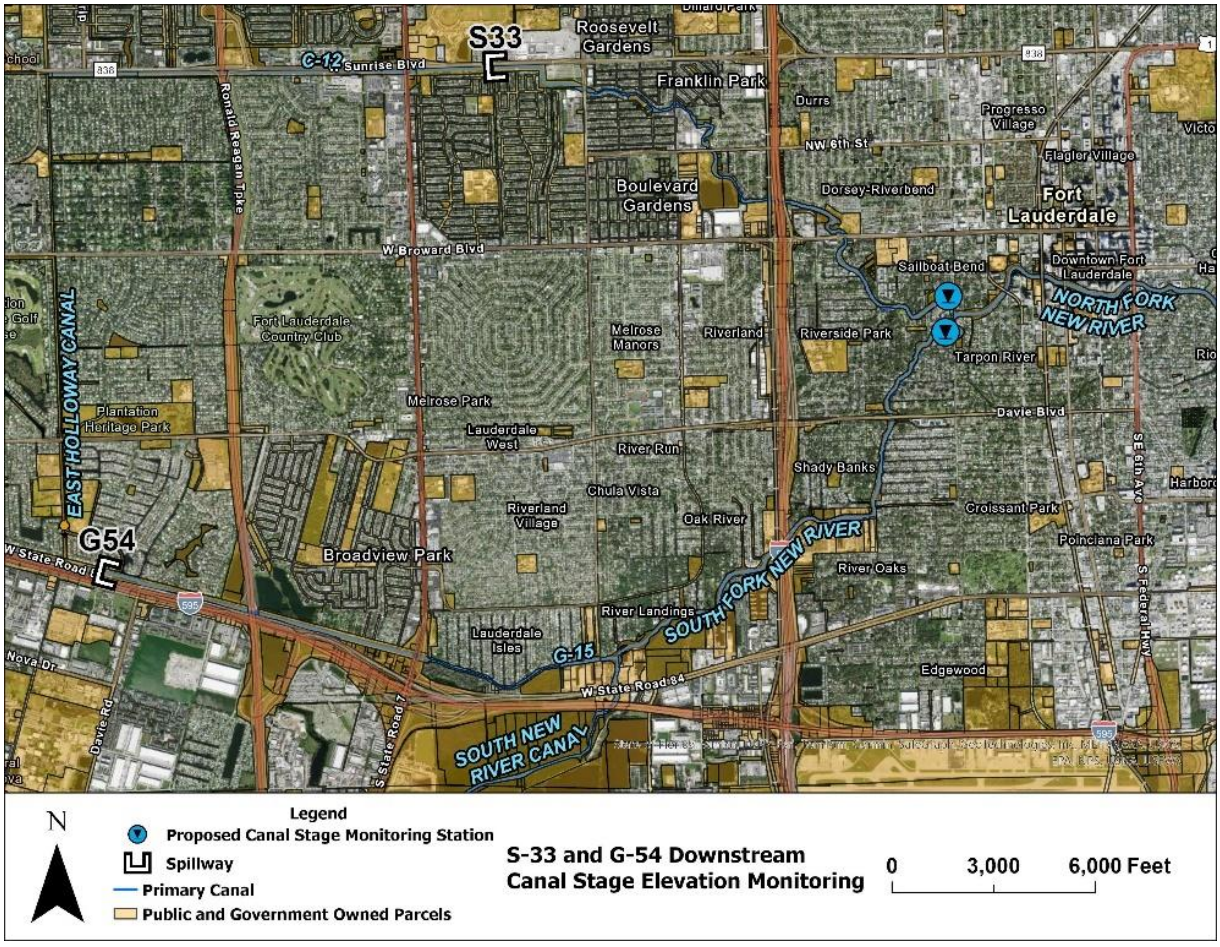

Figure F.13-4. New Monitoring Station Proposed Locations to Record S-33 Gated Spillway and G-54 Gated Spillway Downstream Stages.

$1.2

Figure F.13-5. Close View of New Monitoring Station Proposed Locations to Record S-33 Gated Spillway and G-54 Gated Spillway Downstream Stages

The final proposed location (26.0681785, -80.1707769) is downstream of the S-13 Pump Station and Gated Spillway along the Dania Cut Off Canal (**Figure F.13-6**). The parcel considered for staging equipment is Boaters Park, owned by the City of Fort Lauderdale and is directly adjacent to the Dania Cut Off Canal.

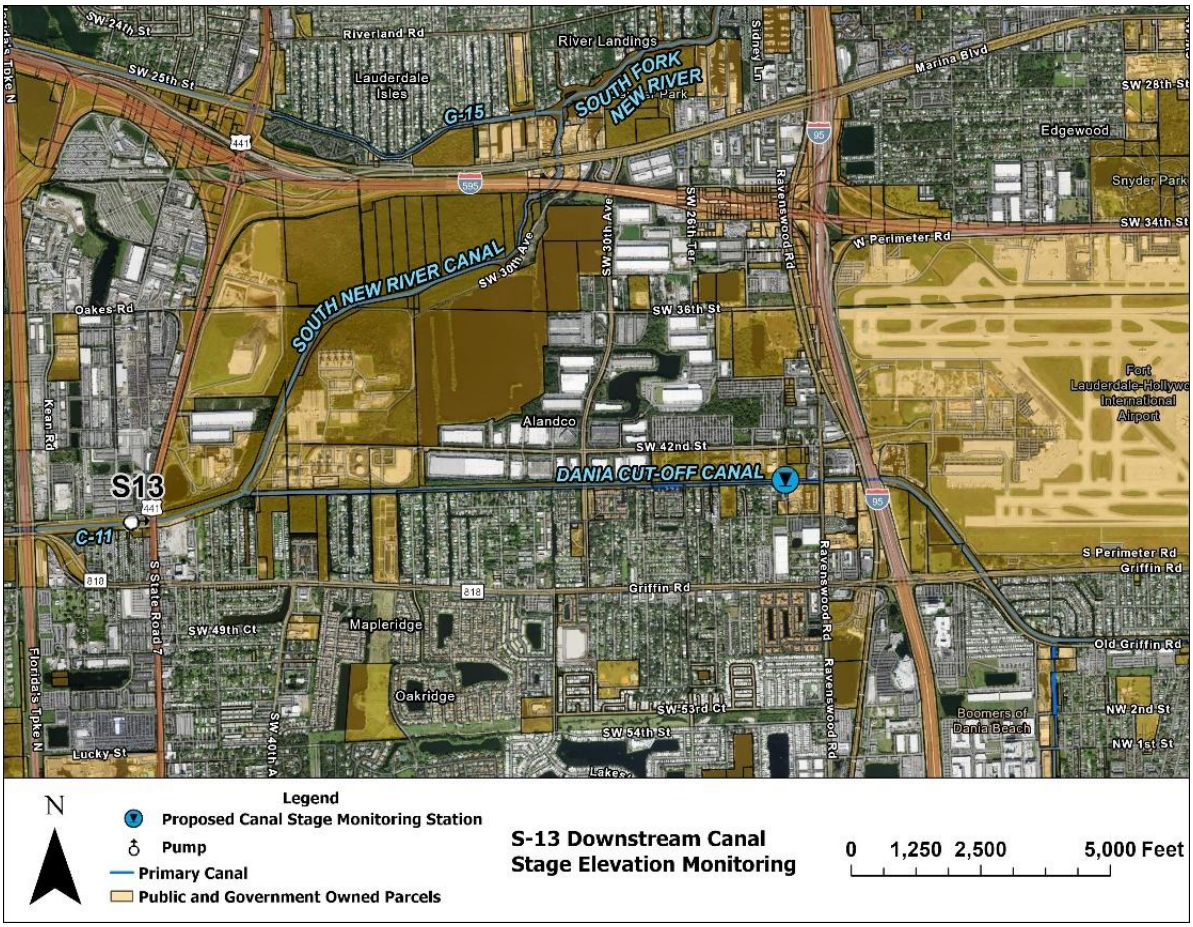

Figure F.13-6. New Monitoring Station Proposed Location to Record S-13 Pump Station and Gated Spillway Downstream Stages.

F.14 Downstream Real Estate Assessment

This section describes the real estate considerations for potential induced flooding impacts that will be further evaluated for severity and determination of real estate taking. According to the ER 405-1-12, "If induced flooding is reasonably anticipated, the Real Estate Plan should briefly describe the nature and the extent thereof and whether additional acquisition of lands, easements, or right of way must, occur as a result". This real estate assessment, prepared in accordance with the USACE Memorandum Guidance for Induced Flooding (July 28, 2025), supports the C&SF Flood Resiliency Study (Section 203) for Broward Basins, a joint USACE–SFWMD initiative. It evaluates rainfall-induced flooding impacts on real estate property resulting from TSP projects, ensuring compliance with federal "no adverse impacts" policy and regional flood resilience standards.

F.14.1 Summary

The study is seeks to identify causation, foreseeability, severity, duration, and recurrence of government-induced flooding. Using MIKE SHE/MIKE Hydro modeling, flood depth differences between future with- and without-project conditions were evaluated for selected events representing different frequencies, including the 2-year surge/25-year rainfall, the 2-year surge/100-year rainfall, and the 20-year surge/25-year rainfall for the selected study baseline – representing 2035 scenarios. South Florida's flat terrain, encroaching tidal boundary, and extensive canal network create complex flood dynamics. Modeling shows some localized flood depth changes, but no significant regional flood depth increases or spatial increase of the flood extent from the proposed project actions. Urban density increasing toward the coastal areas and sea level rise factors dominate long-term flood risk, supporting a follow-on Coastal Storm Risk Management study.

According to the assumptions and references summarized above, an initial screening of potential real estate impacts was conducted to identify properties that may experience measurable changes in flood conditions under future with-project conditions. This evaluation, informed by modeled flood depth differentials provides an early indication of areas where increased flood exposure could occur. Among preliminary findings, in the area downstream of G-56 Gated Spillway along the Hillsboro Canal, minor flood duration increases were observed primarily along roads and canal-adjacent parcels. Other isolated impacts were also observed in additional parcels within the Study Area, as illustrated in **Error! Reference s ource not found.** below. Depths exceeding finished floor thresholds indicate potentially compensable real estate impacts. In most of the illustrated inundated model cells below, flood depth differentials fall within water bodies (including downstream coastal canals). Initial calculations suggest water surface elevations are not exceeding the level that would result in a real estate impact. Additionally, parcel-specific investigation would be performed to further analyze these outcomes.

To address potential rainfall-induced flooding identified under future project conditions, a range of mitigation options are also being considered. Among mitigation options, the observed impacts can be reduced and/or eliminated through the following measures:

1. Operational Refinement: Already implemented, could be further refined; seeks to operate upstream infrastructure to avoid exacerbating peak stages downstream when already impacted by sea level rise factors.
2. Nonstructural Measures: Elevating the property offers localized protection and insurance benefits.
3. Structural Measures: Targeted drainage upgrades to canals, swales, pumps, and control structures—aligned with the Broward County Resilience Plan measures, including seawalls — to enhance regional resilience. No structural measures are recommended at this point to mitigate initially observed impacts.
4. Real Estate Acquisition (Takings): Considered where other measures are infeasible, guided by USACE policy and federal legal standards.

In conclusion, this assessment provides a policy-compliant, technically sound foundation for evaluating potential induced flooding impacts under the Section 203 TSP. Preliminary results indicate no significant induced flooding overall and potentially compensable takings in localized parcels. Continued

coordination between SFWMD and USACE, alignment with county resilience initiatives, and a multi-layered adaptation strategy remain key to future resilience and project success.

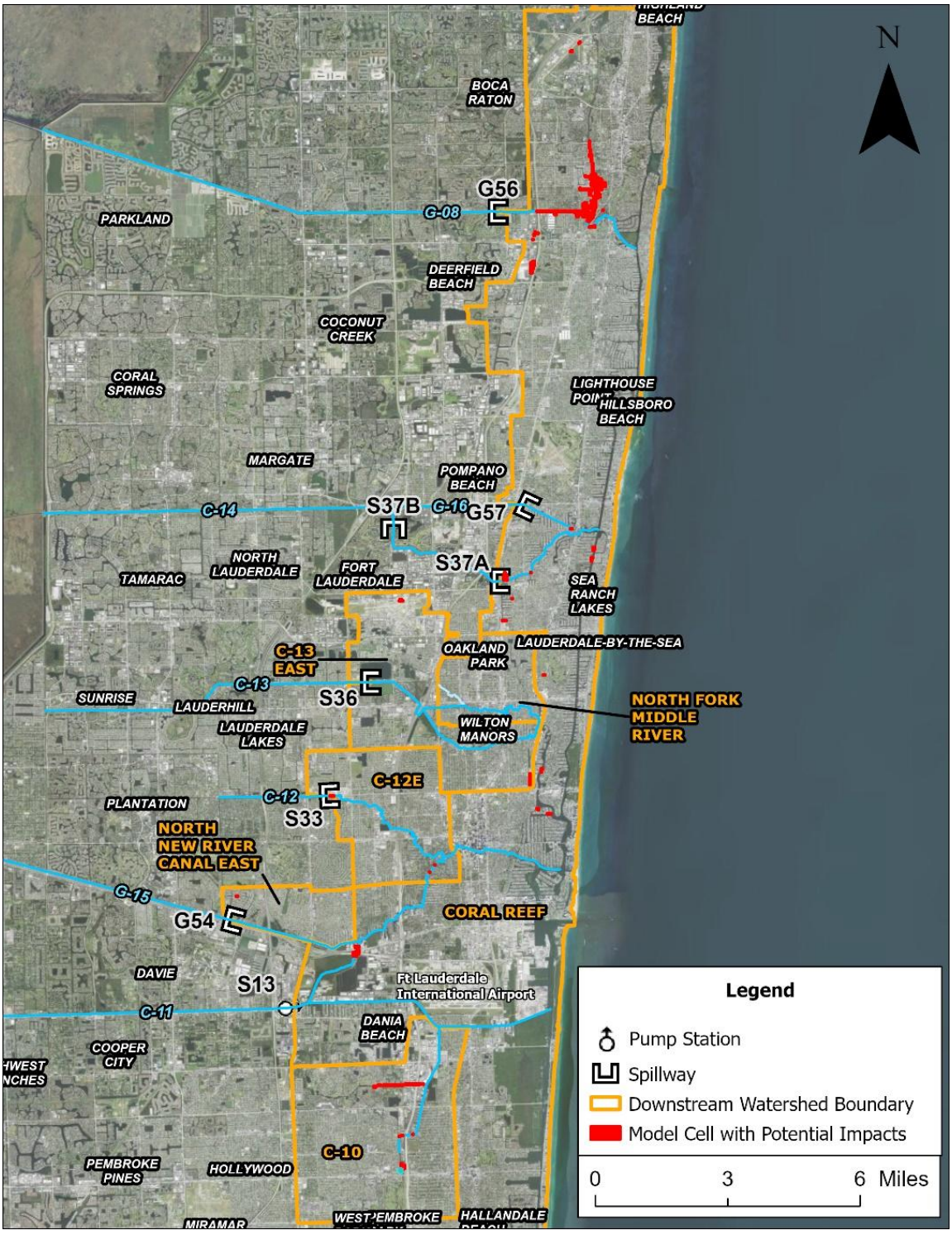

Figure F.14-1. Overview of Initially Observed Flood Depth Increase Downstream of Section 203 Study Coastal Structures, Including Areas Over Existing Water Bodies.

F.14.2 Real Estate Assessment Basis

In accordance with the USACE Memorandum Guidance for Induced Flooding, dated July 28, 2025, and consistent with the policy framework established under ER 1105-2-103, Policy for Conducting Civil Works Planning Studies (December 7, 2023) and ER 405-1-12, Real Estate Handbook, Chapter 12 (May 1, 1998), a real estate analysis was conducted to evaluate potential induced flooding impacts resulting from the recommended TSP project's implementation. This analysis forms part of the broader C&SF Flood Resiliency Study (Section 203) – Broward Basins, a flood risk management study, performed under the authorities of Section 216 of the Flood Control Act of 1970 and Section 203 of the Water Resources Development Act of 1986, in partnership with USACE. The objective of this section is to identify, document, and evaluate potential effects to real property interests that may result from hydrological and hydraulic changes associated with the tentatively selected plan proposed projects.

The evaluation is informed by relevant legal precedents interpreting the Fifth Amendment Takings Clause of the U.S. Constitution as it pertains to government-induced flooding, including Ideker Farms v. United States (2023), Arkansas Game & Fish Commission v. United States (2012), and the Addicks/Barker litigation. These cases provide judicial criteria regarding causation, foreseeability, severity, duration, and recurrence of flooding necessary to establish potential compensable takings. The principles derived from these decisions, along with applicable USACE policy and technical guidance, were used to develop a consistent methodology for identifying, screening, and characterizing potential induced impacts to structures and parcels located within the Study Area.

While the analytical criteria used to interpret model outputs and quantify flood depth differences between future without-project and future with-project conditions are well-established and applied nationwide, their application in South Florida requires particular care. The region's extremely low and flat topography, tide-influenced gravity drainage systems, and complex surface–groundwater interactions create flood dynamics that differ significantly from those in other regions. The present study addresses rainfall-induced flooding risks within this unique hydrologic context; however, the results also highlight substantial coastal and sea level rise-driven flood risks in the future without-project condition. These findings support the recommendation to pursue a follow-on Coastal Storm Risk Management study to address those coastal influences, which are outside the scope of this Flood Risk Management Study, which focus on rainfall-driven flooding risks.

South Florida's hydrological landscape presents unique challenges for flood risk management due to its low-lying terrain, highly transmissive aquifers, elevated groundwater tables, and extensive, intensively managed canal network. The C&SF Project alone includes more than 2,200 miles of canals and levees, nearly 1,000 control structures, and numerous pump stations, all of which interact dynamically with rainfall, tides, and groundwater levels. These characteristics demand advanced hydrologic, hydraulic, and hydrodynamic/coastal modeling approaches to accurately represent system behavior and evaluate flood vulnerability.

Accordingly, the analysis presented herein relies on high-resolution elevation datasets, sophisticated numerical modeling, rigorous hydrologic and hydraulic interpretation, and application of local ordinances to quantify changes in flood depth and duration attributable to project conditions and to ensure that induced flooding evaluations are scientifically sound, policy-compliant, and regionally appropriate. The resulting analysis provides a technical basis of policy-compliant framework for

determining whether observed or projected flooding effects meet the established thresholds for potential real estate acquisition, compensation, or further evaluation under USACE real estate procedures while supporting continued risk-informed decision-making for both current and future flood risk management initiatives in South Florida.

F.14.3 Policy Guidelines

The following policy guidelines were utilized to inform the analysis in this section:

- Memo Guidance for Induced Flooding, July 28, 2025
- ER 1105-2-103, Policy for Conducting Civil Works Planning Studies, December 7, 2023
- ER 405-1-12, Real Estate Handbook, Chapter 12, May 1, 1998

F.14.4 Criteria to Identify Potential Rainfall Induced Flooding Effects

The identification of potential project-induced flooding impacts to structures in the downstream study areas was conducted using a systematic geospatial and hydrologic/hydraulic analysis framework. The Section 203 Baseline condition was selected at the period of analysis for the assessment of rainfall induced flooding, corresponding to the 2035 scenarios (with and without projects). Selected events were simulated representing different frequencies and variation in rainfall and surge magnitudes, including the 2-year surge/25-year rainfall, the 2-year surge/100-year rainfall, and the 20-year surge/25-year rainfall. The assessment began by identifying grid cells that indicated a flood depth increase after implementing the TSP to capture parcels that have potential adverse effects, using an overlay approach on GIS.

- Evaluation of Flood Depth Differentials: Comparative analyses were performed between future with-project and future without-project conditions. Only structures within parcels exhibiting an increase in maximum flood depth of 0.1 foot or greater under project conditions were identified as potentially affected. These depth differentials were extracted directly from MIKE Flood model datasets (raster grid cells) to ensure consistency with modeled hydraulic conditions. The 0.1-foot (approximately 1.2-inch) threshold used to identify potential project-induced flood depth increases reflects guidance provided by the H&H/Modeling team on how to consider model uncertainty and precision when analyzing small differences. Although the modeling was done in a robust and technologically sound manner, small model tolerances exist and should be understood when interpreting the data.

F.14.5 Other Criteria to Identify Potential Rainfall Induced Flooding Effects to be Analyzed

- Exclusion of Structures Persistently Inundated Under Baseline Conditions: Structures located within parcels subject to continuous inundation under the future without-project scenario might be excluded from further analysis. These locations were identified through grid cell time-series analyses indicating water depths greater than 0.0 feet for the entire 28-day model simulation period (equivalent to approximately 575 hours). This exclusion ensures that only those structures potentially influenced by incremental project effects, rather than persistent baseline flooding, are retained for evaluation.

- Application of Minimum Foundation Elevation Threshold: Structures might be further evaluated based on the relationship between modeled flood depths and individual foundation (finished floor) elevations. Structures for which simulated flood depths did not exceed around 0.5 to 0.75 foot below the finished floor elevation might be excluded from consideration. This threshold reflects HAZUS depth-damage curve guidance for one-story residential structures without basements, wherein damage onset is assumed to occur only when flood depths approach or exceed the finished floor elevation. Flooding below this level produces negligible or no structural damage and therefore does not meet the analytical criteria for induced impact evaluation. In addition, Broward County's flood protection standards established under Ordinance No. 2020-11 might be utilized in this analysis:
    - *Broward County's flood protection standards, as established under Ordinance No. 2020-11, require that the lowest habitable finished floor elevation for new development and major redevelopment be set above the applicable 100-year flood elevation. This elevation must be determined using the most appropriate source of flood data, which may include FEMA Flood Insurance Rate Maps, the County's 100-Year Flood Elevation Map (Plate WM 13.1), or the Future Conditions 100-Year Flood Elevation Map (Plate WM 13.1 – 2060) developed through integrated hydrologic and hydraulic modeling (MIKE SHE/MIKE Hydro River). These future condition maps incorporate projected sea level rise, precipitation changes, and future land use to estimate flood elevations representing a 1% annual chance event under mid-century climate and development scenarios. For residential construction, finished floors must be elevated at least 18 inches above the adjacent road crown or above the future 100-year flood elevation, whichever is higher. Nonresidential buildings may be permitted at lower elevations 6' only if certified to meet FEMA floodproofing standards. Applications for new surface water management licenses, major redevelopment, or major license modifications submitted after June 30, 2021, must comply with these future condition standards. Within the context of this analysis, this ordinance criterion primarily affects new development and major redevelopments, rather than existing structures. However, a portion of such redevelopment activity may occur within the 2035 baseline assessment period considered for this study. Based on Broward County Planning Division projections, annual conversion rates for tidally influenced areas are estimated at approximately 0.5% for residential and up to 2% for commercial or downtown areas. These rates represent the proportion of existing developed parcels likely to undergo substantial redevelopment each year, and therefore, to become subject to the minimum finished floor elevation requirements. Accordingly, while the ordinance has limited near-term applicability to many existing structures, it plays a critical role in incrementally elevating the flood resilience of the built environment through redevelopment over time, consistent with the County's long-term adaptation framework and the hydrologic basis of Plate WM 13.1 – Future Conditions.*
- Screening of Canal-Adjacent Structures Based on Seawall Elevation Compliance: Structures located adjacent to canals might be evaluated in accordance with Broward County Ordinance requirements for minimum seawall elevations projected for the years 2035 (minimum 4 feet NAVD88) and 2050 (minimum 5 feet NAVD88). A canal-adjacent "shoreline buffer" extending 10 feet landward into each parcel was delineated, and corresponding high-resolution DEM values were analyzed. Structures within parcels where seawall or adjacent ground elevations were

below 4.0 and 5.0 feet NAVD88 might be excluded, as flood conditions in such areas are more likely to reflect tidal or canal backwater influences rather than project-induced effects.

- *Adopted on March 31, 2020, Ordinance No. 2020-11 (codified as Article XXV of Chapter 39 of the Broward County Code of Ordinances) establishes uniform minimum elevation standards for tidal flood barriers to enhance coastal resilience against sea level rise and tidal flooding. The ordinance requires all new, substantially repaired, or rehabilitated shoreline infrastructure, including seawalls, banks, berms, and similar structures—within tidally influenced areas (excluding oceanfront beaches) to be constructed to function as tidal flood barriers with a minimum elevation of five (5) feet NAVD88, or four (4) feet NAVD88 if permitted before 2035 and designed for future elevation to five feet by 2050. Property owners must maintain flood barriers in good repair, and allowing tidal waters to flow onto adjacent properties or rights-of-way is deemed a public nuisance and a citable offense. The ordinance promotes use of green-grey infrastructure and habitat-enhancing materials and allows alternative or automated tidal barriers that meet performance standards. It also mandates disclosure in real estate transactions within tidally influenced areas, notifying buyers that properties may be subject to minimum flood barrier elevation requirements. Collectively, this ordinance serves as a regional model for municipalities to adopt consistent coastal resilience and tidal flood protection standards (Broward County Code of Ordinances, Ch. 39, Art. XXV, §§ 39-404–39-408; Ord. No. 2020-11, enacted Mar. 31, 2020).*

- Evaluation of Flood Duration Differentials: Structures might be subsequently assessed to evaluate change in flood duration. A minimum increase in flood duration of a certain number of hours between the with-project and without-project simulations might be established in the threshold for potential induced flooding. This evaluation, also based on MIKE model time-series outputs, enables identification of structures where incremental water retention could indicate meaningful project-induced impacts with appropriate consideration of model evaluation tolerance.

This multi-tiered screening methodology ensures that the analysis focuses on quantifiable, significant, and hydraulically attributable changes in flood behavior, consistent with the technical and legal standards established under USACE induced flooding guidance and the Fifth Amendment Takings Clause framework. The structured approach supports risk-informed determinations of potential project-induced effects on real property interests and ensures alignment with applicable USACE policy and real estate procedures.

F.14.6 Requirements to Evaluate Takings

The following bullets detail the requirements under consideration for real estate taking evaluation:

1. Details regarding the project feature operation, or details regarding project construction and the impact to surrounding lands which are not in the project ROW.
2. Historical water elevation of surrounding properties (without project condition).
3. Determination of the elevation/depth of standing water on the surrounding properties after project construction and/or operation (with project condition).
4. Frequency of flooding over surrounding properties.

5. Velocity of water flowing over properties. (not as critical in this Study Area where watershed driven downstream velocities are typically nominal compared to typical riparian / flood plain systems).
6. Duration of each flooding event (how long will the water remain over properties).
7. Uncertainty of numerical modeling data utilized for the project and/or operational change analysis as referenced in EM 1110-2-1619.

F.14.7 Potential Rainfall Induced Flooding Impacts and Descriptions

According to the assumptions and references summarized above, an initial screening of potential real estate impacts was conducted to identify properties that may experience measurable changes in flood conditions under future with-project conditions. This evaluation, informed by modeled flood depth differentials provides an early indication of areas where increased flood exposure could occur. The findings presented in this section are organized by the direct area of influence respective to each main coastal structure. These initial findings, as illustrated in Error! Reference source not found., represent a p reliminary identification of potentially affected parcels and structures, forming the basis for subsequent detailed impact and resiliency evaluations. While most existing development remains governed by current ground and floor elevations, a portion of future redevelopment expected through 2035 may be influenced by new standards for minimum finished floor elevations and drainage infrastructure improvements.

F.14.7.1 Area of Influence – G-56 (Coral Reef Western Boundary, South of Spanish River Road, North of Sample Road, West of Intracoastal)

Within the G-56 structure direct area of influence, the model captures a cluster of grid cells that indicate an increase in peak depth when the without project as compared with project conditions for 2035. Some contiguous grid cells are located South of Palmetto Park Road to Hillsboro Blvd. However, due to the MIKE models grid set up, some of the grid cells centralized along the canal show spatial overlap with adjacent properties located along the E-4 (El Rio) Canal as well as in the “finger” canals that abut neighboring properties. For many of these grid cells that overlap both a canal and a private property, the initial interpretation of the elevation profile at higher resolution would indicate flooding that was encroaching the property. For example, the E-4 (El Rio) Canal has an increase in stage from its intersection with Palmetto Park Road to the confluence with the Hillsboro Canal. However, it appears that observed stage elevation increase does not exceed the ground elevation for the 20-year surge, 25-year rainfall and 2-year surge, 100-year rainfall scenarios. This indicates that the model results do not show stage elevation that is exceeding the ground elevation at the structure, in these locations. One of the census blocks identified as experiencing higher flood depths is located along the Hillsboro Canal at Hillsboro Park. The topology of this census block indicates low depression in the northern areas, including small offshoot of the canal that backs into it. It includes five properties subject to flooding impacts. According to the existing conditions without project, this region is expected to experience flood depths that exceed the estimated finished floor elevation. Based on the 2035 simulated model results without project and results with project, the maximum flood depth difference for the five properties was 0.124 feet, or approximately 1.5 inches and do not suggest an increase in the frequency of flooding for this area.

F.14.7.2 Area of Influence – G-67 and S37A (Coral Reef Western Boundary, South of Sample Road, North of Commercial Road, West of Intracoastal)

Grid cells within the G-65 and S37B direct area of influence, in most cases, show increase flood depths overlapping with existing waterbodies. Within Boulevard Park, there are 11 grid cells that show flood depths increase. These 11 grid cells are located within a finger canal but do overlap with any adjacent parcels. Similar observations are applied to one grid cell downstream in the Cypress Creek Canal, the higher depth grid cells in the finger canals of the Coral Ridge Isles neighborhood, Cypress Cove, Bay Colony, and to the grid cells within the intracoastal. All these grid cells are likely to have a significant gradient in elevation when using a higher resolution DEM capturing the differences between the canal and the ground elevation at the structure. This procedure would highlight the extent at which flood waters are anticipated to encroach the parcel. Preliminary analysis suggests that the true flood elevation does not exceed the finished floor elevation but could be within a portion of the parcel.

F.14.7.3 Area of Influence – S-36 (C-13 East Western Boundary, South of Commercial Road, North of Sunrise Blvd, West of Intracoastal)

Two localized grid cells show an increase in peak depth within the direct area of influence of S-36 Coastal Structure. The first is within a retention pond located at NE 13th St and N Federal Hwy which should be analyzed to delineate the water stage elevation that might exceed the finished floor elevation on the nearby property. Similarly, just east on the intracoastal and north of E Sunrise Blvd, there are higher flood depths within grid cells primarily located within the waterbody but also show overlapping with parcels adjacent to the intracoastal. Further analysis is recommended for these areas to calculate the elevation gradient using a higher resolution DEM in the MIKE SHE grid cells and compare with the MIKE SHE topography elevation. Preliminary analysis suggests that the flood extent and depth do not exceed the finished floor elevations on the structures within these parcels.

F.14.7.4 Area of Influence – S-33 and G-54 (North New River Canal & Coral Reef Watersheds Western Boundary, South of Sunrise Blvd, North of I-595, West of Intracoastal)

Four localized grid cells show an increase in peak depth within the direct area of influence of S-33 and G-54 Coastal Structures. Just downstream of the S-33 structure, the flood stages in the C-12 canal are expected to rise with-project by 0.2 foot, but these grid cells do not overlap with private property or identified structures. Some cells are showing flood depth increase around Sunrise Key, where the grid cells are mainly within the canal and partially overlap with the adjacent parcels. Two grid cells along the North New River Canal overlap the adjacent private properties but likely do not have impact on structures. Finally, a cluster of grid cells show flood depth increase near the confluence of the South River Canal and the North New River Canal and overlap with a marina. A more detailed analysis using the high-resolution DEM, as well as determining the height of seawalls would be beneficial to delineate the extent of the flooding along the canal for this area of influence.

F.14.7.5 Area of Influence – S-13 (C-10 and Coral Reef Watersheds Western Boundary, South of I-595, North of West Pembroke Road, West of Intracoastal)

Two localized grid cells show an increase in peak depth within the direct area of influence of S-13 Coastal Structures, within the C-10 basin. The first is along the Dania Cut Off Canal, which include properties overlapping with the flooding extent. Since the grid cells are mainly centered in the

waterway, more detailed analysis is necessary. The second is along the Hollywood Canal, which shows six grid cells that overlap with adjacent properties. Preliminary analysis shows that these parcels do not have stage elevations with-project that exceed the finished floor elevation. In both cases, further analysis is recommended to calculate the elevation gradient using a higher resolution DEM in the MIKE SHE grid cells and compare with the MIKE SHE topography elevation.

F.14.7.6 Summary

Consolidating all the grid cells that show impacts resulted in identifying above 600 parcels that have potential impacts from higher flood depths. It was also recognized in the analysis that around 20 to 30 parcels had a structure in which the water stage elevation exceeded the finished floor elevation. A significant portion of the potential adverse flooding impacts initially identified are expected to be limited to yard areas and existing swales, if at all. Assuming parcels that are impacted at the structure would undergo a full real estate taking, and the remaining parcels would likely require for the project to acquire flowage easements, the estimated costs would range between $240 million and $330 million, assuming buying 20 to 30 percent of parcel land as flowage easement, and 25 to 40 percent contingency. The next step of this analysis is to fully consider the evaluation criteria listed above and perform a more detailed evaluation to assess flood depth potential impacts and the appropriate compensatory measures, as most cases might not result in full real estate takings or flowage easement acquisition. Each initially identified parcel will be thoroughly reviewed using higher resolution DEM to understand the severity of the impacts and if this is severe enough to constitute real estate takings. In addition, the mitigation measures listed below are also under consideration.

F.14.8 Mitigation Options

Building on the identification of potential rainfall-induced flooding impacts, this section evaluates mitigation strategies under consideration to reduce both observed and projected risks to real property and infrastructure. To address potential rainfall-induced flooding identified under future with-project conditions, a range of mitigation options are being considered. These options include nonstructural measures, such as property elevation, structural measures focused on drainage improvements, and where warranted, real estate acquisition or takings. Together, these approaches provide a layered strategy to reduce flooding risk, improve long-term resilience, and support compliance with USACE and local policies.

Nonstructural measures, including property elevation, remain a standard practice in flood risk management and are considered for parcels within areas of detected impacts. Current approaches typically involve raising homes above anticipated flood elevations to reduce exposure. Complementing these measures, enhancements to drainage infrastructure represent a critical and potentially more broadly effective approach to mitigating flood impacts. Proposed improvements focus on local and secondary drainage systems, many of which are already incorporated into existing local government planning instruments, including stormwater management plans, watershed master plans, and the Broward County Resilience Plan. The Broward County Resilience Plan provides a robust, long-term framework for targeted investments in structural and nonstructural interventions over the next 50 years, guiding the County toward a more resilient and adaptive future.

Nonstructural Mitigation: Property Elevation

Property elevation is a well-established nonstructural strategy for reducing flood risk to individual homes and other structures. This approach involves raising the finished floor elevation of a building above the expected flood level, often using fill, piers, or pilings. Elevation provides direct protection against localized flooding and is particularly effective in low-lying areas where small increases in flood depth can result in significant property damage. Current practices for property elevation in South Florida typically include:

- **Assessment of flood risk** using FEMA Flood Insurance Rate Maps, local ordinances, and modeled flood depths to determine target elevation levels.
- **Design and engineering** of elevation measures to comply with building codes, local floodplain regulations, and USACE standards.
- **Implementation** through foundation modification, structural lifting, and installation of flood-resistant features such as breakaway walls or flood vents.
- **Post-elevation verification and documentation** to ensure compliance and eligibility for flood insurance benefits.

Preliminary estimates suggest an average cost of approximately $450,000 per property within identified impact zones. While highly effective at protecting individual properties, elevation alone does not address broader drainage or community-level flooding and is therefore most effective when combined with other structural and systemic measures. Utilizing the number of properties subject to higher flood depths in the future with projects scenario, as identified in the section above, a range of $250 million to $300 million is estimated for elevating around 600 properties potentially affected.

Structural Mitigation: Drainage Improvements

Enhancing drainage infrastructure is considered the most critical mitigation strategy for reducing both observed and potential flooding impacts across larger areas. These improvements aim to increase conveyance or storage capacity and accelerate the reduction of stormwater volumes and associated flood risks from residential, commercial, and public areas.

Key considerations for drainage mitigation include:

- Local and secondary drainage systems: Targeted upgrades to neighborhood-level canals, swales, culverts, and pump stations can significantly reduce flood duration and depth.
- Integration with existing planning frameworks: Proposed measures are coordinated with municipal and county plans, including stormwater management plans, watershed master plans, and the Broward County Resilience Plan, to maximize efficiency, cost-effectiveness, and regulatory compliance.
- System-wide benefits: Unlike property-specific elevation, drainage improvements provide benefits at the community scale, reducing overall flood risk, protecting multiple properties simultaneously, and supporting continued economic activity.

- Resilience to future conditions: Enhancing drainage capacity prepares the region for anticipated increases in rainfall intensity, sea level rise, and tidal influences, contributing to long-term climate resilience.

Specific examples of potential drainage improvements may include:

- Expansion or deepening of secondary canals and swales.
- Installation or upgrade of pump stations.
- Implementation of green infrastructure, such as bioswales, permeable pavements, and detention basins.
- Installation of control structures to manage flows between primary and secondary drainage networks more effectively.

In addition, observed rainfall-induced flooding risks can be further addressed by aligning proposed measures with strategies outlined in the Broward County Resilience Plan. As a forward-looking framework, the Resilience Plan provides an actionable roadmap for community investments over the next 50 years to address the increasing threats of sea level rise, more intense rainfall, storm surge, and rising temperatures. By leveraging the Plan's measures, project mitigation strategies can be enhanced, coordinated with existing local and regional efforts, and delivered in a more cost-effective and comprehensive manner. The Broward Resilience Plan combines both natural and engineered solutions, including:

- Green infrastructure and natural solutions: Expanded swales, bioswales, green spaces, and permeable surfaces increase stormwater infiltration, reduce runoff, and provide environmental co-benefits. These measures can be integrated with local drainage improvements to augment conveyance and storage capacity, directly reducing flood depth and duration for identified impact areas.
- Engineered systems: Upgraded stormwater management facilities, canals, pumps, and seawalls protect critical infrastructure and improve system resilience. Targeted investments in secondary drainage systems identified in the Broward Resilience Plan can be aligned with Section 203 TSP upgrades to mitigate rainfall induced flooding, maximizing risk reduction while minimizing duplication of effort.
- Community and property-level adaptation: Elevation of at-risk properties, managed retreat through strategic acquisitions, and localized flood protection barriers can be implemented to ensure consistency with long-term resilience goals.

By overlapping Broward Resilience Plan initiatives with the areas of observed and modeled flooding, the proposed plan and mitigation alternatives can leverage ongoing planning and investment opportunities. For example, proposed drainage improvements can leverage planned canal enhancements or pump station upgrades already included in the Resilience Plan, creating a coordinated approach that addresses both immediate rainfall-induced flooding and future resilience priorities. The integration of Resilience Plan measures into project-specific mitigation offers several benefits:

- Efficiency and cost-effectiveness: Coordinating with existing planned investments reduces redundancy, optimizes use of public funds, and accelerates implementation timelines.

- Community-wide risk reduction: By combining property-level and system-level interventions, a more resilient urban and suburban landscape is created, lowering overall flood exposure.
- Environmental co-benefits: Green infrastructure supports biodiversity, enhances ecosystems, and promotes sustainable land use, complementing engineered drainage solutions.
- Alignment with long-term strategy: Integrating project mitigation with the Resilience Plan ensures that short-term interventions contribute to the County's 50-year vision for climate resilience, economic stability, and community preparedness.

Adopting and integrating measures from the Broward County Resilience Plan enhances the proposed mitigation strategy by leveraging planned investments, providing multiple layers of protection against rainfall-induced flooding, and advancing the County's long-term resilience objectives.

Real Estate Acquisition / Takings

In circumstances where mitigation through elevation or drainage improvements is insufficient, acquisition of real property—commonly referred to as real estate takings—may be considered as a last-resort mitigation measure. This approach involves the purchase of parcels or compensation that are subject to repeated or severe flooding.

Key aspects of this approach include:

- Eligibility and criteria: Potential acquisitions are evaluated using modeled flood depth and duration data, USACE policy, and federal legal precedents regarding compensable takings, including the Ideker Farms, Arkansas Game & Fish, and Addicks/Barker cases.
- Acquisition strategies: Options may include voluntary purchase agreements, buyouts with relocation assistance, or in limited circumstances, eminent domain following legal guidance and policy requirements.
- Benefits: Real estate acquisition eliminates exposure to flood risk for acquired properties entirely, reduces long-term maintenance and emergency response costs, and allows land to be repurposed for open space, stormwater storage, or natural floodplain functions.
- Limitations: This measure is typically the costliest on a per-property basis and has significant social and community impacts. It is therefore reserved for parcels where other mitigation measures are infeasible, insufficient, or disproportionately expensive relative to the risk reduction achieved.

Based on the different mitigation options described above, including non-structure property elevation measures, structure drainage improvements and real estate takings, the overall cost to mitigate rainfall induced downstream impacts is in the order of $300 million.