



CITY OF
FORT LAUDERDALE



River Oaks Neighborhood Repetitive Loss Area Analysis 2020

Terracon

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Executive Summary

Flooding is the highest-ranking natural disaster in the United States, accounting for more loss of property and human life any than other natural disaster. The U.S. Congress created the National Flood Insurance Program (NFIP) through the National Flood Insurance Act of 1968, to provide flood insurance programs to property owners to reduce flood damages caused by natural disasters. Repetitive Loss Properties (RLP) is a classification within the NFIP that designates properties that experience frequent flooding events and multiple “repetitive losses” that result in insurance claims. These properties are often within an area that contains similar properties that are either also experiencing repetitive loss or exposed to the same types of flooding risk. The Repetitive Loss Area Analysis (RLAA) is used by municipalities to determine the potential causes of flooding to address the reduction of insurance claims. The RLAA process is designed use desktop and field data collection of an areas with repetitive loss to that includes building or property information, a statement of the problem of the area, and potential mitigation measures to address the losses. The City of Ft. Lauderdale has contracted Terracon to conduct an RLAA for the River Oaks neighborhood to help address the repetitive loss claim in that area. The following analysis will describe the likely problems related to flood events, highlight property loss mitigation measures and make recommendations for the City and property owners to potentially undertake to mitigate flooding in each of the repetitive loss areas in the City.

Terminology, Programs and Regulations

National Flood Insurance Program (NFIP)

The Federal Emergency Management Agency (FEMA) created the National Flood Insurance Program (NFIP) in 1968 to help reduce the economic impact of flooding on both private and public buildings by offering government-based flood insurance to property owners. This program is a cooperative agreement between FEMA and local government units where communities are encouraged to create floodplain management plans and enforce regulations to reduce future flooding damage. Though participation is voluntary, participating communities are eligible to receive Federal aid for damage to the insured structures within the flood hazard areas.

FEMA Flood Zones

FEMA categorizes flooding risk by the chance of flooding during a 30-year mortgage, and those in high risk areas are referred to as Special Flood Hazard Area (SFHA) which include Zones A, AO, AH, A1-30, AE, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, V1-30, and V. Moderate to low risk Zones include B, C, and X. Mandatory flood insurance purchase is required for properties in high risk zones and offered to low risk zones.

As of 2018, there were 38,321 NFIP policies in force within the City of Ft. Lauderdale totaling \$9,552,458,600 in coverage with \$1,741,903.02 paid in premiums in 2017. The study area lies in Zones AE, AH and X.

Community Rating System (CRS)

Communities that go beyond the minimum flood mitigation requirements set by the NFIP can apply to be accepted into the Community Rating System (CRS), which is recognized by the NFIP. The CRS aims to promote awareness of flood insurance, and rewards communities for further mitigation activities by reducing flood insurance premiums for policy holders. The discount rate is based on the community's score of their floodplain management activities which is outlined in Section 110 of the *CRS Coordinator's Manual*. Class 10 communities are the lowest ranking and receive no premium reduction. The premium for each class above 10 is a 5% cost reduction over the previous class resulting in a Class 1 ranking with a 45% total reduction in premium cost.

The City of Ft. Lauderdale is currently rated a Class 6 community in the CRS program. To maintain its current 20% flood insurance premium reduction, the City must provide a status report to the NFIP each year.

Repetitive Loss Properties (RLP)

FEMA defines these as an NFIP-insured property where two or more claim payments of at least \$1,000 have been paid within a 10-year period since 1978. There are *seven* RLP's that drive this analysis, however the data and location of these RLP's will not be disclosed in this report to comply with the Privacy Act of 1979.

Repetitive Loss Categories

The number of unmitigated repetitive loss properties determines the category the community will fall into, and each category has subsequent requirements for that community to complete in accordance with CRS guidelines. Many of the losses under the NFIP are derived from RLP's and addressing this loss is priority of CRS program participation.

- **Category A:** A Community with no unmitigated RLP's. No special requirements from the CRS.
- **Category B:** A community with at least one comma but fewer than 10, unmitigated repetitive loss properties. Category B communities are required by the CRS to research and describe the repetitive loss problem, create a map showing the location of all repetitive loss properties and complete an annual outreach activity directed to RLP's.
- **Category C:** A community with 10 or more unmitigated RLP's. Category C communities are required to do everything in category B and prepare a floodplain management plan that covers all repetitive loss properties or prepare an RLA for all RLP's.

The City of Ft. Lauderdale is a category C community according to the CRS as it has 50 or more unmitigated repetitive loss properties. Category C communities are required (under Section 510 of the *CRS Coordinator's Manual*) to develop a floodplain management plan or a repetitive loss area analysis that covers all the city's RLP's.

Repetitive Loss Area (RLA)

A Repetitive Loss Area (RLA) consists of seven RLP's and the surrounding properties that experience the same or similar flooding conditions, whether or not the buildings on those surrounding properties have been damaged by flooding. A property with sustained flooding may not appear on the list of FEMA's repetitive loss properties because the owner does not have a mortgage. This is one of a multitude of reasons that there are gaps in FEMA's data, which leads to only part of the flooding issues being examined. To ensure the entire problem is being considered and addressed, the RLA is created and *mapped* to include buildings with *similar flooding exposure* as those already on the list. If only the RLP's are examined, then only part of the entire problem is being addressed.

The City of Ft. Lauderdale has identified several specific neighborhoods as a priority to address current flooding issues; this study is focused on one RLA in the River Oaks neighborhood. Based on GIS analysis provided by the City, the RLA was created for the River Oaks neighborhood and included 434 parcels, seven of which are RLP's.

Repetitive Loss Area Analysis (RLAA)

Once the RLA has been established and mapped, the next step is to conduct an analysis of the of the RLA to develop a more comprehensive understanding of the conditions that might reduce or increase flooding. The following RLAA is intended to highlight alternative flood mitigation remedies and provide specific guidance on how to reduce damage from repetitive flooding. The benefits of the RLAA can serves as a solution for homeowners that experience repetitive flooding problems, and from a state and federal prospective, mitigating repetitive loss properties makes economic sense and reduces the financial burden on the NFIP program.

1.0 Repetitive Loss Area Analysis

1.1 Background

Flooding is the most common natural disaster in this nation, as well as the costliest, causing millions of dollars of damage every year. The NFIP offers federally backed flood insurance to homeowners and paid \$1,354,075 in insurance claims in 2018 with Florida representing 36% (\$487,607) of these claims. Frequently flooded properties that qualify as RLP's comprise approximately 1% of the insured properties under this program. However, these account for 30% of all claim payments, costing the NFIP around \$200 million annually. Broward county, Florida ranks 5th of the top 12 Florida counties in the total number, and percent of repetitive loss claims. Ft Lauderdale is the most populous city in Broward county and the flooding within the city can be attributed to tidal flooding resulting from hurricanes and tropical storms and flash flooding from heavy rainfall events.

The City of Ft. Lauderdale has identified several neighborhoods as priorities to address current flooding issues. The focus of this study is located in the River Oaks neighborhood (Figure 1). The study area is comprised of areas throughout in SHFA Zones AE, AH with areas in the northern portion of the boundary area in Zone X (Figure 2).

Seven RLP's were identified from FEMA's repetitive loss list. Since flooding typically affects several buildings during an event, GIS analysis was used to include properties that were not on the list but nearby known RLPs, and an RLA was created within the southwestern portion of River Oaks neighborhood (Figure 3).

Terracon conducted an analysis of this area in accordance with the RLAA process outlined in the *Community Rating System Coordinator's Manual*, Section 510. Conducted under these guidelines, this analysis ascertains the causes of repetitive flooding to the study area, as well as identifies alternative flood protection measures to correct the repetitive flooding damage.

The CRS acts as a liaison between the NFIP and communities looking to reduce their flooding risk and insurance premiums from the impacts of excess rain events. In the *CRS Coordinator's Manual*, FEMA-approved activities that communities can undertake to reduce their flooding risk are outlined, and once completed, the community receives credits that can be applied towards insurance premium discount. In 1992, the City of Ft. Lauderdale joined the CRS Program and is currently rated a Class 6 community. To maintain its current 20% flood insurance premium reduction for properties in Special Flood Hazard Area (SFHA) Zones or 10% for those in Zone X, the City must provide a status report to the NFIP each year. Successful completion of a RLAA earns communities' additional credits that qualify them for additional discounts.

1.2 Study Area

There are 434 parcels included in this RLAA within the neighborhood of River Oaks. Based on the existing RLP's obtained from FEMA, GIS analysis was used to create a 500-ft radius buffer around each property to account for nearby buildings that may not be RLP's but had similar flooding exposure. This GIS exercise produced the RLA east of I-95, west of SW 15th Ave, bound by South New Fork River to the north, and State Road 84 to the south (Figure 3). The city of Ft Lauderdale staff used GIS analysis and *mapped* all properties within a 500-foot -buffer adjacent to the seven RLP's within in the River Oaks neighborhood, created the RLA and it serves as the basis for the analysis. The RLA *mapped* includes a mix of "building use" *sections* that includes a commercial *section* (marina) with contained onsite-stormwater retention, a multi-family residential *section* condominium with City drainage, and single-family residential *section* with City drainage. It should be noted that the single-family residential *section* with City drainage is the only building use *section* in this analysis that contains RLP's. The remaining 2 types of building use *sections* are included in this analysis because they lie within a 500-foot-radius of an RLP. They have *similar flooding exposure* to the RLP's *mapped* for this analysis, therefore they are included in the RLA, but experience no repetitive losses or reported flooding.

Terracon GIS staff used LiDAR data collected by the Hazen Team in 2018 to create accurate depiction of the RLA to demonstrate the consistency of low elevation conditions throughout the site. Figure 4 depicts the contour elevations of the neighborhood to be very low with little to no variation throughout, with elevations ranging from approximately 1-6 feet NAVD 88 (Figure 4). Furthermore, a Digital Elevation Model (DEM) was performed that offers a very accurate depiction of the true elevation of the ground surface (Figure 5).

1.3 The RLAA 5-Step Process

The recognized procedure to conduct a RLAA is outlined in Section 510 of the 2017 *CRS Coordinator's Manual*:

Step 1 – Advise all property owners that they are within the repetitive loss area and that a repetitive loss area analysis will be conducted to ascertain the flooding problems. Ask for input from residents about previous flooding events.

Step 2 – Contact other agencies that have data on past flooding or insurance claims in the study area or plans that could affect the cause or impacts of the flooding.

Step 3 – Collect data on each property in the analysis area through site visits to determine the potential cause(s) of repetitive flooding.

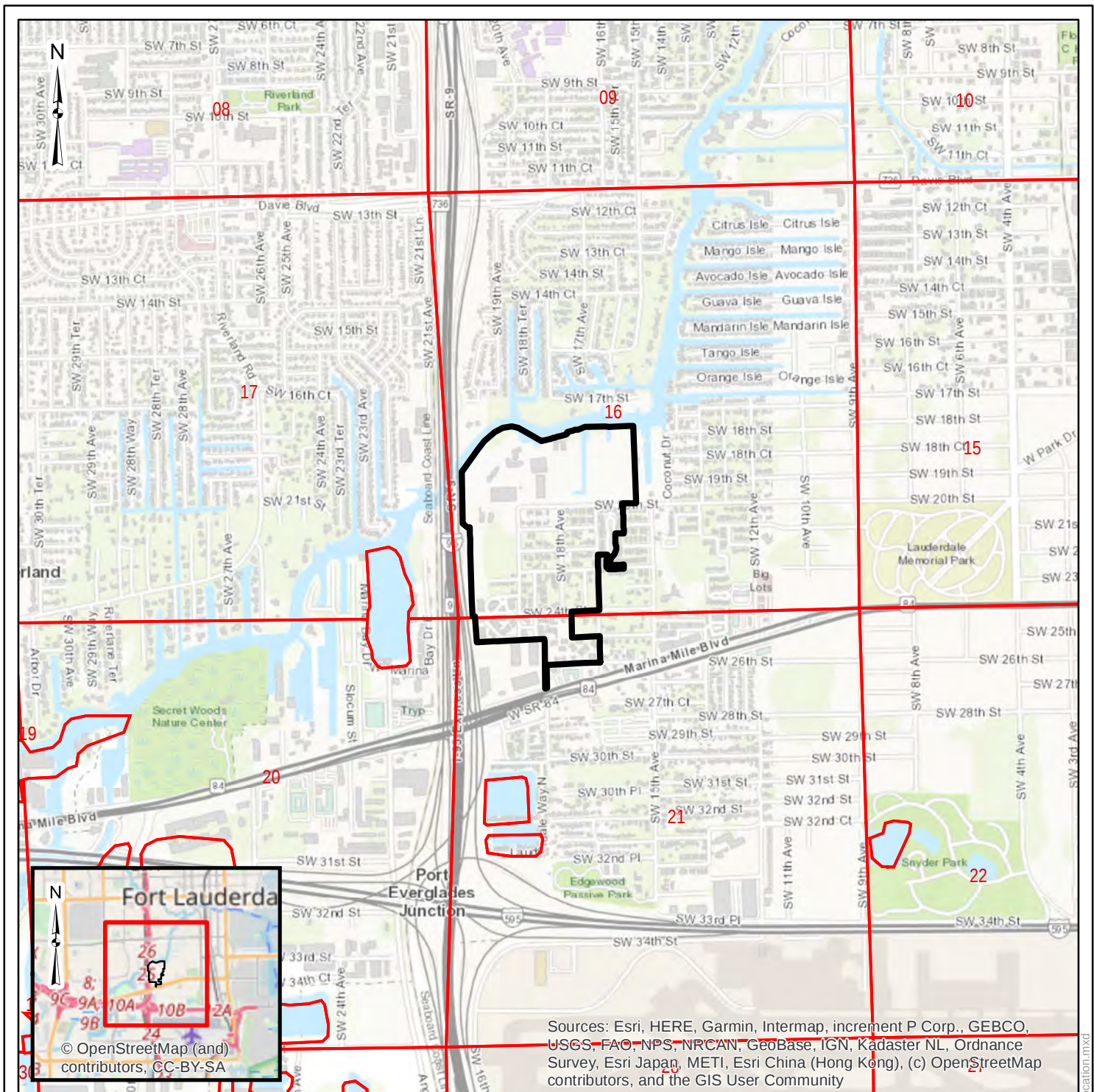
Step 4 – Consider mitigation alternatives for properties or drainage systems and identify which are the most effective and feasible.

Step 5 – Document findings and include a recommended mitigation for the community.

1.4 Problem Statement

The River Oaks neighborhood adjacent to significant water resources including the South Fork New River to the north and west, a small creek system to the west and two deep water commercial marinas to the north and west. Rainfall in this community can be excessive at times due to frequent seasonal storm activity typical of southern Florida as well as intense rain events from hurricanes and tropical storm activity. Flooding within the RLA can be attributed to flash and riverine flooding resulting from these types of heavy/prolonged rainfall and can be further aggravated by the following:

- The RLA is susceptible to storm surge due to the proximity to the Atlantic Ocean, Intracoastal Waterway and South Fork New River
- Many of the buildings are older with slab-on-grade construction built before ordinances created that are flood-focused
- As newer development has taken place, adjacent properties are set at higher elevation to that of older structures
- The study area is low-lying with many buildings graded at street level
- The few storm drains and swales that do exist are unable or not meant to handle the capacity of water flow in the area
- Much of the right-of-way that was intended to facilitate swale drainage is not properly graded to do so or the surface is now impervious for parking purposes
- The only areas that currently experience repetitive losses is the *section* classified as single-family residential with City drainage



Repetitive Loss Area

0 1,000 2,000 4,000 Feet

DATA SOURCES:
ESRI WMS - World Topographic Basemap, OpenStreetMap

Project No.:
34197224
Date:
Apr 2020
Drawn By:
JRN
Reviewed By:
AWP

Terracon

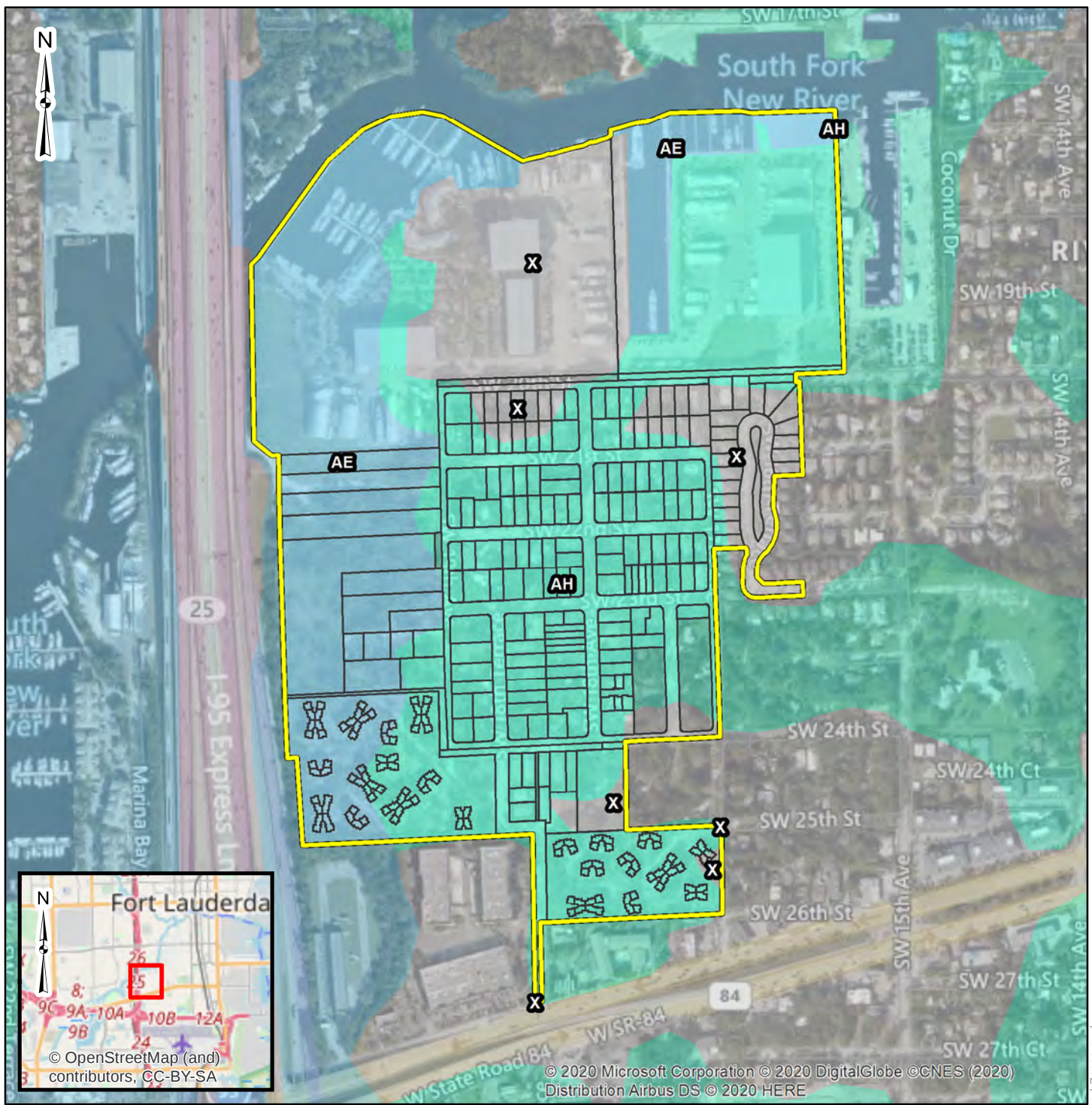
5371 NW. 33rd Avenue
Suite 201 Fort Lauderdale, FL 33309
PH. (954) 741-8282 terracon.com

Project Location

City of Fort Lauderdale
River Oaks - Repetitive Loss Area Analysis
Broward County, Florida

Exhibit

1

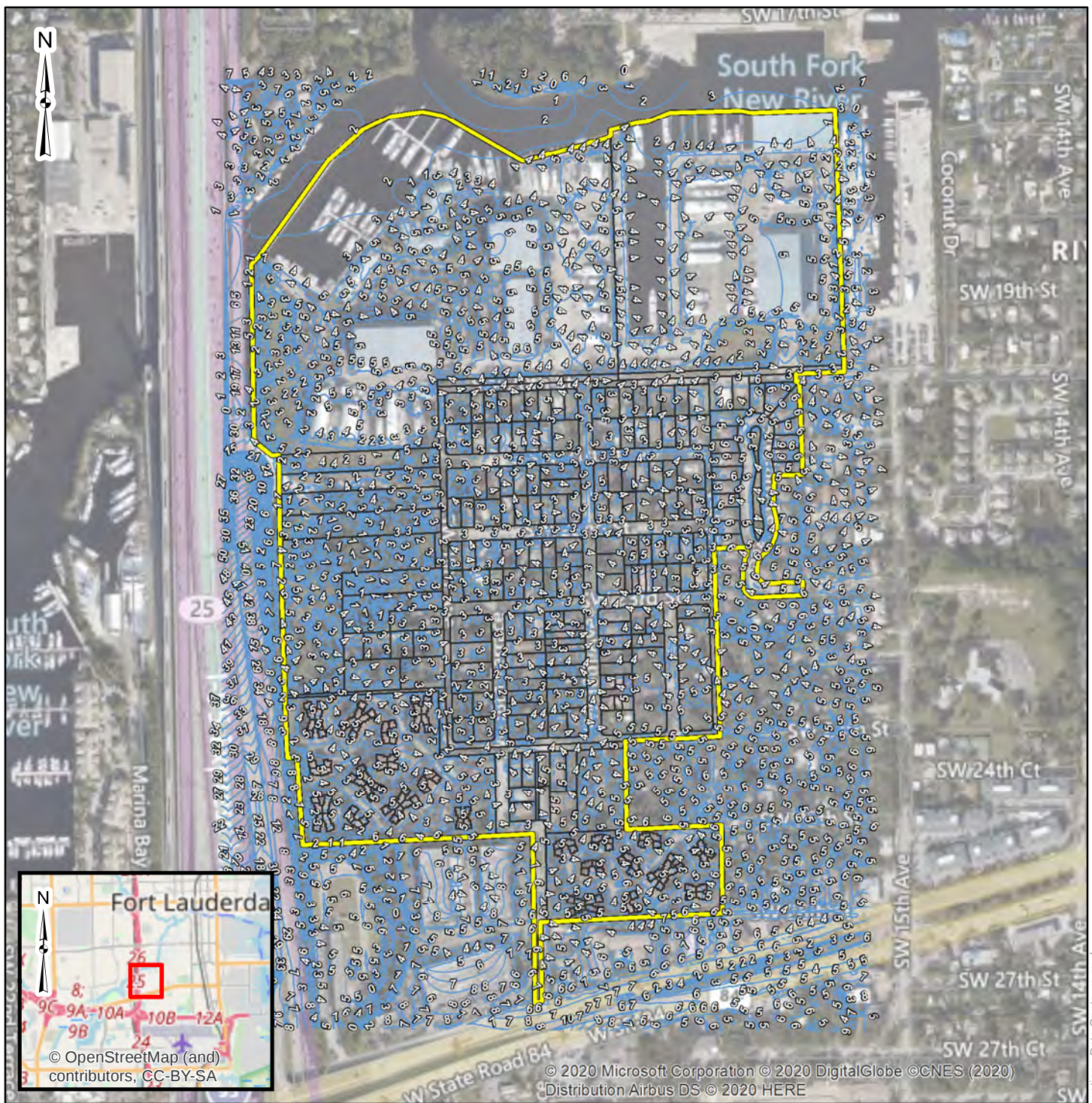


Minimal Flood Hazard
Zone X

Special Flood Hazard Area
Zone AE
Zone AH

DATA SOURCES:
ESRI WMS - Bing Imagery Hybrid Basemap,
OpenStreetMap

Project No.: 34197224 Date: Apr 2020 Drawn By: JRN Reviewed By: AWP	 5371 NW. 33rd Avenue Suite 201 Fort Lauderdale, FL 33309 PH. (954) 741-8282 terracon.com	FEMA Flood Zones City of Fort Lauderdale River Oaks - Repetitive Loss Area Analysis Broward County, Florida	Exhibit 2
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 Repetitive Loss Area

 RLA Parcels

~ 1' Contours

0 300 600 1,200 Feet

DATA SOURCES:
ESRI WMS - City of Fort Lauderdale; Bing Imagery Hybrid
Basemap, OpenStreetMap

Project No.:
34197224
Date:
Apr 2020
Drawn By:
JRN
Reviewed By:
AWP

Terracon

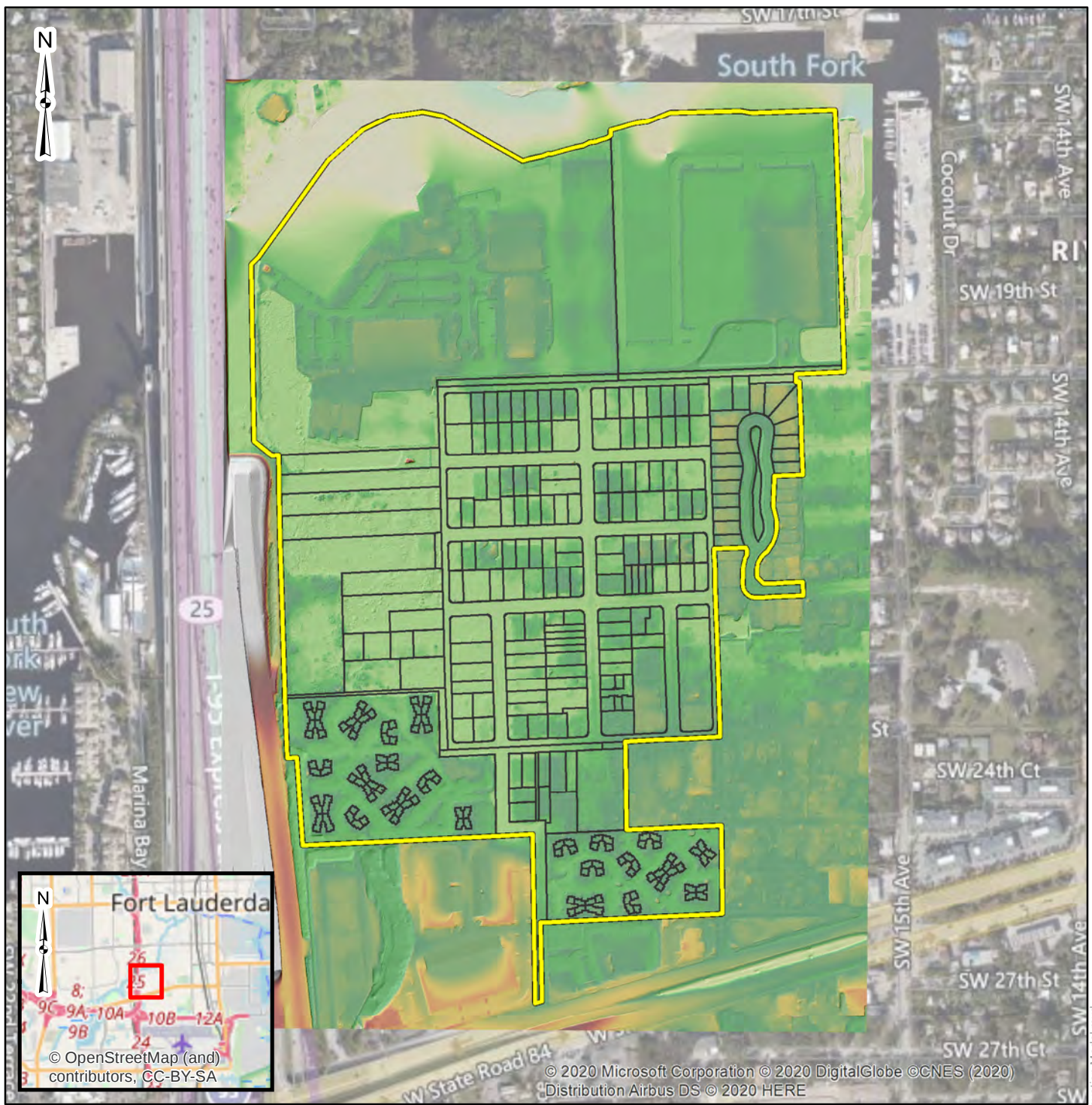
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LiDAR Elevation - Data Contours

City of Fort Lauderdale
River Oaks - Repetitive Loss Area Analysis
Broward County, Florida

Exhibit

4



Project No.:	34197224
Date:	Apr 2020
Drawn By:	JRN
Reviewed By:	AWP



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Digital Elevation Model
City of Fort Lauderdale River Oaks - Repetitive Loss Area Analysis Broward County, Florida

Exhibit
5

2.0 The River Oaks Neighborhood RLAA Process

2.1 Step 1. Neighborhood Notification and Participation

FEMA requires that the first step in the RLAA process is to notify all residents and businesses within the RLA about the analysis. The City of Ft. Lauderdale Floodplain Manager sent out individual letters in November 2019 to inform property owners of the project. Included with the letter was a questionnaire where homeowners could provide flooding history about their property as well as indicate if they have flood insurance, private or federal. The questionnaire also asks residents if they are interested in further information on flood protection. Copies of the letter and questionnaire can be found in Appendix B.

The City received 13 responses, less than 1% participation. Five homeowners indicated that their properties had flooded; four of which noted it was due to a lack of drainage in the area (storm or ditch) and the other noted it was due to the low elevation of their property compared to the street grade. Two of the homeowners who experienced flooding re-graded their yard for drainage but felt it was ineffective, and one used sandbags, and indicated these were effective. Four of the flooded property owners responded they didn't know if they lived in an SFHA. Only two of these properties had flood insurance coverage, with only three owners interested in additional flood protection information. Homeowner questionnaire responses will not be made available to the general public in accordance with the Privacy Act of 1979. The responses have been summarized in Table 1.

Table 1: Homeowner Questionnaire Response

Previous flooding	Cause of concern	Foundation type	Protection measures taken	Measures effective	FEMA Listed RLP	Know if in SFHA	Flood insurance (private or NFIP)	Want more information
N	N/A	Slab	None	N/A	No	I don't know	Yes	Yes
Y	No storm drainage	Slab	Re-graded yard	No	Yes	I don't know	No	No
N	N/A	Slab	None	N/A	No	No	No	No
Y	No drainage	I don't know	Sandbags	Yes	No	I don't know	No	Yes
Y	No drainage	Slab	None	N/A	No	I don't know	I don't know	No
N	N/A	Slab	Generator	N/A	No	I don't know	Yes	No
N	N/A	Slab	None	N/A	No	No	Yes	Yes
Y	Low elevation	Slab	Re-graded yard	No	Yes	I don't know	Yes	Yes
N	N/A	Slab	None	N/A	No	I don't know	I don't know	Yes
Y	No drainage	Slab	None	N/A	No	Yes	Yes	Yes
N	N/A	Slab	None	N/A	No	No	Yes	Yes
N	N/A	Slab	None	N/A	No	Yes	No	No
N	N/A	Slab	Waterproof exterior walls, re-grade yard	N/A	No	I don't know	Yes	Yes

2.2 Step 2. Contact Agencies and Organizations

Before beginning any field work and after contacting residents, collaboration began with relevant agencies and organizations to coordinate efforts with all those interested in flood protection in the City of Ft. Lauderdale. Any available reports relevant to the study area were reviewed for pertinent information. The agencies contacted, and reports analyzed include:

- FEMA/Insurance Service Office, City of Ft. Lauderdale, FL, Repetitive Loss Data, July 16, 2019
- FEMA, NFIP, *Community Rating System (CRS) Coordinator's Manual*, 2017. Section 510
- FEMA, Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) for Ft. Lauderdale, 2014
- City of Ft. Lauderdale CRS Coordinator / Floodplain Manager
- The Hazen Team's *City of Ft. Lauderdale Stormwater Master Plan Modeling and Design Implementation Update*, 2018
- Broward County, GIS Parcel and Flood Map Data, 2018

2.3 Step 3: Data Collection

The on-site field survey was conducted over multiple days during January and February 2020. FEMA's National Tool Limited View was not used in this survey, but most of the information required by the National Tool was incorporated into the survey using ESRI Collector App. After collecting the above-mentioned data and contacting the appropriate agencies, ESI utilized the ESRI Collector App to record the following information on each property surveyed:

- Address
- Land use
- Drainage pattern around building
- HVAC location and elevation
- Presence of A/C unit if no HVAC visible
- Foundation type and condition
- Structure condition
- Downspout and/or gutter condition
- Height above street grade
- Drainage ditch location and condition
- Storm drain location and condition
- Additional notes/homeowner comments during visit

Using the Collector App, photographs were taken of sample properties and the above findings were attached with the field notes for each property (Exhibit 1). This information has been included in a geodatabase made available to the City but in accordance with the Privacy Act of 1974 this information will not be shared with the general public. Photos of typical conditions (no address visible) have been included as examples in this report. The data collected was analyzed for specific

and larger patterns that could explain the current flooding conditions in the area as well as consider mitigation efforts already in place. Additionally, Table 2 below depicts the Repetitive Loss Data Overview.

Exhibit 1: ESRI Collector App Sample Format

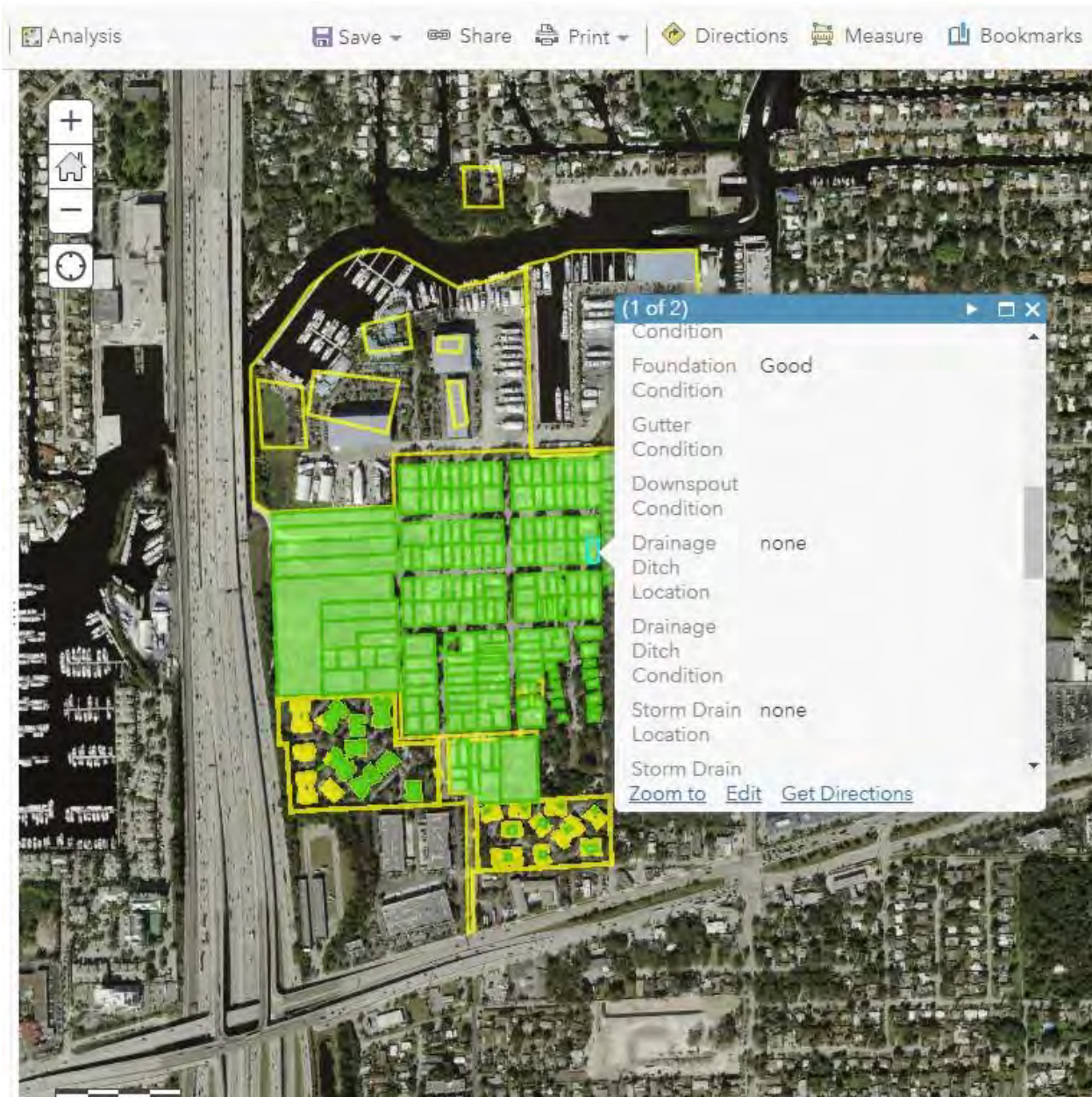


Table 2: Repetitive Loss Area Overview

Repetitive Loss Area	Building Use Section	Number of RL Properties	Number of Additional Non-FEMA listed flooded Properties	Number of Additional Properties	Potential Total Number of Properties in Section	Road Names
River Oaks	Commercial Marina	0	0	0	0	SW 20 th St.
River Oaks	Single-family Residential	7	3	14	24	SW 20 th St. SW 18 th Ave. SW 22 nd St. SW 23 rd St. SW 18 th Terrace
River Oaks	Multi-family Residential Condominiums	0	0	0	0	SW 18 th Terrace

*Potential flooded properties due to proximity to RLP

Example properties in the Repetitive Loss Area

Single Family Residential



Example properties in the Repetitive Loss Area

Commercial Marina



Example properties in the repetitive Loss Area
Multi-family Residential Condominiums



2.4 Step 4: Alternative Mitigation Measures

There are many ways to protect a property from flood damage. Different methods are appropriate for different flood hazards, building types and building conditions. The various *property protection measures* should fall into one of the following FEMA *mitigation categories* which are based on the CRS planning process. Exhibit 2 below found in the 2013 CRS Coordinator's Manual, lists the typical *property protection measures* and Exhibit 3 from Section 510 of the CRS *Coordinator's Manual* lists *mitigation categories* that each *protection measure* can fall under.

Exhibit 2: Typical Property Protection Measures

- Demolish the building or relocate out of harm's way
- Elevate the building above the flood level
- Elevate the flood-prone components, such as Furnace or HVAC
- Dry flood proof the building so water cannot get into it
- Wet flood proof portions of the building so water won't cause damage
- Construct a berm or redirect drainage away from the building
- Maintain nearby streams, ditches, and storm drains so debris does not obstruct them
- Correct sewer backup problems

Source: 2013 CRS Coordination Manual

Exhibit 3: FEMA Mitigation Categories

Floodplain Management Planning

1. **Preventive** activities keep flood problems from getting worse. The use and development of flood-prone areas is limited through planning, land acquisition, or regulation. They are usually administered by building, zoning, planning, and/or code enforcement offices.
 - Floodplain mapping and data
 - Open space preservation
 - Floodplain regulations
 - Erosion setbacks
 - Planning and zoning
 - Stormwater management
 - Drainage system maintenance
 - Building codes
2. **Property protection** activities are usually undertaken by property owners on a building-by-building or parcel basis.
 - Relocation
 - Acquisition
 - Building elevation
 - Retrofitting
 - Sewer backup protection
 - Insurance
3. **Natural resource protection** activities preserve or restore natural areas or the natural functions of floodplain and watershed areas. They are implemented by a variety of agencies, primarily parks, recreation, or conservation agencies or organizations.
 - Wetlands protection
 - Erosion and sediment control
 - Natural area preservation
 - Natural area restoration
 - Water quality improvement
 - Coastal barrier protection
 - Environmental corridors
 - Natural functions protection
4. **Emergency services** measures are taken during an emergency to minimize its impact. These measures are usually the responsibility of city or county emergency management staff and the owners or operators of major or critical facilities.
 - Hazard threat recognition
 - Hazard warning
 - Hazard response operations
 - Critical facilities protection
 - Health and safety maintenance
 - Post-disaster mitigation actions
5. **Structural projects** keep flood waters away from an area with a levee, reservoir, or other flood control measure. They are usually designed by engineers and managed or maintained by public works staff.
 - Reservoirs
 - Levees/floodwalls
 - Diversions
 - Channel modifications
 - Storm drain improvements
6. **Public information** activities advise property owners, potential property owners, and visitors about the hazards, ways to protect people and property from the hazards, and the natural and beneficial functions of local floodplains. They are usually implemented by a public information office.
 - Map information
 - Outreach projects
 - Real estate disclosure
 - Library
 - Technical assistance
 - Environmental education

Figure 510-4. Categories of floodplain management activities.

All six of these categories of floodplain management activities were taken into consideration for the RLA. Of the FEMA-approved *property protection measures*, the costs and feasibility of the following six approaches were deemed appropriate and reviewed for the River Oaks RLA:

- Acquiring and Maintaining Insurance
- Utility Protection
- Floodproofing
- Elevation
- Drainage Improvements
- Acquisition

Acquiring and Maintaining Insurance

This mitigation effort is the least effort, and the responsibility lies with the homeowner. Insurance coverage will not prevent future flood damage.

Cost: Flood insurance rates are based on several factors, including the flood zone the property falls within and the age of the building. Most homes in the study area were in SFHA Zones AE and AH meaning they are already required to purchase flood insurance, either private or through the NFIP. The remaining residents in Zone X would mostly likely benefit from obtaining flood insurance as two of the properties on FEMA’s RLP list were located partially in or right next to a SFHA. Any homes built before December 31, 1974 qualify as “pre-FIRM” (Flood Insurance Rate Map), and receive subsidized flood insurance premium rates. Buildings after this date are required to be built above the base flood elevation (BFE) and the subsequent rates are based on actual risk rather than the subsidized rate. If a pre-FIRM owner elevates their property in accordance with FIRM requirements, they become eligible for the lower post-FIRM actual risk rates.

Feasibility: Acquiring and maintaining insurance requires little effort and the City of Ft. Lauderdale is already a Class 6 CRS community.

Advantages	Disadvantages
• Policy covers surface flooding from the overflow of inland/tidal waters or from storm water runoff • Best source for quick cleanup and compensation during emergency compared to disaster assistance funding • “Pre-FIRM” buildings qualify for subsidized premium rates	• No physical improvements are made to the structure • “Response” action rather than preventative

Utility Protection

During the field survey, visible utilities such as HVAC and window AC units were noted along with their location and elevation. This mitigation action can also apply to other utilities, such as: fuel meters and pipes, electrical service boxes, and sewage and drinking water systems. It is important to consider protecting these, as they may prevent homeowners from returning to their residence even if it is structurally sound.

Cost: The cost associated with this activity is variable due to the condition of the unit, structure, and foundation. The homeowner may be able to perform protection measures, but it would be a good idea to consult a professional contractor/engineer before beginning any work, as well as checking permit requirements. The cost could be reduced if the measures were part of a repair or remodeling project.

Feasibility: Given the flooding experienced by homeowners in the study area, utility protection would be an appropriate measure. Interested homeowners should examine their flooding history and decide if utility protection is an acceptable mitigation measure for their building.

Advantages	Disadvantages
• Relatively less involved action to perform as opposed to other actions	• May require a permit • Does not protect the main structure from flood damage

Floodproofing

This action prevents flood waters from breaching a structure by modifying it, which is done through dry or wet floodproofing. Dry floodproofing gets its name from keeping the whole structure exterior completely sealed to prevent any water from entering. Wet floodproofing only seals parts of the exterior and purposefully leaves portions such as the crawlspace or garage open to water entering but without destroying the structure. Utility protection can be included in floodproofing. Depending on the structure material, walls are coated with waterproofing compounds or plastic sheeting. Any openings, such as doors and windows, need to be sealed permanently or temporarily with sandbags or shields.

Cost: As with utility protection, the cost of this activity varies based on the structure and foundation type and condition. Other than conditions, depending on the level of security the homeowner wants from flooding, floodproofing can range from \$5,000 up to \$20,000. The property owner may be able to complete some floodproofing measures, such as sandbagging, but a professional contractor will likely be needed to complete the rest.

Feasibility: Dry floodproofing utilized the building itself to as part of the barrier against flood waters, so it is only used on concrete slab foundations. This would be appropriate for the River Oaks neighborhood as almost 94% of the buildings surveyed were concrete slab foundation. Floodproofing is also appropriate as much of the reported flooding is shallow and for relatively short periods of time. Being physically present to place sandbags or shields over openings during a flooding event might be especially inappropriate, however, for elderly or disabled residents. This brings another point that the homeowner must be given warning about the flooding to go home and enforce floodproofing measures.

Dry Floodproofing

Advantages	Disadvantages
• Protects the actual structure from flood damage • Often less costly than other retrofitting methods • May be funded by a FEMA mitigation grant program	• Requires human intervention, and subsequently, adequate warning • Does not protect and minimize potential damage as well from high-velocity flood flow and wave action • Homeowner may not find the measures aesthetically pleasing • Success depends on the building's condition, often difficult to tell if there are cracks in slab

Wet Floodproofing

Advantages	Disadvantages
• Allows internal and external hydrostatic pressures to equalize, lessening the load on the walls and floors • Often less costly than other retrofitting methods • May be funded by a FEMA mitigation grant program	• Requires human intervention, and subsequently, adequate warning • Does not protect and minimize potential damage as well from high-velocity flood flow and wave action • Homeowner may not find the measures aesthetically pleasing

Elevation

A more intensive option for RLP' is physically raising the structure above the BFE level to prevent any contact with water. Houses can be elevated on fill, posts or piles, or a crawlspace to allow water to flow under the building. A house elevated on fill requires adding a specific type of soil to a lot and building the house on top of the added fill. Posts or piles are built or raised on a foundation of piers that are driven into the earth and rise high above the ground to elevate the house out of the design flood level. A crawlspace is built or raised on a continuous wall-like foundation that elevates the house above the design flood level. It is important to include vents or openings in the walls below the flood level that are appropriately sized: one square in for each square foot of the crawlspace or enclosures footprint. Additionally, all materials below the design flood level must be flood resistant and all machinery, equipment, and plumbing must be above the design flood level.

Cost: A majority of the cost to elevate a building is in the preparation and foundation construction. The cost to elevate six feet is little more than the cost to go up two feet. Elevation is usually cost-effective for wood frame buildings on posts/piles or crawlspace because it is easiest for lifting equipment to be used under the floor and disruption of the habitable part of the house is minimal. Elevating a slab house is much costlier and disruptive. The actual cost of elevating a particular building depends on factors such as its condition, whether it is masonry or brick faced, and if additions have been added on over time. While the cost of elevating a home can be high, there are funding programs that can help. The usual arrangement is for a FEMA grant to pay 75% of the cost while the owner pays the other 25%. In the case of elevating a slab foundation, the homeowner's portion could be as high as \$50,000 or more. In some cases, assistance can be provided by Increased Cost of Compliance (ICC) funds.

Feasibility: Federal funding support for an elevation project requires a study that shows that the benefits of the project exceed the cost of the elevation. Project benefits include savings in insurance claims paid on the structure. Elevating a masonry or a slab home can cost up to \$200,000, which means that benefit/cost ratios may be low. Looking at each property individually could result in funding for the worst-case properties, i.e., those that are the lowest below the base flood elevation, subject to the most frequent flooding, and in good enough condition to elevate. Prioritizing properties is especially important in this neighborhood since most of the foundations are slab.

Advantages	Disadvantages
• Elevating to or above the BFE allows a substantially damaged or improved house to be brought into compliance • Often reduces flood insurance premiums • Reduces or eliminates road closures due to overtopping • May be funded by FEMA mitigation grant programs	• May be cost-prohibitive • The appearance of and access to the structure may be adversely affected • May require property owner cooperation and right-of-way acquisition • May require road or walkway closures during construction

Drainage Improvements

Methods of drainage improvements include overflow channels, water quality structures, pump stations, catch basins, storm lines, canal improvements, ditch and swale improvements, permeable pavement installations, and runoff storage. Modifying channels attempts to provide a greater carrying capacity for moving floodwaters away from areas where damage occurs. Whenever drainage improvements are considered as a flood mitigation measure, the effects upstream and downstream from the proposed improvements need to be considered.

Cost: This approach dependent upon capital improvement project scope agenda determined by the City Capital Improvement Programs.

Feasibility: Due the nature of RLP's this RLA, this mitigation measure would greatly benefit with drainage improvement programs. The Hazen Team provided the city with sophisticated modeling strategies that could include flow patterns to re-direct the water flow of the neighbor where RLP's occur east toward existing roadside canal along Coconut Drive that connects north the South Fort New River. This canal system is currently outside the RLA, however could be re-worked deepened and cleared of debris to allow for more water capacity during the heavy rainfall events.

Proposed water quality structures catch basins and new pump stations could be installed to move water more efficiently to the South New Fork River via this drainage canal on the corner of 20th Ave and Coconut drive. It seems feasible that a combination of varying City Capital Improvement Projects geared to drainage improvement is a viable solution to repetitive losses. Redirecting stormwater flow to surrounding creek systems could enhance more efficient water flow throughout the neighborhood to reduce the flooding, specifically in the single-family residential section are that contains RLP's in this study. Examples of The Hazen Team's stormwater improvements maps can be found in Appendix A that depict a proposed re-direction of water flow throughout the site.. Another feasible alternative would be for the city to work for improvement of the roadside swales

and current storm water retention areas that are located in this section to decrease the amount of ponding and standing water that continues to flood the areas and locations surrounding RLP's.

Advantages	Disadvantages
• Can increase channel carrying capacity through overflow channels, channel straightening, crossing replacements, or runoff volume storage and improved flow direction • Minor projects may be fundable under FEMA mitigation grant programs	• May help one area but create new problems upstream or downstream • Channel strengthening increases the capacity to accumulate and carry sediment • May require property owner cooperation and right-of-way acquisition

Acquisition

This measure involves acquisition of one or more properties and clearing the site. Acquisitions are usually recommended where the flood hazard is so great or so frequent that it is not safe to leave the structure on the site.

An alternative to buying and clearing the whole subdivision is buying out individual “worst case” structures with FEMA funds.

Cost: This approach would involve purchasing and clearing the lowest or the most severe repeatedly flooded homes. If FEMA funds are to be used, three requirements apply:

- The applicant for FEMA must demonstrate that the benefits exceed the costs, using FEMA's benefit/cost software.
- The owner must be willing to sell.
- The parcel must be deeded to a public agency that agrees to maintain the lot and keep it forever as open space.

Feasibility: Due to the high cost and difficulty to obtain a favorable benefit ratio in shallow flooding areas, acquisitions are reserved for the worst-case buildings and properties. Not all property owners are inclined to sell their properties. As such, the result of a buy-back program could lead to creating a spatially uneven property balance of vacant and unoccupied lots, creating “holes” in the neighborhood. There is no reduction in expenses to maintain the neighborhood's infrastructure for the City, although the tax base is reduced. The vacant lots must be maintained

but the new owner agency, and additional expense is added to the community. If the lot is only minimally maintained, its presence may reduce the property values of the remaining buildings.

2.5 Mitigation Funding

Each mitigation measure could qualify for one or grant programs. Depending on the type of structure, severity of flooding and proximity to additional structures with similar flooding conditions, the most appropriate measure can be determined. There are several possible sources of funding for mitigation projects.

FEMA grants: Most of the FEMA programs provide 75% of the cost of a project. In most coastal communities, the 25% non-FEMA share is paid by the benefiting property owner. Each program has different congressional authorization and slightly different rules.

The Hazard Mitigation Grant Program (HMGP): The HMGP provides grants to States and local governments to implement long term hazard mitigation measures after a disaster declaration. Projects must provide a long-term solution to a problem (e.g., elevation of a home to reduce the risk of flooding damages as opposed to buying sandbags and pumps to fight the flood). Examples of eligible projects include acquisition and elevation, as well as local drainage projects.

The Severe Repetitive Loss Program (SLR): The SRL grant program funds mitigation projects for properties on the severe repetitive loss list. Eligible flood mitigation projects include the acquisition, demolition or relocation of structures that are listed on FEMA's severe repetitive loss list, after which the property is converted to open space. Elevation of existing SRL structures to be at least the Base Flood Elevation (BFE).

The Flood Mitigation Assistance program (FMA): FMA funds assist States and communities in implementing measures that reduce or eliminate the long-term risk of flood damage to structures insured under the NFIP. Funds are used to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of NFIP insured structures. States are encouraged to prioritize FMA funds for applications that include repetitive loss properties. These can include structures with two or more losses each with a claim of at least \$1000 within any 10-year period since 1978.

Pre-Disaster Mitigation Program (PDM): PDM program provides funds to states, territories, Indian tribal governments, communities and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event.

Increased Cost of Compliance (ICC): ICC is a special flood insurance funding provision that is available in the NFIP for insured buildings that have been substantially damaged by a flood. Coverage pays for the cost to comply with floodplain management regulations after a flood if the building has been declared substantially damaged. ICC will pay up to \$30,000 to help cover the elevation, relocation, demolition, (and for non-residential buildings), flood proofing. It can also be

used to help pay the 25% owners share of the FEMA funded mitigation project. In order to qualify the building's flood insurance policy must have been valid during the flood and will cover the damage claim payment made under the regular policy coverage if total claim does not exceed \$250,000. All claims must be accompanied by a substantial or repetitive damage determination made by the local floodplain administrator.

Coverage under the ICC does have limitations.

- ICC only covers damage caused by a flood as opposed to wind or fire damage
- The building's flood insurance policy must be valid effect during the flood
- ICC payments are limited to \$30,000 per structure
- Claims must be accompanied by a substantial or repetitive damage determination made by the local floodplain administrator
- The structure must be Zone A

Small Business Administration Mitigation Loans: SBA offers mitigation loans to applicants also applying for and SBA disaster loan. The mitigation loan is in addition to the amount of the approved disaster loan and may not exceed 20% of the total amount of physical damage to real property. Mitigation loans protect property against future damage include, but are not limited to:

- Retaining Walls (for slope failure and erosion protection)
- Grading and Contouring Land (may address minor sheet flow flooding issues)
- Elevating Flood Prone Structures (appropriate for smaller buildings)
- Relocating Utilities (for flooding and earthquake mitigation)
- Retrofitting Structures (can address many natural hazards)
- Safe Rooms and Storm Shelters

Other Grant Opportunities

- US Economic Development Administration (EDA)
- Public Works/ Infrastructure Grant (Infrastructure/ Stormwater Improvements)
- Five Star/ Urban Waters Restoration (Stormwater Improvement/ Flood Reduction)
- Coastal Partnership Initiative (Intercostal Waterway related)
- Community Budget Issue Request (Florida Legislature direct application for water-related projects)
- Repetitive Flood Claims Grant

2.6 Step 5. Conclusions, Recommendations and Action Plan

Conclusion

Properties in the River Oaks neighborhood study area are subject to frequent inundation and repetitive losses from a variety of factors ranging from proximity to the influences of a tidally influenced riverine system, general low elevation of the RLA, lack of defined flow patterns, and heavy rain and flooding events and normal-seasonal rainfall exacerbated by inadequate drainage of the area. This inadequacy stems from the overall disconnection of the existing stormwater system drainage (or lack thereof), the swale drainage and surface flow does not function adequately, and the flow capacity is often exceeded during rain events. Additionally, many areas of right-of way have been consolidated into hard surface parking that are essential for water conveyance. Based on the field surveys and collection of data, the analysis of existing studies the following are some general recommendations.

Recommendations

Property owners should obtain and keep a flood insurance policy on their structures (building and its contents coverage). The city should provide information and community outreach on the advantages of maintaining flood insurance should you live in an RLA, or areas prone to frequent flooding.

- Encourage mitigation measures
- Assist property owners in applying for mitigation grants
- Street cleaning or sweeping program to remove debris from street and drainage culverts
- Seek and secure funding for the drainage improvements
- Improve the City's CRS classification
- Education outreach campaign about keeping streets and drainage culverts clean
- Continued adoption of the recommended improvements and adoption of a comprehensive storm water management system similar the one proposed by 2018 study by The HAZEN Team.
- Adopt this RLAA according to the process detailed in the *CRS Coordinator's Manual*

For Residents of the Study Area

- Contact the City for more information about possible funding opportunities
- Review the alternative mitigation measures discussed in this analysis and implement those that are most appropriate for their situation
- Purchase and maintain a flood insurance policy on the home and its contents
- Report flooding hazards to the City of Ft. Lauderdale Department of Sustainable Development

Action Items

Flood Insurance and Flood Insurance Promotion

Property owners should keep and obtain flood insurance policy on their structure and the contents therein. The City should continue Flood Insurance Promotion, as outlined in the 2017 CRS *Coordinator's Manual*, in its efforts to encourage property owners to purchase flood insurance. This effort should be continued on an annual basis to all properties in the RLA.

Responsibility: The property owner is responsible to secure a flood insurance policy on a building by building or parcel basis, and the City and CRS Coordinator is responsible for flood insurance promotion

Funding: Property owners are responsible for securing insurance policy and insurance promotion programs are funded via a City channel, grant, or budget allocation.

Property Protection Measures

Property owners are encouraged to take actions that will protect themselves from flood damage. This will include such actions as elevating equipment above possible flood levels, and implementing various measures, including

Floodproofing: When appropriate, property owners should consider floodproofing measures such as flood gates, shields, flood retaining walls, hydraulic pumps,

Utility protection: Encourage property owners to elevate indoor and outdoor utility equipment above the BFE and install flood resistant materials in any crawl spaces or associated building structures on the property.

Responsibility: Property owners responsible for most property protection measures, and the City's CRS Coordinator is responsible for distributing public information pertaining to property protection.

Funding: Property owners for protection measures and the protection measure information can be provided by the City.

Structural projects

This measure helps keep flood waters away from buildings or an area through a variety of large and small-scale Capital Improvement Projects. These projects should be undertaken with funding by the City, State or Federal governments, grant processes or a combination thereof. These projects are not often undertaken by the homeowners. The focus of the projects should focus on drainage improvement projects to redirect surface flow, restore failing roadside swales and retention areas.

Responsibility: Capital Improvement projects are administered by the City

Funding: The funding for this is allocated through the City's annual budget, state and federal funding, grant opportunities, or a combination thereof.

Appendix A – The Hazen Team Figures





Existing Infrastructure

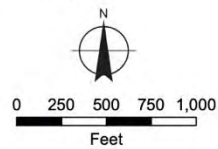
- Existing Catch Basin
- Existing Manhole
- ▲ Existing Outfall
- Existing Storm Line

Proposed Infrastructure

- ⊕ Proposed Water Quality Structure
- Proposed Pump Station
- Proposed Catch Basin
- Proposed Manhole
- Proposed Storm Line
- ▨ Proposed Canal Improvements
- ▨ Proposed Swale Area
- ▨ Proposed Permeable Pavement

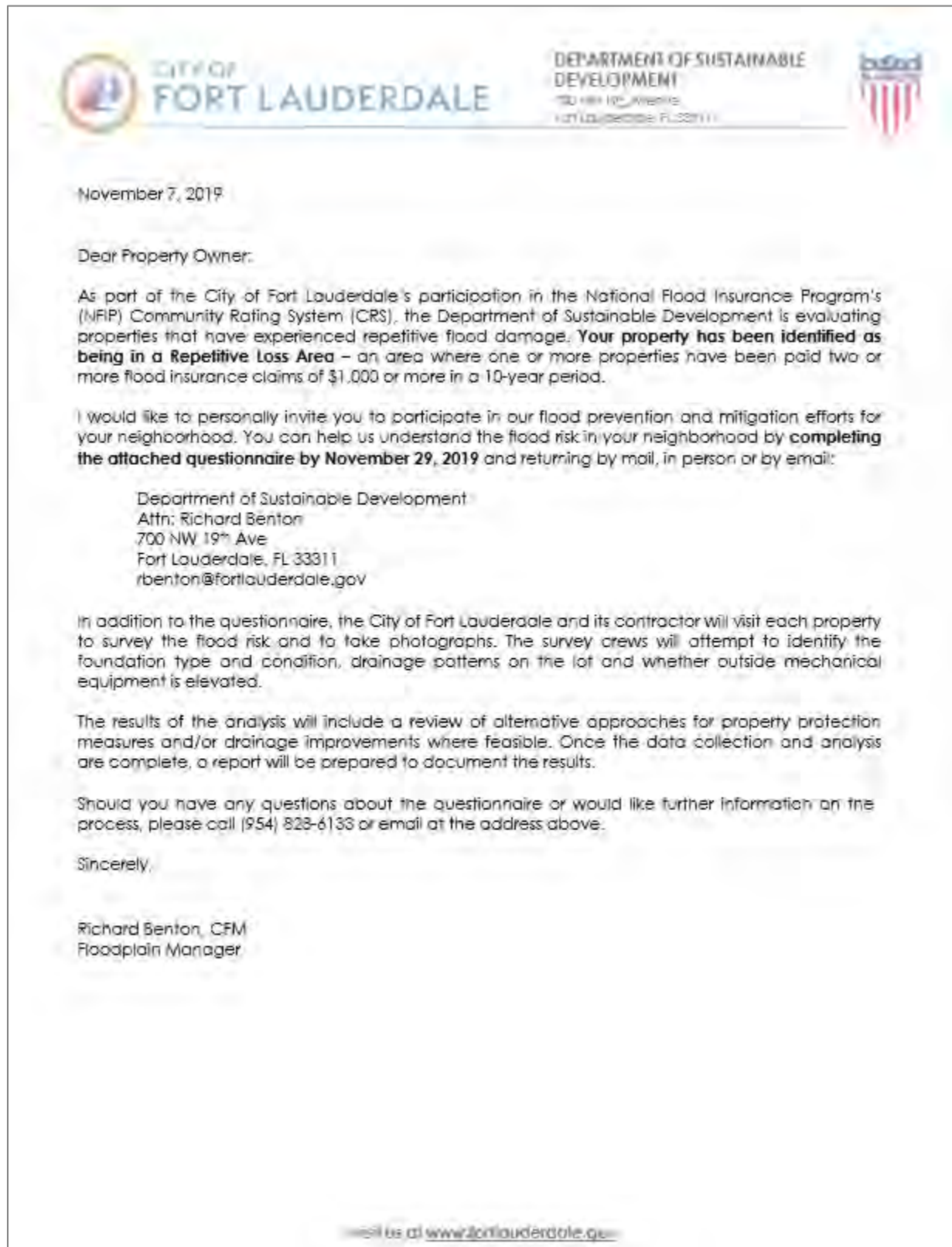
Boundaries

- ▭ River Oaks Neighborhood Boundary
- ▭ Parcel



43193-004-01

Appendix B - Neighborhood Outreach Materials and Homeowner Comments



Notice letter to residents in RLA from the City



REP LOSS AREA ANALYSIS

Rev: 1.0 + Revision Date: 11/7/2019 | I.D. Number: FM,RLAAQ1.0

Name: _____

Property Address: _____

1. How many years have you lived at this address?

- | | |
|--------------------------------------|-------------------------------------|
| ☐ Less than 1 | ☐ 5-10 years |
| ☐ 1-5 years | ☐ 10+ years |

2. Do you rent or own this home/building?

- | | |
|-------------------------------|------------------------------|
| ☐ Rent | ☐ Own |
|-------------------------------|------------------------------|

3. What type of foundation does your home/building have?

- | | |
|---------------------------------------|------------------------------------|
| ☐ Slab | ☐ Stem wall |
| ☐ Crawlspace | ☐ Pilings |
| ☐ Other: _____ | |

4. Has your property or home/building ever been flooded?

- | |
|---|
| ☐ Yes |
| ☐ No. Please skip to Question 9. |

5. In what year(s) did the flooding occur? _____

6. How deep was the floodwater?

- | | |
|--|---------|
| ☐ In crawlspace: _____ | Ft deep |
| ☐ Over first floor: _____ | Ft deep |
| ☐ Yard only: _____ | Ft deep |
| ☐ Water kept out of home/building by sandbagging, sewer valve or other measure. | |

7. How long did the water remain in the home/building? _____

8. What do you feel was the cause of the flooding? (Check all that apply)

- | | |
|---|--|
| ☐ Storm sewer backup | ☐ Sanitary sewer backup |
| ☐ Standing water next to structure | ☐ Drainage of nearby properties |
| ☐ Other: _____ | |

9. What flood protection measures do have you have on the property?

- | | |
|--|--|
| ☐ Waterproofed exterior walls | ☐ Re-graded yard for drainage |
| ☐ Sandbags | ☐ Generator / backup power |
| ☐ Other: _____ | |

10. Did any of the measures identified in Question 9 work? If yes, which ones? If no, why not?

11. Is your structure located in a FEMA Special Flood Hazard Area (SFHA)?

- | | |
|------------------------------|--|
| ☐ Yes | ☐ I do not know |
| ☐ No | |

12. Do you have NFIP or Private Flood Insurance?

- | | |
|------------------------------|--|
| ☐ Yes | ☐ I do not know |
| ☐ No | |

13. Do you want information on protecting your home/building from flooding?

- | |
|------------------------------|
| ☐ Yes |
| ☐ No |

14. Please include any additional information and comments you have about flooding in your area.



Appendix C – References

- 1 - <https://www.fema.gov/national-flood-insurance-program> - NFIP info
- 2 - https://www.fema.gov/media-library-data/1493905477815-d794671adeed5beab6a6304d8ba0b207/633300_2017_CRS_Coordinators_Manual_508.pdf - CRS Manual
- 3 - <https://www.fema.gov/pdf/nfip/manual200805/19crs.pdf> - CRS status by state, county
- 4 - https://www.floridadisaster.org/contentassets/c6a7ead876b1439caad3b38f7122d334/appendix-f_nfip-policy-statistics.pdf - Broward Co stats
- 5 - <file:///C:/Users/camccann/Downloads/AligningNaturalResourceConservationFloodHazardMitigationandSocialVulnerabilityRemediationinFlorida.pdf> - Broward ranked 5 out of 12
- 6 - <https://crsresources.org/files/500/rlaa-guide-2017.pdf> - RLAA guide
- 7 - https://www.fema.gov/media-library-data/20130726-1709-25045-4851/2_severerepetitive_loss.pdf RLP account for 25 – 30 % of all claims
- 8 - <https://www.fema.gov/policy-claim-statistics-flood-insurance> - what NFIP paid total in 2018 and by state
- 9 - <https://www.fortlauderdale.gov/departments/sustainable-development/building-services/flood-forms-and-info/community-rating-system> - city discount rate
- 10 – FEMA flood zone classification <https://www.fema.gov/flood-zones>
- 11 – Hazen Team Report <https://www.fortlauderdale.gov/home/showdocument?id=27688>