University of New Orleans

CITY OF NEW ORLEANS

2021 City of New Orleans
Repetitive Loss Area Analysis

December 2021
Prepared by UNO-CHART
for the City of New Orleans

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CONTENTS

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This Repetitive Loss Area Analysis (RLAA) is the result of a partnership between the City of New Orleans and the University of New Orleans' Center for Hazards Assessment, Response & Technology (UNO-CHART).

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TERMINOLOGY

1% chance flood: The flood having a one percent (1%) chance of being equaled or exceeded in any given year, is known as the "100-year" or "1% chance" flood.

100-year flood: The flood that has one percent (1%) chance of being equaled or exceeded each year. The effective risk for the 100-year flood is 26% over a 30-year mortgage.

Base Flood: The base flood is a statistical concept used to ensure that all properties subject to the National Flood Insurance Program are protected to the same degree ("1% chance" or "100-year") against flooding. The National Flood Insurance Program (NFIP) and other agencies use the base flood to require flood insurance and regulate development.

Base Flood Elevation (BFE): The elevation of the crest of the base flood or 100-year flood.

Digital Flood Insurance Rate Map (DFIRM): All new FIRMs are prepared as a GIS based map of a community's flood hazards. All new maps are based upon this digital platform and communities may use these maps instead of paper maps for regulatory purposes.

FEMA: Federal Emergency Management Agency

FIRM: The Flood Insurance Rate Map is the official map which identifies hazard areas and flood risk zones in the community.

Freeboard: A factor of safety usually expressed in feet above the Base Flood Elevation (BFE) for purposes of floodplain management.

Geographic Information Systems (GIS): integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information in the form of maps, globes, reports, and charts.

Grey Infrastructure: includes the conventional elements of a drainage system used for stormwater management such as dams, levees, sewers, pumps (pump stations), and floodgates.

Green Infrastructure: Stormwater management techniques and practices that mimic natural hydrologic functions and incorporate landscape features to store or treat runoff. Green infrastructure incorporates the natural environment to provide multiple benefits and support resilient communities. Green infrastructure can include site-specific management practices as well as watershed-scale techniques such as land preservation and the restoration of wetlands and floodplains that naturally store water and reduce runoff.[1]

Hazard Mitigation: Any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event (floods, fires, earthquakes, etc.), such as elevation or floodproofing.

ICC: Increased Cost of Compliance, a $30,000 rider on flood insurance policies for policy holders that can be used to bring the structure into compliance in the event that it is substantially damaged by a flood. The coverage can be used for building elevation, demolition, floodproofing, and relocation.

NFIP: The National Flood Insurance Program is FEMA's flood insurance coverage and floodplain management program.

[1] A Guide to Assessing Green Infrastructure Costs and Benefits for Flood Reduction (noaa.gov)

Repetitive loss area analysis (RLAA): An approach to identify repeatedly flooded areas, evaluate mitigation approaches, and determine the most appropriate alternatives to reduce future repeated flood losses. For more details on the required steps, refer to Community Rating System Activity 510, Element 512b[2]

Repetitive loss property (RL)[3]: An NFIP-insured property where two or more claim payments of more than $1,000 each have been paid within a ten-year period since 1978.

Special Flood Hazard Area (SFHA): The base floodplain delineated on a Flood Insurance Rate Map that a community must regulate under the requirements of the National Flood Insurance Program. The SFHA is mapped as a Zone A or AE (see definition). In coastal situations, Zone V (see definition) is also a part of the SFHA. The SFHA is included in a community's regulatory floodplain.

Substantial Improvement: The repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 50% of the market value of the structure before the improvement or repair is started**.**

UNO-CHART: The University of New Orleans' Center for Hazards Assessment, Response and Technology is an applied social science research center with an expertise in repetitive loss area analyses.

Zone A: The Special Flood Hazard Area (except coastal V Zones) shown on a community's Flood Insurance Rate Map. There are seven types of Zone As:

> **AE**: SFHA where base flood elevations are provided. AE-Zone delineations are used on newer FIRMs instead of A# Zones.

Zone V: The Special Flood Hazard Area subject to coastal high hazard flooding. There are three types of V Zones: V, V#, and VE, and they correspond to the A-Zone designations.

Zone X: Newer Flood Insurance Rate Maps show Zones B and C (see above) as Zone X. The shaded Zone X corresponds to a Zone B and the unshaded Zone X corresponds to a Zone C.

[2] National Flood Insurance Program Community Rating System, FIA-15/2017, pages 510-29 through 510-39; https://crsresources.org/manual/

[3] https://www.fema.gov/national-flood-insurance-program/definitions#R

EXECUTIVE SUMMARY

The City of New Orleans has long faced a myriad of flooding problems and has initiated a variety of projects and programs to reduce flood losses. These have ranged from levees to protect areas from high flows on the Mississippi River to a massive drainage and pump system to storage basins to capture and hold runoff to ordinances and regulations requiring new construction to include flood protection measures. Despite these projects and programs, there has still been flood damage.

This Repetitive Loss Area Analysis addresses the most common type of flooding in the City – repetitive flooding. This analysis follows a five-step process described in Chapter 1 that summarizes the repetitive flood problem, reviews the variety of projects and programs that that can prevent or reduce repetitive flood losses, and recommends which ones should be pursued and where.

The Repetitive Flooding Problem

The National Flood Insurance Program (NFIP) defines a "repetitive loss property" as a building that has had two or more flood claims for $1,000 or more over any ten-year period. The project team was able to plot the locations of 6,363 of the 6,541 NFIP repetitive loss properties.

A "repetitive loss area" includes repetitive loss properties and neighboring buildings (including uninsured buildings) that have a similar exposure to flooding. As seen on the map of the City in Figure 1 (page 20), repetitive loss properties are found in every developed area of the City. It was concluded that the entire City should be considered as one repetitive loss area and that a program to address repetitive flooding should be City-wide.

Chapter 2 provides data on the problem summarized for nine of the City's eleven planning districts; Chapter 6 provides some of the data at the neighborhood level. The analysis does not look at flooding in the French Quarter or the Central Business Districts because the building database did not cover those two planning districts. It was decided that with 95% of the City's buildings covered in the other nine districts, there are adequate data for recommendations that impact the whole City.

The repetitive flood problem is described in Chapter 3. Based on historic rain and flood data, NFIP claims, and a close review of the 28 largest floods over the past 40 years, it was concluded that a repetitive loss program should focus on rain-induced overland stormwater flows. Floods from high river, Gulf, and Lake levels and levee overtopping or failure cause much greater damage, but they are not "repetitive," i.e., they do not occur twice in ten-year periods.

Reducing Flood Damage

This analysis considers two approaches to reduce damage to existing buildings: control the water and modify the structures. The first is reviewed in Chapter 4 - Flood Control Measures, i.e., ensuring there is adequate capacity to drain stormwater out of neighborhoods and convey it outside the levee system. In addition to the pipes and pumps, these measures include Green

Infrastructure and catch basin maintenance that help manage the water before it gets to the pipes. Flood control measures are implemented by government agencies.

Chapter 5 discusses Building Protection Measures, which include elevating the damageable parts of structures above flood levels, building barriers to the water, floodproofing the walls or interiors, and improving drainage away from the structures. The measures are implemented by the building owner, although the City can influence their use with building regulations and funding support. Chapter 5 identifies which measures work best for the different types of foundations and walls found in New Orleans.

Flood losses and related data are summarized for the nine planning districts at the beginning of Chapter 6. The rest of the chapter reviews each district's repetitive flood problem, the status of flood control measures, and the numbers and types of buildings that would benefit from building protection measures. Some of the data is provided at the neighborhood level. There are recommendations at the end of each district's section.

Findings and Recommendations

Findings and recommendations are covered in Chapter 7, beginning with a summary of the flood problem. Key findings are:

→ The City's drainage system was built to carry 2-year storm flows, a level considered inadequate today.

→ There are major efforts to upgrade the system to carry the 10-year storm, much of which has been completed or is underway.

→ "Many of the repetitive, damage-causing floods have resulted from larger storms or concentrations of heavier rain in some locales. In other words, taken alone, the drainage system improvements will do a lot to reduce property damage, traffic obstacles, and safety and health hazards, but will not prevent flooding from larger storms."[4]

→ Building protection measures can protect structures, but each measure has advantages and disadvantages.

→ "No building protection measure is 100% guaranteed, so every property should have a flood insurance policy to pay for repairing the damage that was not prevented."[5]

Chapter 7 concludes with 16 recommendations to be implemented by individuals and various City offices. Building owners, residents, and businesses are advised to explore the building protection measures for their structures, carry a flood insurance policy, and do their part to keep catch basins working. Recommendations for City offices are to provide support to people interested in building protection measures and catch basin care, publicize their services, and to

[4] Ready for Rain - NOLA Ready

[5] Answers to Questions About the National Flood Insurance Program (fema.gov)

provide data and track the progress of this analysis' recommendations. The Department of Public Works and the Sewerage and Water Board are to continue and complete their planned drainage improvement programs and evaluate the need for new projects in two of the districts.

CHAPTER 1 INTRODUCTION

Flooding from multiple sources is a major problem for many across the State of Louisiana and the City of New Orleans is no exception. Repetitive flooding is a problem experienced by residents citywide. The goal of this Repetitive Loss Area Analysis (RLAA) is to help homeowners reduce their flood risk by providing a broader understanding of the flooding problems in their neighborhood, and the potential solutions to the continual distress related to repetitive flooding. This RLAA also discusses the availability of possible funding sources for certain flood mitigation options.

Repetitive flooding causes significant strain on a community, including worry about how high the water may rise, potential loss of life or injury, loss of personal belongings, possibility of mold and related health issues, and uncertainty of return to one's home and city. Adding to this worry are the decisions related to the potential solutions:

- What is the city doing to control flooding?
- What can I do on my own to reduce damage from repetitive flooding?
- Should I elevate my house and, if so, how high?
- Are there options available other than elevation?
- Is there a solution that might work for the entire neighborhood?

This RLAA attempts to provide answers to these questions and others respective to the various conditions faced by residents located in different areas of the city. By gaining a better understanding of the flooding issues, property owners will be better able to reduce their risk of flooding, the City will be able to plan and prioritize risk reduction projects, and neighborhoods can become more resilient.

As repetitive flooding is a citywide concern, most of the buildings across the City are addressed in this project. The RLAA is intended to be a guide not just for property owners to learn more about their vulnerability to flooding but for citywide planning; as such, mitigation recommendations are made for individual owners, "Repetitive Loss Planning Districts", and the City.

This analysis and report are a result of a collaborative partnership between the City of New Orleans, the University of New Orleans' Center for Hazards Assessment, Response & Technology (UNO-CHART) and the residents of New Orleans, many of whom continually suffer the stress and personal loss that accompanies living in repetitively flooded areas.

1-1 Background

The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA) and is tasked with paying claims while trying to keep the price of flood insurance at an affordable level. The NFIP has a longstanding problem with repetitive flood loss properties, which are estimated to have cost $13 billion nationwide and over $3.4 billion in Louisiana alone[6] since 1978.

Repetitive flood loss properties represent only 1.3% of all flood insurance policies, yet historically they account for 25-30% of all claim payments[7]. Mitigating these repeatedly flooded properties will reduce overall costs to the NFIP, the communities in which they are located, and the individual homeowners, themselves. Overall, mitigating repetitively flooded properties benefits everyone.

Since 2004, the University of New Orleans' Center for Hazards Assessment, Response and Technology (UNO-CHART), has gathered data and analyzed Louisiana's repetitive flood loss areas in partnership with FEMA, the State of Louisiana, local governments, neighborhood associations, and residents. Using Geographic Information System (GIS) and geo-coded flood insurance claims data, UNO-CHART prioritized repeatedly flooded areas and properties for attention and analysis. In selected locations, UNO-CHART worked with local officials and residents to conduct in-depth analyses of the causes and possible solutions to the flooding problem.

UNO-CHART prepared this RLAA for the City of New Orleans. This RLAA follows FEMA guidelines to determine why an area has repeated flood losses, and what alternative flood protection measures would help break the cycle of repetitive flooding.

At the time of this report, the city had 6,541 repetitive loss (RL) properties; 1,446 (22.1%) were mitigated and 5,095 (77.9%) were unmitigated repetitive loss properties. It should be noted that the list of FEMA repetitive loss properties underestimates the full flood problem. The list only represents properties (1) that were insured during two or more floods that occurred within a ten-year period and (2) for which NFIP claims were filed. This report examines almost all properties in the city because the entire City of New Orleans is subject to repetitive flooding.

This RLAA will support individual homeowner and community-wide planning. Repetitive Loss Area Analyses are also encouraged by and credited under the Community Rating System (CRS). The City of New Orleans participates in the CRS program and at the time of this report New Orleans/Orleans Parish is rated as a Class 8 CRS community; as such, homeowners can receive a

[6] Numbers provided by FEMA Region VI as of December 2018.

[7] https://www.fema.gov/media-library-data/20130726-1709-25045-4851/2_severerepetetiveloss.pdf

10% flood insurance premium reduction for properties within the designated Special Flood Hazard Area (SFHA) and 5% flood insurance premium reduction for non-SFHA properties.[8]

1-2 The Repetitive Loss Area Analysis (RLAA) Process

A repetitive loss area analysis (RLAA) is an approach to identify repeatedly flooded areas, evaluate mitigation approaches, and determine the most appropriate alternatives to reduce future repeated flood losses; it is described as a mitigation plan for a repetitive loss area[9]. The RLAA process is prescribed by the Community Rating System, Activity 510, Element 512b. The process includes the following five steps that must be completed for a community to earn CRS credit for the completion of the RLAA[10]:

> *Step 1. Advise all the properties in the repetitive loss areas that the analysis will be conducted and request their input on the hazard and recommended actions.*
>
> *Step 2. Contact agencies or organizations that may have plans or studies that could affect the cause or impacts of the flooding.*
>
> *Step 3. Visit each building in the repetitive loss area and collect basic data.*
>
> *Step 4. Review alternative approaches and determine whether any building protection measures, or drainage improvements are feasible.*
>
> *Step 5. Document the findings.*

The following paragraphs include a brief description of how the RLAA steps were completed for this RLAA for the City of New Orleans. Neighborhood outreach, an additional step taken by the project team, is also described here.

The Community Rating System (CRS) recognizes National Flood Insurance Program (NFIP) member communities that exceed the minimum requirements of the NFIP. The program encourages flood risk reduction based on community participation in floodplain management practices that reduce flood risk or provide public flood risk. The recognition comes in the form of flood insurance premium reductions based on the reduced flood risk. For more information on the CRS, see National Flood Insurance Program Community Rating System | FEMA.gov.

[8] https://www.fema.gov/floodplain-management/community-rating-system

[9] National Flood Insurance Program Community Rating System, FIA-15/2017, pages 510-29 through 510-39; https://crsresources.org/manual/

[10] National Flood Insurance Program, Community Rating System, Coordinator's Manual, FIA-15/2017; https://www.fema.gov/media-library-data/1493905477815-d794671adeed5beab6a6304d8ba0b207/633300_2017_CRS_Coordinators_Manual_508.pdf

1-3 STEP 1: NEIGHBORHOOD NOTIFICATION

The City of New Orleans' Office of Safety and Permits partners with the Sewerage and Water Board to send an annual flood risk flyer along with water bills that are mailed to residents. The RLAA project team worked with the Office to revise this annual flyer to include a description of the RLAA. The flyer was mailed to residents via Sewerage and Water Board bills during the month of July 2018 and again in July 2019. This flyer served as notification that the RLAA was being conducted and provided a website for residents to find additional information about the RLAA and a draft report. The flyer also encouraged people to share information regarding flood hazards and potential mitigation through an online survey. A copy of the flyer and a list of the survey questions are included in Appendix II - Survey Questions. The survey is posted at https://nola.gov/hazard-mitigation/flood-risk-analysis/.

Neighborhood Outreach Meetings

Results and data collected for this analysis were presented at several resident outreach meetings. The project ream presented at regular meetings of local neighborhood associations through a combination of virtual and in-person meeting formats. The outreach meetings provided District-specific information including updates on existing and planned drainage projects, presentation of district specific area analysis data, and an overview of property specific building protection measures. Residents were encouraged to ask questions and provide feedback to the UNO-CHART team members and City Hazard Mitigation officials. Summaries of questions and feedback for each district meeting were recorded and contributed to the development of this report. Outreach meetings were also a key interface during the collection of resident survey data. A summary list of the neighborhood outreach meetings, dates, and locations is included in Table 1 below.

Photo Credit: UNO-CHART public outreach 1

Table 1 - Summary of Neighborhood Outreach Meetings

NOLA District/Neighborhood	Date	Location	Participants
Gentilly Heights Voscoville	3/05/2020	Norman Mayer Library	17
East New Orleans Neighborhood Advisory Commission	3/10/2020	St. Maria Goretti Community Center	43
Bywater Neighborhood Association	3/09/2021	Virtual via Zoom	15
Algiers Neighborhood Presidents Council	3/23/2021	Virtual via Zoom	14
Mid-City Neighborhood Organization	4/12/2021	Virtual via Zoom	21
Lakeview Civic Association	5/15/2021	St. Dominic Gym	65

Resident Survey Data

A resident survey was made publicly available on the City of New Orleans Hazard Mitigation Office website during the development of this report. The survey collected resident specific data such as building type, flood history, existing building protection measures, and flood

insurance information. The purpose of the survey was to gain additional information to develop improved building-specific recommendations concerning flood mitigation measures. In total, the city received a total of (73) responses from residents. Both a list of survey questions and a link to the survey can be found in Appendix II Survey Questions.

Summary of Survey Results

Most of the survey respondents were single-family homeowners (67%) who had at one point experienced flooding (57%). Over three-fourths (76%) of the flood events were associated with Hurricane Katrina or subsequent storms. The three most common survey responses for the suspected cause of flooding were (1) drainage from nearby properties or the street, (2) levee failure, and (3) storm surge from nearby lakes or waterways. Important to note is the fact that the majority (85%) of the surveyed respondents carried flood insurance and over half (57%) of the surveyed property owners responded that their building was elevated at least 18 inches or higher above grade. Over (85%) of the respondents whose building type was slab on grade also responded that their property had at one-point experienced flooding. The three most common flood protection measures implemented by property owners were (1) moving utilities/contents to a higher level, (2) sandbagging when threatened by flooding, and (3) installing drains and pipes to improve drainage. Over two-thirds (68%) of the survey respondents indicated that their implemented protection measures were an effective flood protection measure.

Based on residents' survey comments, location within the city was the primary determinant of whether they had experienced flooding. Residents who commented that they lived in higher areas of the city were among those who did not carry flood insurance. Residents frequently attributed lack of drainage infrastructure capacity as one of the main reasons for flooding in their location. The overall sentiment of the survey results indicated that residents were very aware of their flood hazard risk and had implemented a combination of both structural and non-structural flood mitigation measures.

1-4 Step 2: Review of Ordinances, Plans, and Flood Insurance Rate Map (FIRM)

The project team reached out to multiple agencies to collect plans, studies, and/or other information that could impact flooding in the City of New Orleans. These agencies included the City of New Orleans' Office of Homeland Security and Emergency Preparedness, Office of Information Technology & Innovation, Office of Safety and Permits, Department of Public Works, and the Sewerage and Water Board of New Orleans. Data collected from these agencies were vital to this RLAA and are referenced throughout this document.

The team also reviewed several relevant documents, including the City of New Orleans's Code of Ordinances, the Orleans Parish Hazard Mitigation Plan 2020, the 2025 Capital Improvement Plan, the City of New Orleans Master Plan, and the Greater New Orleans Water Plan. The

following includes brief summaries of the flood reduction activities included in these documents.

Flood Insurance Rate Map (FIRM)

The Flood Insurance Rate Map (FIRM) is the official map designated by FEMA to display Special Flood Hazard Areas (SFHAs), Base Flood Elevations (BFEs), and detailed risk premium zones in accordance with the general rules of the NFIP. [11] FIRMs within NFIP participating communities indicate the level of flood hazard risk.[12] This report uses the most recent FIRM Panels for Orleans Parish which were effective beginning September 30, 2016[13] and based on a Flood Insurance Study (FIS) also effective beginning September 30, 2016.[14] The FIRMs for each repetitive loss planning district are shown in Chapter 6.

FIRMs present the base or 1% chance flood for the community and cover large areas. As such, FIRMs do not provide a great deal of information on smaller, repetitive floods. For example, floods that are less than one foot deep are generally not mapped as a Special Flood Hazard Area, even though such shallow floods can occur much more frequently than the base flood and can cause significant damage to buildings.

Floodplain Management Ordinances

The City of New Orleans Code of Ordinances establishes provisions for floodplain regulation in Chapter 78 and other applicable sections of the code. Section 78 provides the basis for many of the flood-related regulatory functions within the city. The code establishes various flood damage protection requirements for new construction and substantial improvements to existing buildings. Some of the flood protection measures included in Chapter 78 and applicable to this report are:

- minimum elevation requirements for new and substantially improved residential and non-residential structures,
- flood-proofing measures for non-residential new construction and substantial improvements,
- requirements for the protection of facilities vulnerable to floods,
- controls for alteration of natural floodplain related functions including alterations that may increase flood damage such as filling and grading, and
- provisions for historic structures.

[11] https://www.fema.gov/flood-maps/coastal/insurance-rate-maps#:~:text=A%20Flood%20Insurance%20Rate%20Map%20%28FIRM%2C%20or%20flood,coastal%20hazards%2C%20such%20as%20storm%20surge%20and%20waves.

[12] https://www.fema.gov/pdf/nfip/manual201205/content/03_generalrules.pdf

[13] https://msc.fema.gov/portal/advanceSearch#searchresultsanchor

[14] https://map1.msc.fema.gov/data/22/S/PDF/22071CV000A.pdf?LOC=c41da21c45b05956fa2385586e3a1d29

A recent amendment to the Stormwater Management requirements (Ordinance No. 32,757) requires all surface non-residential off-street parking spaces to be permeable – another flood mitigation measure. [15]

Orleans Parish Hazard Mitigation Plan Update 2020 - DRAFT

The city, in January of 2021, published an updated draft of the City of New Orleans Hazard Mitigation Plan (HMP). The purpose of the plan is to identify manmade and natural hazards and their associated risks within Orleans Parish. The plan develops a strategy to mitigate hazard vulnerabilities within the city and serves as a guide for local policies and decisions with the intent of increasing disaster resiliency.

Along with tropical cyclones, the plan identifies flooding as the most frequently occurring hazard affecting the city. Flooding and tropical cyclones together make up 24 of the 28 Presidential Disaster Declarations issued for the New Orleans area since 1965. The Hazard Mitigation Plan includes strategies aimed at reducing the impact of flooding on residential properties through mitigation measures aimed at flood damage reduction. One such strategy is education and outreach, included in Section 3.5, which focuses on advising residents of ways they can mitigate damage to their property.

Damage reduction from repetitive flooding is identified in Section 3.5 of the HMP as a priority for Orleans Parish. Section 3.7 addresses repetitive flood loss properties within Orleans Parish including the total number of repetitive loss structures as of 2019, a map of repetitive loss property densities, information on premium discounts through the CRS, and definitions for repetitive loss and severe repetitive loss structures.[16]

City of New Orleans Master Plan

The City of New Orleans Master Plan serves as a 20-year plan outlining both long and short-term economic growth and resiliency goals for the city. One of the fundamental questions in the plan relevant to this report is "How do we keep the city safe from flooding and natural hazards?". Part Four, "Sustainable Systems" focuses on the management of flood and storm risks for the purpose of increasing community resilience and disaster risk reduction.
Chapter 12 of the plan titled "Adapt to Thrive: Environmental Stewardship, Disaster Risk Reduction, and Climate Change" includes specific goals aimed at comprehensive management of urban stormwater, incentives for property owners to implement flood risk reduction measures, continued implementation and enhancement of green infrastructure projects, floodplain management policy changes, and related resiliency goals. [17]

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[15] Code can be accessed at https://library.municode.com/la/new_orleans/codes/code_of_ordinances?nodeId=PTIICO_CH78FL

[16] https://ready.nola.gov/NOLAReady/media/Assets/Hazard%20Mitigation%20Plan/2020-City-of-New-Orleans-Multi-Jurisdictional-Hazard-Mitigation-Plan-Draft-20210108.pdf

[17] https://www.nola.gov/city-planning/master-plan/

Land Use Plan

The purpose of the Land Use Plan is to "guide future development in the city" by incorporating design principles and comprehensive zoning to shape both public spaces and private development. One of the goals of the plan is to promote smart growth land use patterns through sustainable land use and zoning practices. Some action items included in the Land Use Plan related to this report refer to promoting innovative stormwater management techniques and practices in site planning and new construction. This includes utilizing parkland and open space for stormwater management as part of the goal of developing sustainable multi-use spaces throughout the city. Some additional strategies include incorporating green infrastructure such as tree and ground cover, green roofs, rain gardens, and pervious surfaces to improve stormwater management capacity.[18]

2021-2025 Capital Improvement Plan

The City of New Orleans Planning Commission developed and adopted the current Capital Improvement Plan (CIP) in October 2020. The CIP includes several future priorities related to "streets and stormwater management". The City hopes to further its priority of managing storm water through a mix of both grey and green infrastructure projects.[19] Specific projects aimed at flood reduction include:

- DPW444 St. Claude Drainage Improvements/subsurface drainage and green infrastructure
- DPW446 Perdido St. Drainage Repairs/ subsurface drainage and green infrastructure
- DPW517 Mirabeau Garden Stormwater Management and Flood Mitigation/ subsurface drainage and green infrastructure
- DPW549 St. Roch Drainage Upgrades
- DPW550 Hagan-Lafitte (Bayou St. John) Drainage Upgrades/ subsurface drainage and green infrastructure
- DPW552 Academy Park Drainage Upgrades/ subsurface drainage and green infrastructure
- DPW582 Oak Park Drainage Upgrades/ subsurface drainage and green infrastructure

Updated information on the flood reduction projects can be found in the Plan's appendices.[20]

Greater New Orleans Water Plan

Greater New Orleans Inc. (GNO, Inc.) developed a comprehensive water management strategy for Orleans Parish and the Greater New Orleans area. GNO, Inc. is a nonprofit organization with the mission of facilitating regional economic development throughout the Southeast Louisiana region. The purpose of the Greater New Orleans Water Plan (GNOWP) is to develop a strategy

[18] https://www.nola.gov/nola/media/City-Planning/Ch-13-Combined-w-Opportunity-Sites.pdf
[19] https://nola.gov/nola/media/City-Planning/2021-2025-Capital-Improvement-Plan-ADOPTED_2.pdf
[20] https://nola.gov/nola/media/City-Planning/2021-2025-Capital-Improvement-Plan-ADOPTED_2.pdf

for the improved management of flood and other water-related hazard threats in the region. The plan serves as the first long-term water plan for the region and is aligned with the 2017 Louisiana Coastal Master Plan. Though the City of New Orleans participated in the development of the GNOWP, it has not been officially adopted by the city as a governing document.[21]

1-5 Step 3: Building Data Collection

For full credit as a CRS repetitive loss area analysis, every building in the repetitive loss areas needs to be evaluated. An on-site review of every one of the more than 150,000 buildings in the City was not feasible, so an alternative approach was used. [22] Project team members reviewed an extensive series of photographs of buildings throughout the City that were collected in 2013 for a study to reduce blight. This proved to be both effective and efficient, although some areas were not included and the photos of large buildings, such as those in the Central Business District, could not be used.[23]

Project team members collected a great deal of information on each structure based on answers to the following questions (additional guidance is provided in italics):

- Is there a structure on the property (yes, no or maybe)? *Structures are building that have enclosed walls with a roof and have a foundation connected to the ground.*
- Is the structure occupied (yes, no or maybe)? *An occupied structure is being used for residential, commercial, industrial, and/or institutional proposes.*
- How many stories (1 and higher)? *Raised basements and attics do not count as a story.*
- What is the foundation type (below grade, slab on grade, crawlspace, or raised)?
- What is the EC Diagram Number (1A, 1B, 2A, 2B, 3, 4, 5, 6, 7, or 8/9)?
- What is the foundation condition (Poor, Fair, Good, NA)? *Poor condition is when the foundation appears damaged to the point of being unsafe. Good is the default condition due to the limited images of the building.*
- How many steps to the front door (1-15)? A step is 7 inches or higher. *Only steps of the structure were counted and not site steps.*
- What are the building walls construction materials (stucco, wood/vinyl, cinderblock/masonry/brick, brick faced, or other)?
- What is the ground elevation (minimum or maximum)? *Minimum elevation site is relatively flat. Maximum elevation site has the building sitting on raised site. Look for site steps that lead to the building.*
- Is the HVAC visible (yes or no)?
- If so, how high is it (at grade, at or above 1st floor, in window, or other)?
- Comments? *This is where the data collectors can add important relevant information.*

[21] https://gnoinc.org/initiatives/the-greater-new-orleans-water-plan/

[22] BlightStatus Demolitions - Map | Data.NOLA.gov

[23] https://data.nola.gov/Housing-Land-Use-and-Blight/BlightStatus-Demolitions-Map/rp4k-we3p

- Need follow up (yes or no)? *If any of the questions could not be answered, a yes answer should be marked for the property for further attention.*

Data entry was continually monitored as part of the project Quality Control (QC) process. The QC process was used to take appropriate corrective actions and to minimize grading errors (see Appendix for details). Team members conducted on-site data collection for some of the properties that were not available through the data collection tool.
Some areas were omitted during the data collection process, including approximately 8,000 parcels that were not included in the City's blight remediation program. A large percentage of properties in the CBD and French Quarter Repetitive Loss Planning Districts were omitted due to the inability of the data collection tool to gather essential data in those areas. This is explained more in Chapter 2.

1-6 Step 4: Mitigation Measures

This step reviews the various measures that can be taken to prevent or mitigate repetitive flood damage. The identified mitigation measures were broken into two overall categories: flood control, i.e., managing flood waters, and building protection measures, or managing the properties impacted by flood waters.

The flood control measures are reviewed in Chapter 4. As described in Chapter 4, the focus on repetitive flooding means giving attention to the drainage system and improvements to the system. Traditional flood control measures for riverine flooding, such as dams and levees, are not appropriate for the type of local drainage flooding that causes New Orleans' repetitive flood problems.

Building protection measures are discussed in Chapter 5. They include acquisition (buying the building and removing it from harm's way), mitigation reconstruction (demolishing the building and replacing it with an elevated structure), elevating the existing building, installing small barriers to surface water, dry floodproofing, wet floodproofing, and landscaping and yard improvements.

Chapter 6 reviews the status of the planned drainage improvements in each of the Repetitive Loss Planning Districts and provides summary data on building types and appropriate building protection measures. Each district summary has recommendations on the flood control and building protection measures.

1-7 Step 5: Documentation of Findings and Recommendations

The final step for an RLAA is to document the findings and recommendations of the analysis. This report was submitted in draft form for review by the City of New Orleans. The final report was shared with several neighborhood associations and posted to the following websites:

- City of New Orleans Website: Hazard Mitigation - Flood Risk Analysis - City of New Orleans (nola.gov)
- UNO-CHART Repetitive Flood Portal: http://floodhelp.uno.edu/Portal.aspx

Implementation & Adoption

The final report will also be submitted to the New Orleans City Council for adoption. Adoption by the city is required to earn CRS credit for this activity.
It is recommended that the City of New Orleans:

1) adopt this Repetitive Loss Area Analysis according to the process detailed in the 2017 CRS Coordinator's Manual,
2) encourage the owners of repetitive flood loss structures to pursue building protection measures,
3) continue to assist interested property owners in applying for mitigation grants,
4) continue to improve and maintain the drainage system, and finally,
5) continue public information activities such as outreach projects, website postings, and flood protection assistance that help residents learn about various ways to reduce their flood risk.[24]

[24] https://www.fema.gov/sites/default/files/documents/fema_community-rating-system_coordinators-manual_2017.pdf (See Pg. 510)

CHAPTER 2 REPETITIVE LOSS PLANNING DISTRICTS

Figure 1 shows 6,363 of the 6,541 properties that have been identified across the City as repetitive loss properties by FEMA. The analysis was only able to plot 6,363 as the remaining properties had incorrect or unusable addresses, such as a post office box. Per the map, these properties appear citywide. There are areas where there are no red dots, but these are areas where there are few, if any insurable buildings. The two red "Xs" are examples; they mark City Park and the New Orleans Lakefront Airport. Much of New Orleans East is vacant land, too. There are no individual repetitive loss areas in the traditional sense of one or two concentrations of a community's flood prone buildings. New Orleans' repetitive flooding is a citywide concern, so the entire city is addressed in this project.

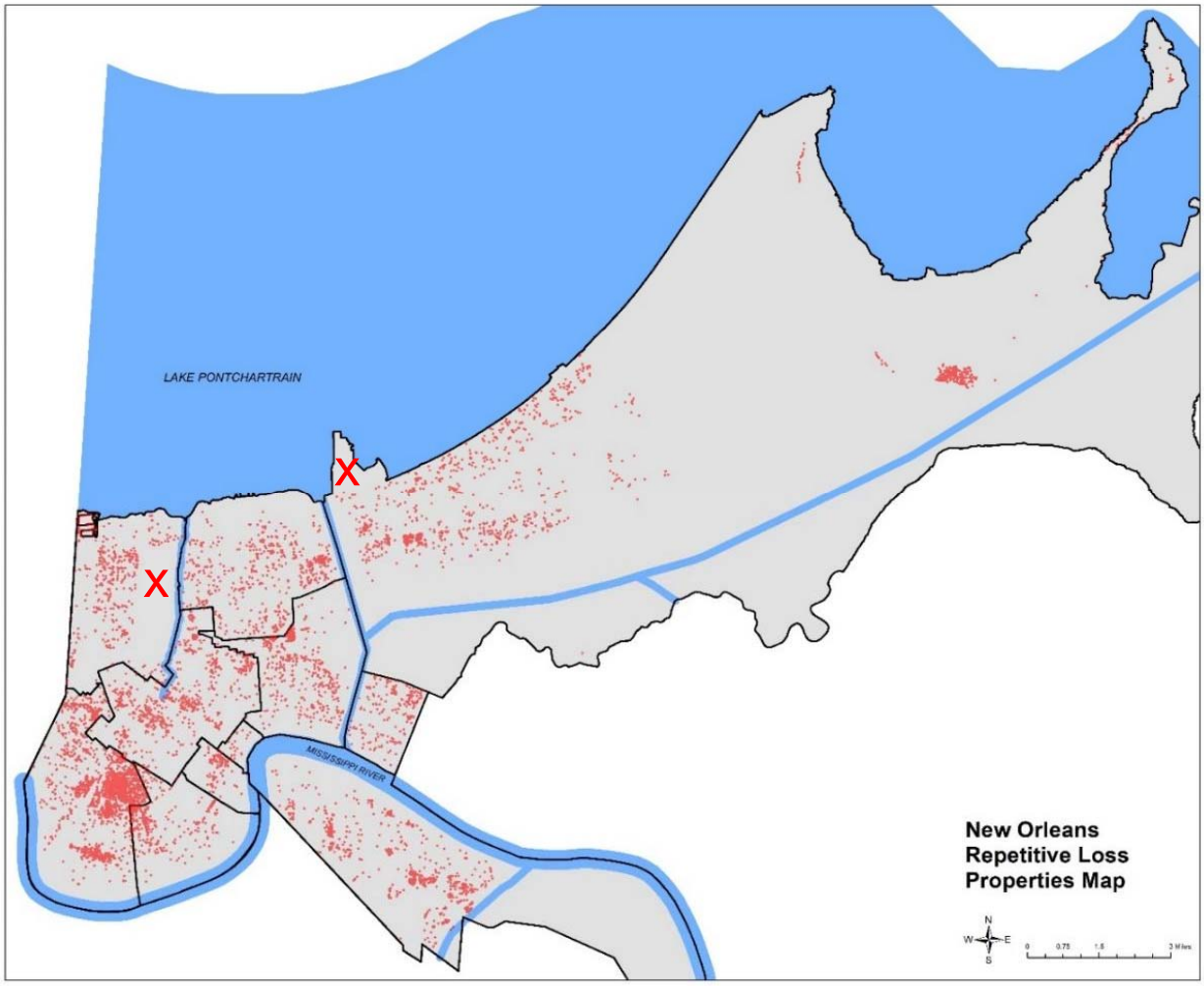


Figure 1 – Designated Repetitive Loss Properties

To facilitate analysis of the data and public review of the findings, the project team divided the city into 11 Repetitive Loss Planning Districts based on the City of New Orleans' Planning Districts[25]. The Repetitive Loss Planning Districts are shown in Figure 2.

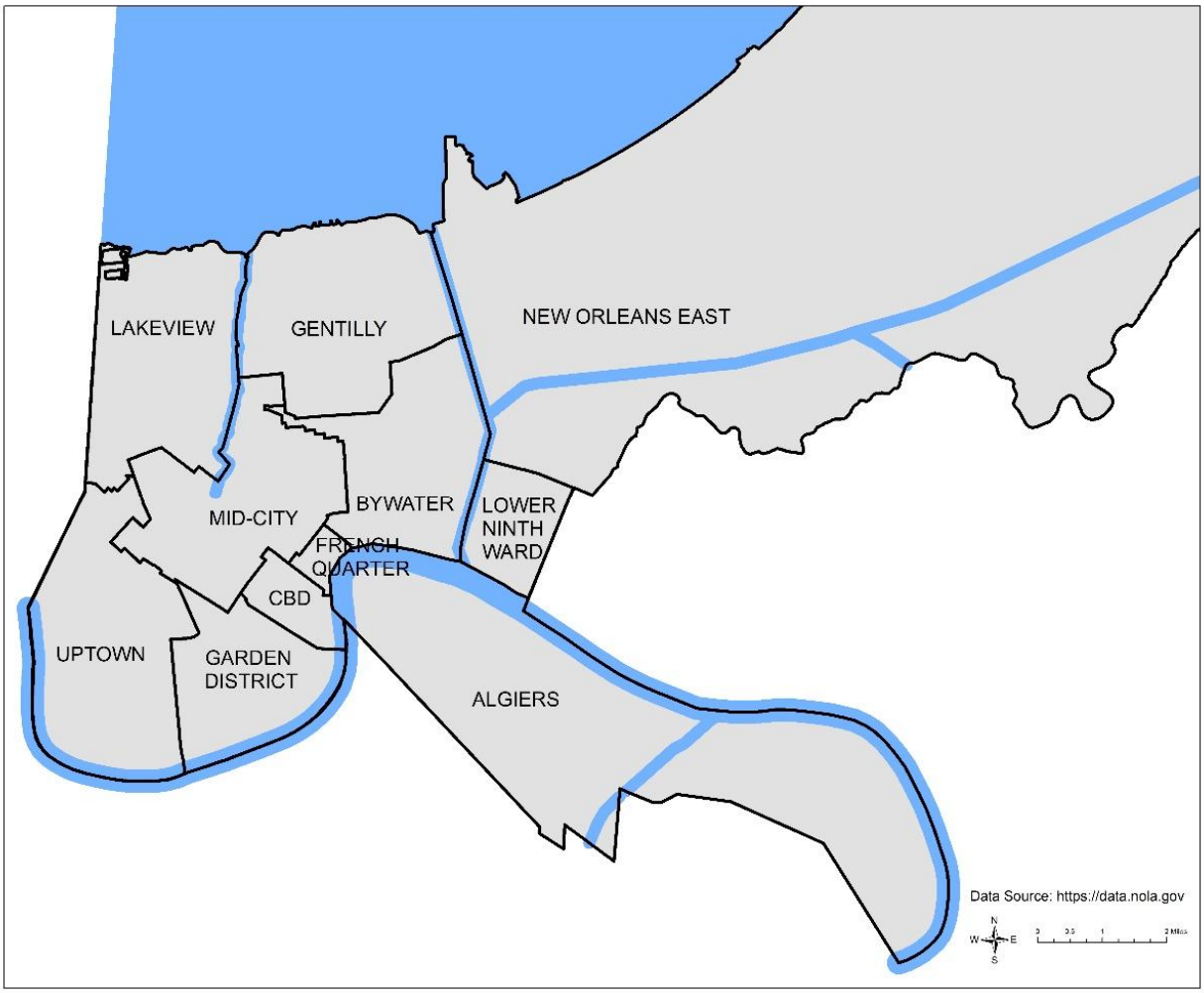


Figure 2 - Repetitive Loss Planning Districts (https://data.nola.gov)

[25] For a map of the City's Planning Districts, see https://www.nola.gov/city-planning/czo/planning-district-maps/citywide-planning-districts/.

Table 2 presents summary data for the 11 Repetitive Loss Planning Districts. The "Rep Loss" column shows the number of FEMA designated repetitive loss properties located in each Repetitive Loss Planning District. The data show that every district has experienced repetitive flooding.

Table 2 - District Summaries

RL Planning Districts	Rep Loss	Total Lots	Lots Surveyed	% Lots Surveyed	Buildings Surveyed
Algiers	660	20,298	19,615	97%	14,423
Bywater	467	14,089	13,466	96%	10,507
Central Business District	117	1,286	70	5%	25
French Quarter	24	1,701	-	0%	0
Garden District	325	12,584	12,086	96%	10,040
Gentilly	535	15,329	14,899	97%	12,816
Lakeview	485	10,144	9,944	98%	9,006
Lower Ninth Ward	202	7,705	7,607	99%	3,569
Mid-City	687	18,533	17,551	95%	14,925
New Orleans East	1,018	29,210	28,604	98%	21,120
Uptown	1,843	20,510	19,405	95%	18,440
Unable to map	178	-	-	5%	-
City Total	6,541	151,389	143,247	95%	114,871

Of the 6,541 NFIP-designated repetitive loss properties in Orleans Parish:

- 1,446 (22.1%) have been elevated or otherwise modified to be protected from shallow flooding,
- 4,917 (75.2%) have not been mitigated, and
- 178 (2.7%) could not be located on a map of the City, so their status could not be determined.

A central part of this analysis is a review of each building in the city using photographs collected using a vehicular mounted camera system. The blight remediation program was primarily concerned with residential properties. The project did not collect photos of the buildings in the Central Business District and the French Quarter for two reasons. First, they are mostly commercial properties in good condition. Second, they are relatively tall buildings on narrow streets, making photographing them nearly impossible for the vehicular camera system used in the project. Because the essential data are not available for these areas, this repetitive loss area analysis does not include summaries of the CBD and French Quarter Repetitive Loss Planning Districts. Further, not every lot or building was surveyed in the other nine districts because of access or other reasons.

However, as shown in Table 2, data were collected on 95% of the parcels in the City of New Orleans. Many, if not most, of the parcels not surveyed were vacant lots and it was cost prohibitive to field check each of the remaining 8,000 parcels that were excluded from the city's blight remediation program. It was concluded that given the cost of data collection, this was sufficient coverage to guide the city's repetitive loss policies and programs.

While this report does not cover every property, residents and owners of properties not surveyed may still call the Office of Safety and Permits at (504) 658-7100 if they would like more information on how to protect their buildings from flood damage.
The nine remaining Repetitive Loss Planning Districts have been further broken down by other city planning programs into neighborhoods (see Figure *3*). Data for the districts and neighborhoods are provided in Chapter 6.

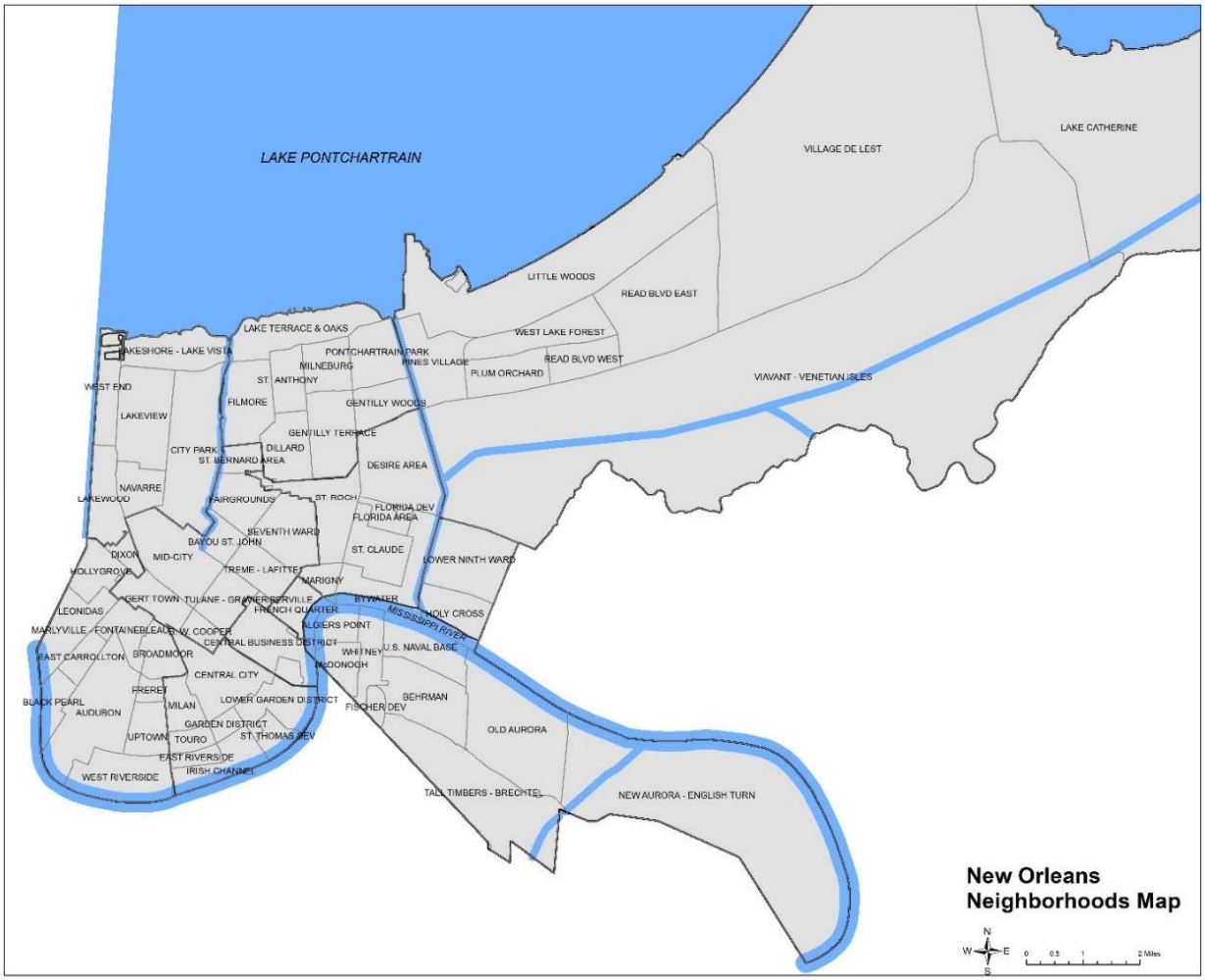


Figure 3 - New Orleans Neighborhoods; (https://data.nola.gov)

CHAPTER 3 THE REPETITIVE FLOOD PROBLEM

One of the best sources of information for repetitive flooding is flood insurance claims. Claims data include the dates, location, and extent of damage for each flood occurrence. However, NFIP claims data do not provide a complete picture as they do not include:

→ Data on uninsured properties and
→ Data on properties insured by private companies not part of the NFIP.

Therefore, while indicative of the problem, the claims data reviewed here understate the extent and severity of repetitive flooding.

UNO-CHART obtained claims data from FEMA Region VI for all properties within Orleans Parish and aggregated the data. Claims vary depending on size of the home, the contents that were damaged, and the elevation of the home. Because of the Privacy Act of 1974, this report does not identify the repetitive loss properties or include claims data for any individual property; rather, it discusses these data only in summary format.

Claims Data and The Privacy Act

The Privacy Act of 1974 (5 U.S.C. 522a) restricts the release of certain types of data to the public. Flood insurance policy and claims data are included in the list of restricted information. FEMA can only release such data to state and local governments, and only if the data are used for floodplain management, mitigation, or research purposes. Specific requirements regarding the Privacy Act requirements for flood insurance data can be found under section 510-31 of the 2017 CRS Coordinator's Manual.

3-1 HISTORIC FLOODS

Table 3shows all the flood insurance claims submitted by policyholders in the City of New Orleans, from 1978 through 2018. The data begin in 1978 as that is the first year that NFIP data were collected. The data reveal that there have been flood insurance claims related to storms, and/or, flooding in the city every year since.

Table 3 also reveals the significant flood years, when there were considerable claims, and the years when there were relatively few claims. It should be noted that the number of claims ("Number Claims") includes 21,014 claims that were "closed without payment." This does not mean that those properties were not flooded. The most common reasons for not paying a claim are:

→ The claims adjuster concluded that the eligible damage was less than the policy's deductible;
→ The flood insurance policy had not been in effect for more than 30 days; or
→ The water damage was not caused by a qualifying event, which is defined by a flood insurance policy as "A general and temporary condition of partial or complete inundation of 2 or more acres of normally dry land area or of 2 or more properties…[26]"

[26] https://www.fema.gov/national-flood-insurance-program/definitions#F

Table 3 - Historical Flood Insurance Claims			
Year	Number Claims	Claims Payments	
		Average	Total
1978	3,166	$4,496	$11,824,928
1979	149	$2,528	$230,034
1980	5,576	$5,665	$27,814,273
1981	856	$4,073	$2,920,019
1982	1,251	$3,451	$3,447,364
1983	5,764	$5,708	$26,549,310
1984	20	$1,441	$7,205
1985	323	$16,296	$3,813,341
1986	37	$9,326	$149,222
1987	19	$31,290	$29,156
1988	1,399	$5,058	$5,488,451
1989	427	$5,689	$1,701,044
1990	1,045	$6,686	$5,910,093
1991	1,827	$8,983	$13,385,044
1992	286	$4,537	$839,270
1993	33	$4,898	$44,078
1994	574	$7,135	$3,324,687
1995	13,931	$13,887	$163,144,019
1996	115	$9,113	$719,920
1997	160	$9,300	$1,078,777
1998	4,208	$10,676	$36,256,030
1999	69	$26,202	$628,851
2000	114	$6,780	$223,731
2001	1,421	$4,771	$3,945,340
2002	4,095	$9,944	$26,779,921
2003	485	$8,351	$2,513,696
2004	330	$10,896	$2,255,475
2005 **	95	$7,251	$268,271
2005 K	71,487	$109,744	$6,832,576,321
2006	72	$18,432	$516,107
2007	127	$14,289	$1,128,869
2008	1,131	$28,743	$13,164,488
2009	325	$12,576	$2,917,582
2010	77	$20,443	$838,165
2011	316	$29,511	$6,108,741
2012	1,592	$16,855	$12,843,546
2013	53	$13,259	$304,958
2014	34	$20,836	$270,874
2015	61	$15,388	$446,240
2016	76	$18,552	$352,486
2017	877	$40,854	$29,455,421
2018	38	$15,459	$293,719
Total**	52,554	$11,910	$413,932,746
Total K	71,487	$116,858	$6,832,576,321
All Claims	124,041	$77,732	$7,246,509,067
** Numbers do not include Hurricane Katrina			

This analysis considers all claims submitted as a conservative measure of the number of properties damaged by flooding. This is because many properties were not insured or not

insured under the National Flood Insurance Program (NFIP). For example, in 2015 there were just over 86,000 NFIP policies in the City and around 150,000 insurable buildings. Some policies are on condominium units, so the ratio of policies to buildings is even smaller.

Only NFIP claims are counted in the tables in this chapter. The claims closed without payment were counted as claims but were not included in calculating the average claim payments. Table 3 has two rows for the year 2005 and the totals. The rows for "2005 K" and "Total K" include the data for Hurricanes Katrina and Rita. The entries for "2005**" and "Total**" do not include claims data for Katrina and Rita.

Over the 41 years shown in Table 3 there have been 124,041 claims for a total payment of $7,246,509,067. Of these claims, 93,224 were paid and 30,817 were closed without payment. Using the number of paid claims, the average claim payment has been $77,732.
Of the 124,041 claims, 71,487 were related to Hurricanes Katrina and Rita, of which 58,469 were paid. Total Katrina and Rita payments were $6,832,576,321 for an average payment of $116,858. It is important to note that 58% of all claims and 94% of all claim payments in the 41 years were due to Hurricanes Katrina and Rita.

As explained in Chapter 4, the non-Katrina and Rita floods are considered repetitive flooding. There were 52,554 claims submitted for those floods, of which 34,755 were paid for a total of $413,932,746. The average payment for these repetitive floods has been $11,910. In other words, the average claim paid in 2005 for flood damage from Hurricanes Katrina and Rita were more than ten times greater than the average claim payment for the rest of the floods experienced in New Orleans since 1978.

3-2 Causes of the Floods

While there were floods and claims payments every year, 99% of all the claims payments were caused by 28 storms. These are listed in Table 4, below. Focusing on these events facilitates the analysis and directs attention to what are likely the worst cases.

Table 4 - The 28 Largest Floods					
Date of Storm	Type of Flood	Rainfall	Number of Claims	Claim Payments	
				Average	Total
5/3/1978	Rain [DD]	L 6.80	3,143	$4,502	$11,781,718
3/29/1980	Rain	S 4.69	241	$2,819	$527,125
4/13/1980	Rain [DD]	L 8.55	5,289	$5,799	$27,227,624
6/10/1981	Rain	S 3.28	703	$4,339	$2,624,962
4/24/1982	Rain	S 4.21	696	$3,696	$2,188,074
12/3/1982	Rain	5.71	506	$3,183	$1,235,180
1/20/1983	Rain	S 1.85	126	$7,500	$720,047
4/6/1983	Rain [DD]	L 7.81	5,248	$5,826	$25,360,435
4/22/1983	Rain	5.31	203	$2,708	$243,675
10/27/1985	Rain [DD]	L 6.11	287	$16,510	$3,714,769
4/2/1988	Rain	L 8.08	1,301	$4,834	$4,998,110
11/7/1989	Rain [DD]	L 12.71	370	$5,894	$1,567,783
5/13/1990	Rain	S 2.55	999	$6,737	$5,800,732
6/10/1991	Rain	S 2.22	1,673	$9,214	$12,853,493
2/17/1992	Rain	S 2.91	168	$5,195	$685,742
5/9/1994	Rain	S 0.69	512	$7,287	$3,162,491
5/8/1995	Rain [DD]	L 12.70	13,752	$13,985	$162,617,557
9/11/1998	Tropical storm [DD]	L 8.18	3,374	$10,175	$28,509,394
9/27/1998	Rain	S 0.60	469	$18,583	$6,429,552
6/5/2001	Tropical storm [DD]	L 7.42	1,233	$4,690	$3,405,138
9/25/2002	Hurricane [DD]	10.17	3,984	$10,016	$26,581,896
6/30/2003	Rain	S 4.28	276	$4,917	$840,758
8/28/2005	Levee failure [DD]	5.15	71,420	$109,763	$6,829,898,374
9/1/2008	Tropical storm [DD]	5.69	881	$33,459	$10,271,879
12/12/2009	Rain	5.43	180	$13,150	$1,959,367
7/17/2011	Rain	S 1.82	138	$37,948	$4,250,197
8/29/2012	Hurricane [DD]	L 9.08	1,408	$17,838	$11,666,200
8/5/2017	Rain/Pump failure	1.48	763	$42,742	$28,337,832
Totals		5.55	119,343		$7,219,460,104
Totals** without Katrina (8/28/2005)		5.57	47,923	$10,202	$389,561,730

[DD] These events received Presidential Disaster Declarations
S = smaller storm, less than 5" of rain. L = larger storm, greater than 6" of rain
The average amount of rain from the 28 largest floods was 5.57." Five and six inches were numbers chosen so there would be approximately the same number of storms considered "smaller" (11) to compare with the 10 "larger" storms.

These 28 floods were caused by one or more of four factors: levee failure, storm surge, rain, and pump failure.

Levee failure: One of the 28 floods summarized in Table 4 was caused by levee failure - the flooding of 8/28/2005 during Hurricane Katrina. Although New Orleans has experienced levee failures throughout its history, they are not frequent occurrences. They happened during Hurricane Betsy in 1965 and 40 years later during Hurricane Katrina in 2005. A Katrina-type levee-failure flood is not considered a "repetitive flood" that occurs twice in a ten-year period. Therefore, it is not the focus of this report, which focuses on more shallow, repetitive, rain-induced flooding.

Storm Surge: The flood on 9/1/2008 was caused by Tropical Storm Gustav. Most of the city was flooded by rain, but Gustav's winds also caused storm surge that overtopped the levee on the Inner Harbor Navigation Canal. This resulted in very high flood insurance claim payments for businesses in that area, but the damage was localized. Overtopping a levee, such as that which occurred in 2008, is not considered a levee failure but a storm surge flood that exceeded the project's design level.

Rain: The amount of rainfall during the few days before and on the date of a storm is shown in the "Rainfall" column of Table 4. These numbers were recorded at Louis Armstrong Airport, so they do not necessarily reflect locally heavy or light rainfalls in the various Repetitive Loss Planning Districts. Comparisons of damage from individual floods, such as one 30 years ago that had the same amount of rainfall as a recent flood, is not dependable with the data available. One flood may have had an obstruction in a key drainage way, or a pumping station may have been inoperable.

Excluding Hurricane Katrina, the most amount of damage was caused by the storm of May 8, 1995. This storm dropped 12.70 inches of rain at the airport and resulted in 13,752 claims. The same amount of rain, 12.71 inches, fell on the airport on November 7, 1989, but produced only 370 claims. This latter storm was localized in Jefferson Parish.

Pump failure: Pumps are part of the City's drainage system. Just as a canal will overflow if there is an obstruction to the water, an area will flood after a small amount of rain if the pump station is down.

The flooding on 8/5/2017 was caused by heavy rain but was aggravated by pumping failures. As discussed in Chapter 4 Flood Control Measures, the flood control and building protection measures for rain only and rain with pump failures are the same, so they are considered together in this analysis.

Analysis: While individual storms cannot be compared, the amount of rainfall does make a difference. Not counting Katrina or the 2017 flood, the 11 smallest storms in Table 4 had less than five inches of rain recorded at the airport. These are noted with an "S" before the amount

of rainfall. None of these rain events had a disaster declaration but they had an average of 546 flood insurance claims and $3.6 million in average payments.
There were also 11 larger storms with more than six inches of rain at the airport. These are noted with an "L" before the amount of rainfall. These had an average of 3,581 claims and nearly $27.9 million in payments. More rain means more repetitive flooding in New Orleans and more damage and flood insurance claims.

More rain means more repetitive flooding in New Orleans and more damage, and flood insurance claims.

A recent study by Barry Keim, state climatologist and professor at LSU, found "today's showers, on average, are more intense and deposit their rain loads more quickly than they did in the early 60s. The result is flash flooding that surprises and sometimes strands motorists and leaves streets and yards underwater before the rains soon move on.[27]" This upward trend of heavy rainfall events is expected to continue in the coming decades.[28]

3-3 Flood Damage

Average flood insurance claim payments for the 28 major storms are found in Table 4. The average payment has generally risen over the years as property values have increased. Not counting Hurricane Katrina related claims, over the 41 years of records, the average claim for repetitive flood damage caused by rainfall has been just over $10,000.
The good news about the low average claim amount is that most of the flooding has not caused substantial damage to individual properties. Low payments mean shallow, slow moving flooding that leaves a building essentially intact. This means that there are more options to protect buildings from flood damage. These options are discussed in Chapter 4 Flood Control Measures and Chapter 5 Building Protection Measures. However, simply looking at the insurance claims numbers does not tell the whole story of how flooding impacts people.

Building damage: First, it is important to note that an insurance claim does not often pay for all the damage to a building. The property owner or tenant must pay for:

→ the deductible, which has normally been $1,000 in recent years, but many policyholders opt for larger deductibles to save on premiums;

Photo Credit: David J. Phillip / The Associated Press

[27] Lussier, Charles. "Why is Louisiana seeing more 'showers on steroids,' intense downpours these days?" *The Advocate*, 11 August 2019. Accessible https://www.theadvocate.com/baton_rouge/news/weather_traffic/article_418dfcc8-b2ff-11e9-ad50-9b94c47fa8d2.html
[28] Lussier, Charles. "Why is Louisiana seeing more 'showers on steroids,' intense downpours these days?" *The Advocate*, 11 August 2019. Accessible https://www.theadvocate.com/baton_rouge/news/weather_traffic/article_418dfcc8-b2ff-11e9-ad50-9b94c47fa8d2.html

→ repairs for damage that costs more than the policy's amount of coverage;
→ damage to the contents of the building (unless the owner or tenant has separate contents coverage); and
→ damage to property not covered by flood insurance, such as landscaping, vehicles, items kept outdoors, and currency.

Second, much property damage is hidden. A building may look sound after the flood water is gone, but the wood will swell when wet. Plywood can come apart. Gypsum wallboard will fall apart if it is bumped before it dries out. The longer these materials are wet, the more moisture, sediment and pollutants they will absorb. To properly clean a building requires weeks of stripping, drying (as in the photo, right), cleaning, and rebuilding, all of which must be done correctly to prevent further damage.

Photo Credit: https://www.tulsahomerestore.com/wp-content/uploads/2017/10/flood-damage-restoration.jpg

Machinery like appliances and gasoline engines may look like they just got wet, but the sediments and chemicals in the water mean they will not work safely unless they are properly dried and cleaned. Other contents, such as mattresses and upholstered furniture, are usually not worth the cost of restoring them to a useful and safe condition.

Life safety: Shallow, slow moving floodwaters are not usually a safety hazard. However, it does not always take deep water to be dangerous. A car will float in less than 2 feet of moving water and will submerge in channels and canals if they are driven or float into one. This is one reason floods kill more people trapped in vehicles than anywhere else. Electrocution is the number two cause of flood deaths, claiming lives in a flooded area that is carrying a live current created when electrical components short.[29] People also die of heart attacks, especially from exertion during a flood fight. [30]

Photo credit: French Wetmore

Floods also can damage gas lines, floors, and stairs, creating secondary hazards such as gas leaks and unsafe structures. Floods can break gas lines, extinguish pilot lights, and short circuit

[29] https://meridiancity.org/environmental/files/floodingbrochure.pdf
[30] https://www.csu.edu/cerc/researchreports/documents/GuideToFloodProtectionNortheasternIllinois2006.pdf

electrical wiring—causing conditions favorable for a fire. Moreover, fire equipment may not be able to reach a burning building during high water events.

Health: Three general types of health hazards accompany floods. The first comes from the water itself. Floodwaters carry whatever was on the ground that the runoff picked up, including dirt, oil, animal waste, and lawn and industrial chemicals. The water can be a breeding ground for bacteria, such as E. coli, and other disease-causing agents.

The second type of health problem comes after the water is gone. Stagnant pools become breeding grounds for mosquitoes, and wet areas of a building that have not been cleaned breed mold and mildew. A building that is not thoroughly and properly cleaned becomes a health hazard, especially for small children, the elderly, and those with compromised immune systems.

Photo Credit: https://www.lsuagcenter.com/articles/connected/avoiding-mold-hazards-in-your-waterdamaged-home

Health problems can be aggravated when heating ducts in a forced-air system are not properly cleaned after flood inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants.

The third health problem is the long-term psychological impact of having been through a flood and seeing one's home damaged and irreplaceable keepsakes destroyed. The cost and labor needed to repair a flood-damaged home put a severe strain on people, especially the unprepared and uninsured. There is also a long-term problem for those who know that their homes can be flooded again. The resulting stress on floodplain residents can take its toll in the form of aggravated physical and mental health problems.

Photo Credit: nola.com

For all these reasons, repetitive flooding has an impact on people that a flood insurance policy will not prevent and/or provide full compensation.

3-4 SUMMARY

According to flood insurance data, some areas in New Orleans have flooded every year since the claims data became available in 1978. Flood insurance policyholders in the city have submitted over 124,000 claims. Fifty-eight (58%) of

those claims were for damage caused by Hurricane Katrina and are not reflective of the more common shallow, repetitive flooding.

There have been four causes of flooding: levee failure, storm surge, heavy local rains, and rain aggravated by pump failure. Levee failure and storm surge have caused flooding, but not repetitive flooding, so this repetitive loss area analysis focuses on flooding caused by rain. Based on claims for floods other than Katrina, the average claim has been a little over $10,000. However, flooding impacts people and property in ways that an insurance claim cannot compensate. There is property damage that flood insurance does not cover, there are life safety hazards, and there are health and mental health impacts from flooding. These impacts are worsened when flooding is more common, or repetitive.

CHAPTER 4 FLOOD CONTROL MEASURES

The most popular way to deal with repetitive flooding is to control the water – to keep it away from people and property. This is called flood control and is the subject of this chapter. The other approach focuses on structures with the goal to modify a building so flooding does not create a problem. The latter approach is covered in Chapter 5 Building Protection Measures. Levees, dams, and reservoirs are the most common flood control measures across the nation. They are appropriate and cost-effective for larger flood problems, such as overbank flooding from a river and storm surge from the ocean or a lake. As noted in the previous chapter, New Orleans' repetitive flood problems are caused by more frequent heavy storms rather than the less frequent major disasters like the failure of a levee on Lake Pontchartrain or the Mississippi River. Therefore, this chapter focuses on flood control measures that are part of the system that handles rain and runoff – the City's drainage system.

4-1. THE DRAINAGE SYSTEM

New Orleans' topography is very flat and much of the land is below sea level. It takes a major effort to collect stormwater runoff and pump it up and out of the levee-enclosed "bowl." Managing the city's drainage system has been key to development in New Orleans. The lowest areas between the Mississippi River and Lake Pontchartrain were not developed until adequate drainage was provided (or the houses built there were elevated well above flooding levels). The better the drainage, the less likely there will be repetitive flooding, at least from the smaller, more frequent storms.

Responsibility for the city's drainage system is shared by two agencies:

- → **The Department of Public Works (DPW)** handles drainage pipes smaller than 36 inches. These smaller pipes generally run along streets to collect stormwater runoff and discharge it into the part of the system managed by the Sewerage and Water Board.
- → **The Sewerage and Water Board (S&WB)** handles the system that collects water from the smaller pipes and conveys it through larger pipes or canals to the pumping stations that pump the storm water to the other side of the levee.

The following is taken from the S&WB's website[31],

> *Because the river levees are higher than the lake levees, most rainwater is pumped into Lake Pontchartrain.*
>
> *There are 24 drainage pumping stations, collectively housing 120 drainage and constant-duty pumps. While drainage pumps are activated to mitigate rain and flooding, constant-duty pumps work to regulate the amount of water in New Orleans drainage canals on any given day. Stations are staffed or monitored by experienced personnel who are on duty 24 hours a day, seven days a week.*

[31] https://www2.swbno.org/history_drainage.asp

There are 12 smaller underpass stations that automatically turn on in response to rising water. These pumps are checked regularly each week and monitored by field personnel during rain events.
The S&WB's drainage network includes approximately 90 miles of open canals and 90 miles of subsurface canals. Many of the subsurface canals are large enough to drive a bus through.

Figure 4 shows how the system works for a part of the Gentilly district:

- → The stormwater runoff flows over yards to the streets.
- → The streets direct the water to drainage pipes that run under the streets (grey lines). These are maintained by DPW.
- → These pipes deliver the water to the larger pipes (green lines) and smaller canals (light blue lines) maintained by the S&WB.
- → The S&WB pipes and canals send the water to the major canals (dark blue lines).
- → All the water collected inside the leveed areas of the City eventually moves to a drainage pump station (red or blue dot) which pumps the water over the levee either directly into Lake Pontchartrain or into a canal that drains directly into the lake.

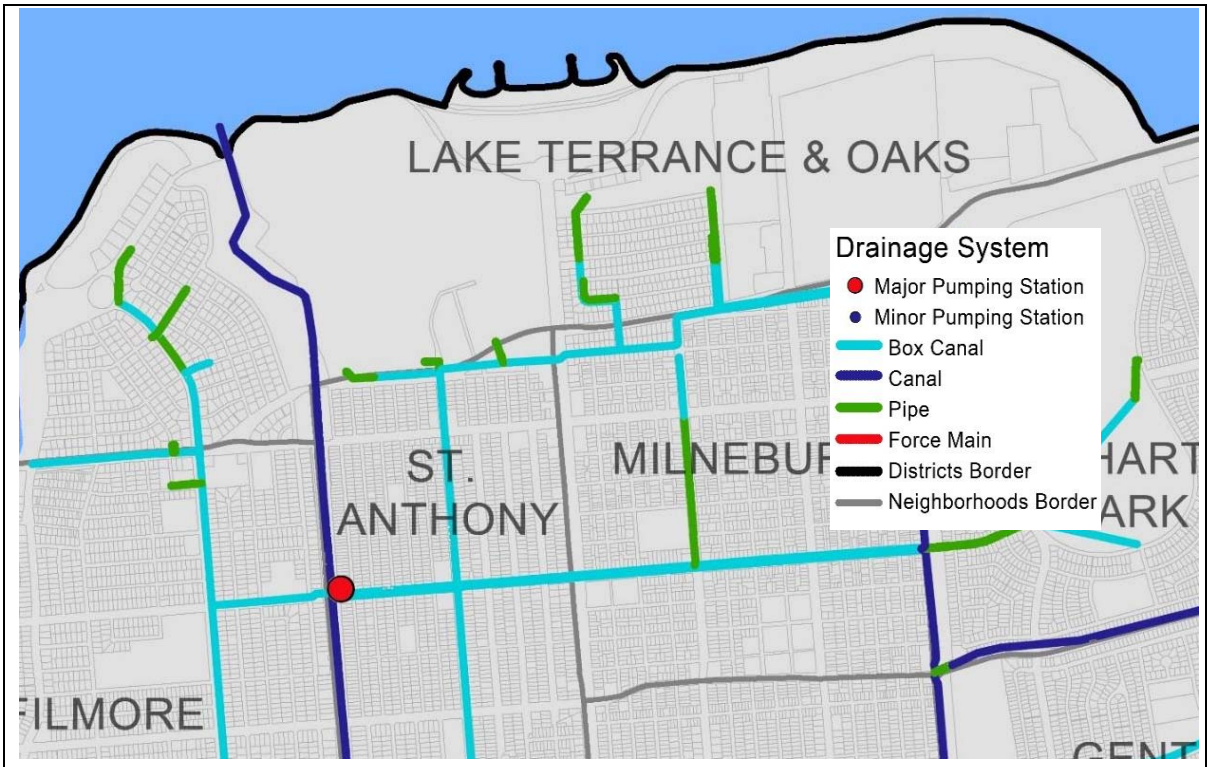


Figure 4 - Drainage System in Northern Gentilly; Source: Sewerage & Water Board

Figure 5 shows how the Sewerage and Water Board facilities cover the entire City. The drainage system handles rain, and the pumps are an integral part of the drainage system. The pipes, canals, and pump stations all need to work for the system to function. When one is plugged or stops working, a small amount of rain can cause flooding in the immediate area. According to an S&WB report prior to the Southeast Louisiana Urban Flood Control Program (SELA) drainage upgrades, the city's drainage system "was designed to manage a 2-year rain event." The SELA drainage system upgrades to major canals and pumping stations improve the capacity of the upgraded parts of the system to now be able to handle a 10-year rain event.[32]

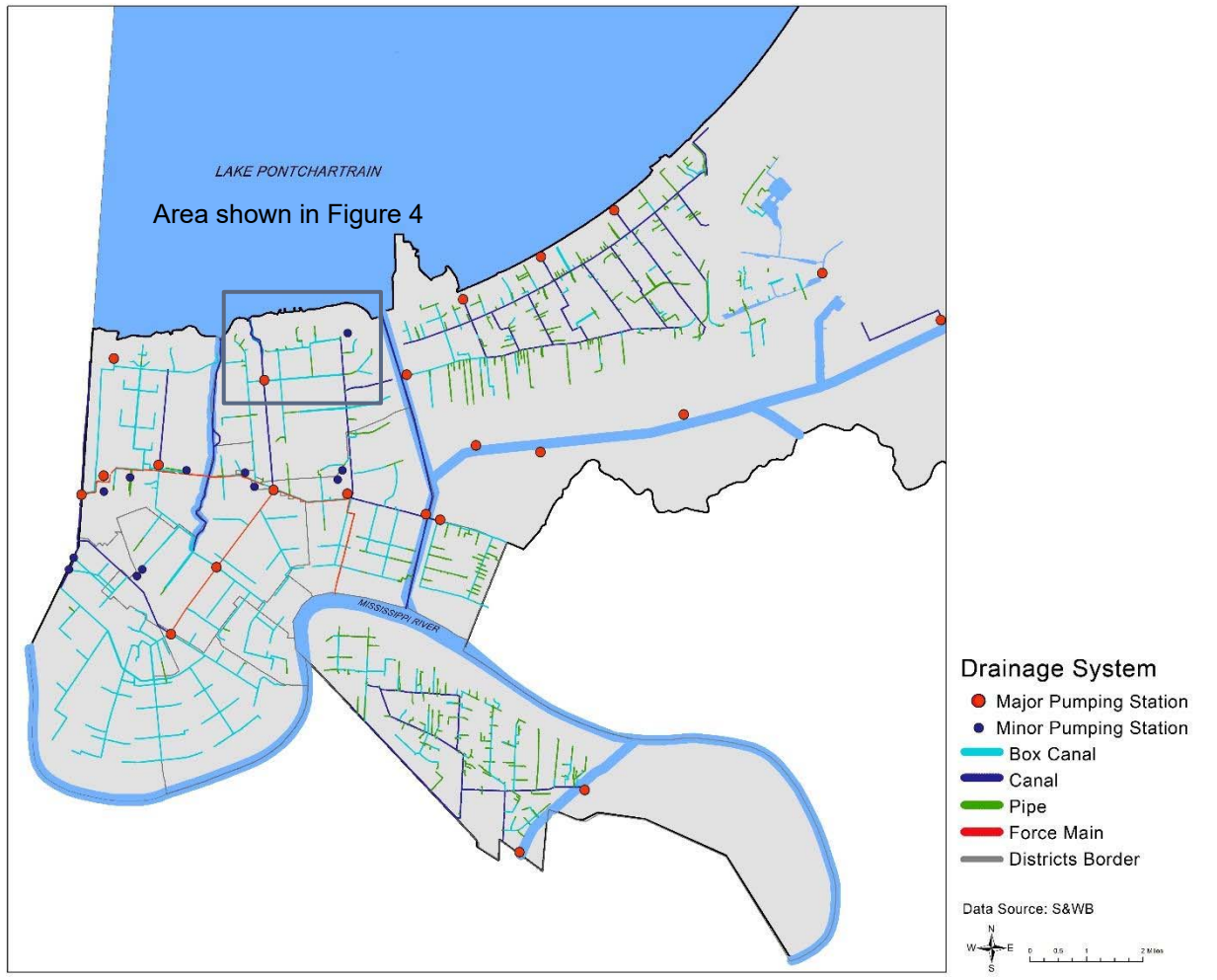


Figure 5 - Sewerage & Water Board Drainage & Pump Stations

[32]https://www.swbno.org/documents/Reports/July%2010%202019%20Rainfall%20Event%20Modeling%20Report.pdf

4-2. Drainage Improvements

The DPW and the S&WB have worked since their inception to improve the flow of stormwater out of developed areas. Currently, there are two citywide programs of improvement projects: large scale projects managed by the S&WB and the US Army Corps of Engineers and roadside projects managed by the DPW. The City of New Orleans has begun to implement a third type of project, Green Infrastructure, throughout the city. More details on these three improvement programs are provided in Chapter 6 for each repetitive loss planning district.

Major Projects: The Sewerage and Water Board manages the larger projects designed to handle the larger amounts of water from heavier rainfall events with an estimated capacity that can handle up to a 10-year rainfall event.[33] A 10-year rainfall event equates to approximately nine inches of rain over a 24-hour period in southeastern Louisiana. This means that the system can accept surface and street runoff that the DPW's underground system may not be able to carry, resulting in a better drainage system overall.

Most of these projects have been under the umbrella program called the Southeast Louisiana Urban Flood Control Program (SELA), which was authorized by Congress after the 1995 flood. SELA's federal funds are managed by the US Army Corps of Engineers. More information can be found at www.swbno.org/Projects/SELA.

SELA projects can be very large, as in the box culvert along Napoleon Ave (right). However, because there is so much run off in an urban area like New Orleans, even a large structure such as this is designed to handle only the 10-year rainfall.

Photo Credit: www.swbnosela.com/selaorleans/gallery.aspx?gallery=100

[33] Microsoft Word – July 10 Rainfall Event Modeling Report.docx (swbno.org),

There are 20 SELA projects completed or funded in the City and are shown in Figure 6. They include 16 major drainage lines or canals, adding pumping capacity to two pump stations, and building two new pump stations. Sixteen of these projects are complete (green in Figure 6) and four projects are under construction (yellow in Figure 6). SELA has received supplemental Congressional authorizations and appropriations which have led to additional projects.

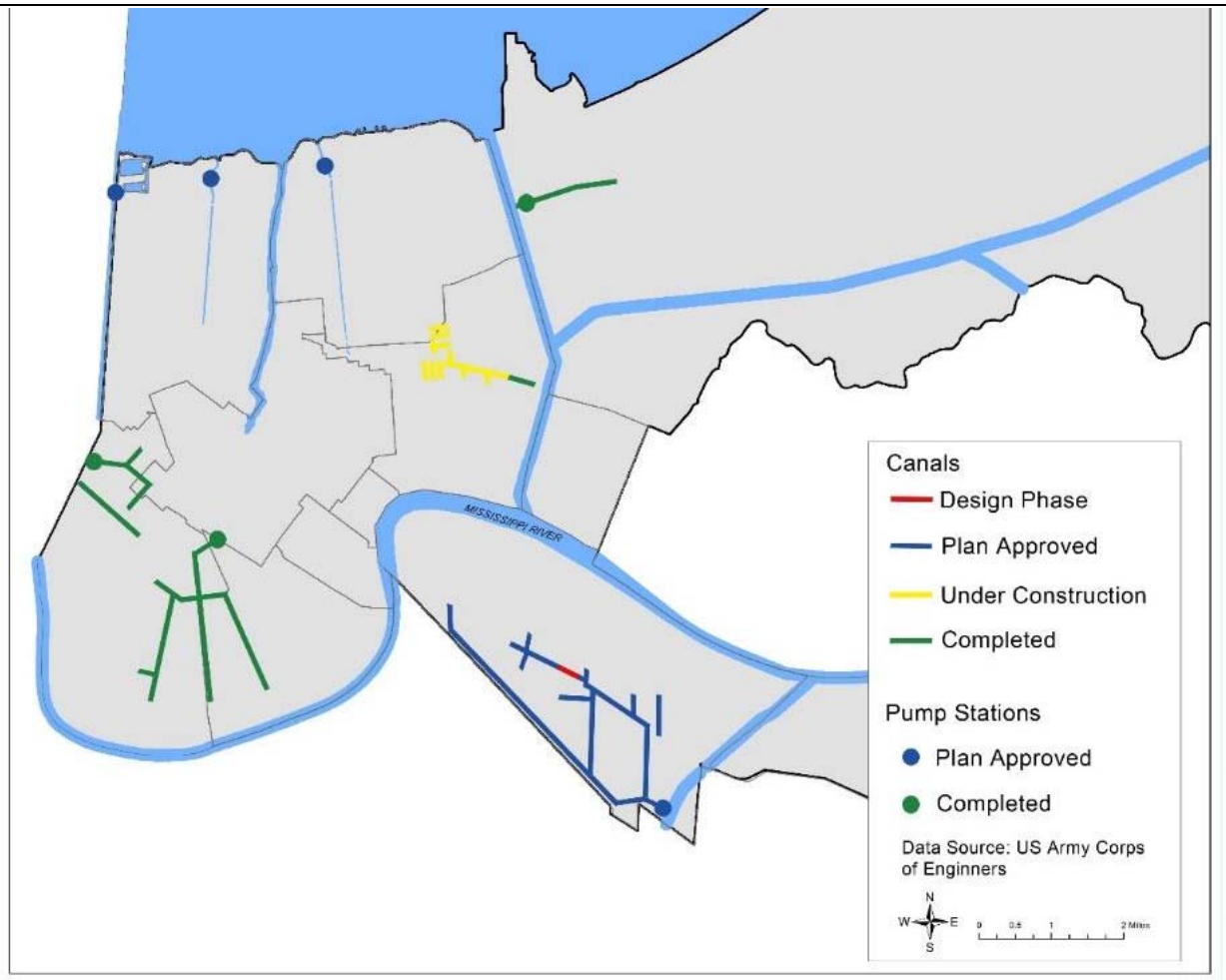


Figure 6 - SELA Projects in the City of New Orleans; Source: US Army Corps of Engineers

Roadside Projects: The DPW and S&WB are collaboratively working on a $2.3 billion project to restore the streets and adjacent drainage facilities throughout the City. The program will fund over 200 projects from a combination of local and federal funding sources. Federal funding sources include: $2 billion in funded projects in the form of FEMA subsidized roadwork from the Joint Infrastructure (JIRR) Program, $250 million from FEMA's Hazard Mitigation Grant Program (HMGP), and $141 million from the U.S. Department of Housing and Urban Development via the National Disaster Resilience Competition (NDRC). Local funding sources include the SWB

funded Sewer System Evaluation and Rehabilitation Program (SSERP) and City-funded projects from City of New Orleans bonds.[34]

These roadside projects are shown on the roadside drainage project maps for each Repetitive Loss Planning District in Chapter 5 Building Protection Measures.

Photo Credit: https://roadwork.nola.gov/types-of-repairs

Related to roadside improvements is catch basin maintenance. The City has a program to encourage residents to take care of the catch basin(s) that drain their properties. This is discussed later in this chapter.

4-3. Green Infrastructure

Local advocates of green infrastructure suggest that our current approach to flood prevention involves over reliance on a resource-intensive, outdated, and overburdened drainage system. In New Orleans rainwater is quickly captured, piped, and pumped out as rapidly and completely as possible by the city's extensive stormwater management systems. This leaves the ground unnaturally and unsafely dry, resulting in subsidence related damage to the built environment. Subsidence not only results in damaged streets and broken foundations, but also brings the city further below sea level, increases flood risk, and places an even greater burden on the pumping system.[35]

Green infrastructure advocates maintain that we should not solely rely on our current strategies of "pave, pipe, and pump", but embrace sustainable alternatives that "slow, store, and use". The benefits of sustainable techniques such as green infrastructure are that they hold water where it falls, slows the flow into the drainage system, and store large volumes for infiltration and repurposing.[36]

In short, green infrastructure projects rely on natural measures to handle drainage, such as letting the water soak into the ground in a rain garden. Not only is there less runoff from a property, the ground filters and cleans the water, improving water quality. An example is illustrated below.

[34] https://roadwork.nola.gov/about/

[35] Green Infrastructure - Sewerage & Water Board of New Orleans (swbno.org)

[36] https://gnoinc.org/initiatives/the-greater-new-orleans-water-plan/

Photo credit: https://ready.nola.gov/green-infrastructure

This open space area has been retrofitted to better store and filter stormwater.

Table 5 summarizes S&WB and NORA Green Infrastructure projects across each of the ten Repetitive Loss Planning Districts. Note that a significant proportion of green infrastructure projects are proposed throughout the city and demonstrate its continued commitment toward sustainable stormwater management measures.

Table 5 Green Infrastructure Projects[37]

NOLA District	Proposed Projects	S&WB Projects	NORA Projects
Gentilly	4	5	6
Lakeview	6	0	0
New Orleans East	13	0	1
Lower Ninth Ward	0	2	0
Algiers	11	1	0
Bywater	6	0	0
Mid-City	37	1	2
Uptown	13	1	1
Garden District	9	1	0
CBD/Warehouse	29	4	1
City Total	128	15	11

The Green Infrastructure Program has received special funding from several different sources. For instance, the city was awarded over $141 million through the National Disaster Resilience Competition (NDRC) organized by the U.S. Department of Housing and Urban Development to

[37] https://swbno.maps.arcgis.com/apps/webappviewer/index.html?id=5b824d4aeda94bf79c617cdab0de36cf

implement elements of its Gentilly Resilience District proposal and expand upon existing investments in urban stormwater management funded by the FEMA Hazard Mitigation Grant Program (HMGP). Later in March of 2018 the City of New Orleans officially amended Article 23 of the Comprehensive Zoning Ordinance with a new unified Stormwater Code located within Chapter 1, Section 121 of the Building Code. The new code contains requirements to protect the City's drainage system during construction, as well as post-construction stormwater management requirements for some projects. Specific provisions are granted for infrastructure in the newly adopted code. For more information regarding the stormwater code see[38]
In coordination with the S&WB and NORA, the City of New Orleans Office of Resiliency and Sustainability (ORS) is working to implement the Gentilly Resilience District Pilot Program which hopes to serve as a model for other neighborhoods across the city. Implemented green infrastructure programs and projects within the Gentilly Resilience District will contribute to improved health, economic opportunity, environmental education, and recreation.[39]
Below is a citywide map of current and proposed S&WB and NORA green infrastructure projects. It should be noted that this map does not include green infrastructure projects not implemented by the city or S&WB. There are also a number of nonprofit organizations throughout the city that have developed green infrastructure on the parcel scale, further promoting the city's adoption of green stormwater projects.

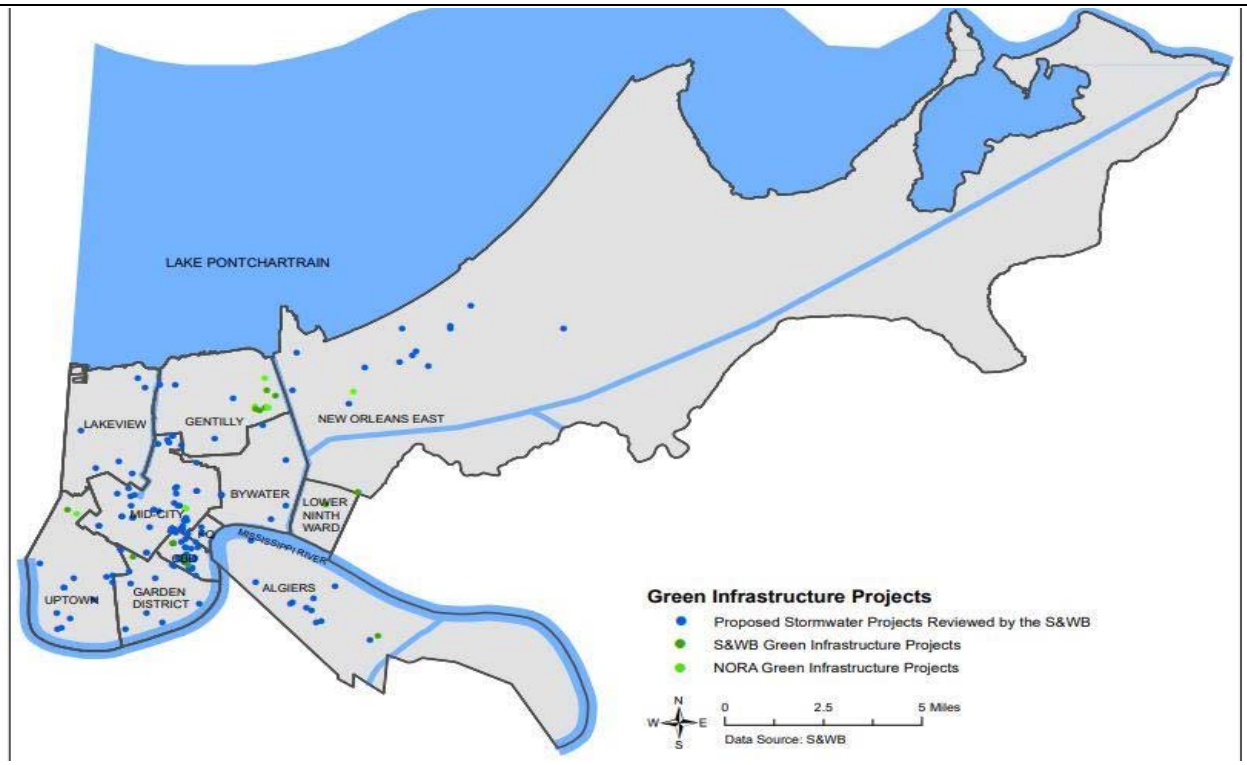


Figure 7 - Citywide S&WB & NORA Green Infrastructure Projects[40]

[38] https://nola.gov/safety-and-permits/stormwater-management/stormwater-management-for-development/
[39] https://nola.gov/resilience-sustainability/gentilly-resilience-district/
[40] https://swbno.maps.arcgis.com/apps/webappviewer/index.html?id=5b824d4aeda94bf79c617cdab0de36cf

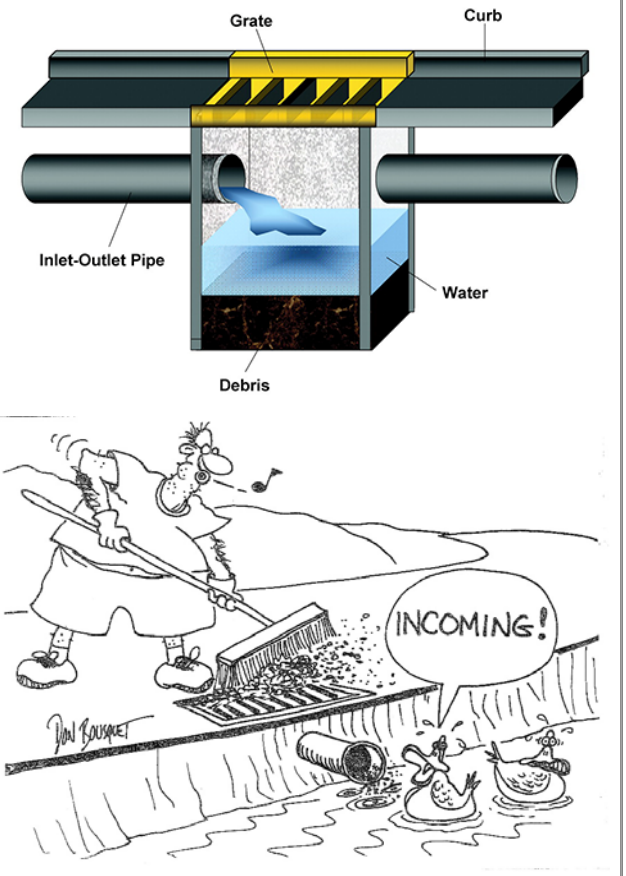
More detailed maps and more examples of Green Infrastructure projects are found in the in Chapter 6 Repetitive Loss District Summaries.

4-4. Catch Basins

The DPW roadside system collects the runoff from yards and street surfaces and drains it toward inlets at the curb. The inlets connect the surface drainage system to the underground pipes. These inlets are also known as catch basins because they have a pit below the pipe that catches debris (right).

The debris builds up over time and can obstruct the flows in the pipes. Therefore, cleaning catch basins is very important to making sure the drainage system works. It also reduces the amount of debris and pollutants that flow through the system to Lake Pontchartrain (below, right).
As noted on its website,

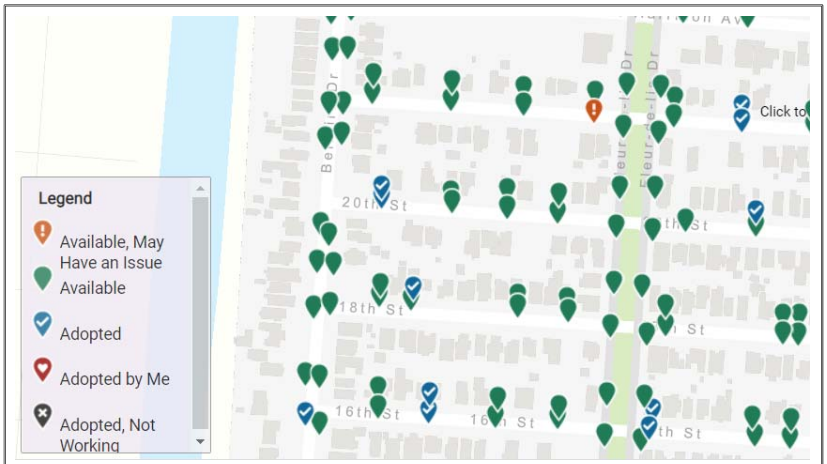
The Department of Public Works' maintenance department is responsible for cleaning and clearing catch basins of debris. There are 68,092 catch basins in the city. Each year the city budgets resources to clean approximately 3,500 catch basins. Residents can help keep catch basins clear of debris by disposing of leaves and other yard waste properly. Proper yard waste disposal includes placing leaves, sticks and twigs in garbage bags, tying the garbage bag closed, placing the garbage bags in city-issued receptacles, and closing the lid of the garbage can.[41]



Source: Information on Catch Basin Cleaning at https://roadwork.nola.gov/news/september-2018/clean-up-nola-adopt-a-catch-basin-cleaning-days/

[41] https://roadwork.nola.gov/news/september-2018/clean-up-nola-adopt-a-catch-basin-cleaning-days/

The Department has a formal "Adopt-a-Catch Basin" program that includes training and instructions on reporting problems. It includes a map of the city's catch basins, noting which are available for adoption (*Figure 9*).
Catch basin maintenance is most effective when it is a shared program – DPW is responsible and cleans the debris out of the pits of 3,500 of the catch basins each year.



Source: https://catchbasin.nola.gov/

Residents and businesses can help through the Adopt-a-Catch Basin program by cleaning debris from the grates and reporting problems to DPW, thereby preventing problems and freeing DPW staff to spend more time on problem areas.

More information on catch basin cleaning can be found at:
https://roadwork.nola.gov/news/september-2018/clean-up-nola-adopt-a-catch-basin-cleaning-days/

4-5. Flood Protection Provided

FEMA's standard for flood protection is the base flood, also called the 1% or 100-year flood. The Corps of Engineers' standard for urban flood protection is even higher. New Orleans' levee system provides at least 100-year flood protection. As noted above, the large SELA projects are designed for the 10-year flood. Roadside, green infrastructure projects, and catch basin cleaning are designed for the 10-year or smaller, more frequent floods.

All these projects help with life safety and preventing property damage. Even a smaller project that prevents street flooding during storms that would not cause much damage to buildings reduces threats to drivers and pedestrians and damage to vehicles. However, a repetitive loss plan focuses on buildings, especially buildings that are, or could be, insured by the National Flood Insurance Program. Although a lower standard can be effective to protect buildings from smaller, more frequent floods, buildings should be protected from damage by the 100-year flood to meet city and FEMA standards for new construction,
Accordingly, most of the projects described above will not solve all of the City's flood problems. They are helpful, protect health and safety, make economic sense, and reduce the risk to some properties, but they are not large enough to provide protection to all buildings at risk of flooding. On the other hand, when completed, most will help reduce damage caused by repetitive flooding.

Therefore, if managing floodwater is not sufficient, it is important to look at the alternative – managing the buildings exposed to flood damage. That is the subject of Chapter 5 Building Protection Measures.

CHAPTER 5 BUILDING PROTECTION MEASURES

As noted at the beginning of Chapter 4, the most popular way to deal with repetitive flooding is to control the water by keeping it away from people and property. However, there are many situations where flood control or drainage improvements will not work or do not make economic sense. There is an alternative to controlling water: modify the affected property so the water does not cause a problem. This is the subject of this chapter - how to mitigate the impact of shallow, rain-induced, flooding on the buildings in New Orleans.
It should be noted that the city and property owners are not faced with an "either/or" decision. It is not a case of doing one or the other; both approaches should be pursued. Chapter 4 discussed the utility of drainage improvements on smaller, more frequent storms and the benefits of keeping streets open and protecting the most frequently flooded areas. Such work should be continued.

However, most repetitive loss properties and most of the other buildings in New Orleans are not flooded by small frequent storms. Some parts of the city are flooded by the larger rainstorms that occur every two or three years and that overwhelm different sections of the drainage system. Building protection measures would be most useful for these properties. Chapter 5 reviews the options for the most common building types found in the city: slab-on-grade and elevated foundations. This chapter also includes a section on flood insurance, which should always be considered because no measure is foolproof, and the next flood could be higher than design levels.

5-1 BUILDING PROTECTION MEASURES

There are seven general approaches to mitigating the effects of flooding on a building. Except for acquisition and/or elevation, none of these measures would protect a building from a levee failure flood, such as that which occurred during Hurricane Katrina. These measures are designed for shallow, slow moving, flood waters.
In all cases, property owners should contact the City of New Orleans Department of Safety and Permits to verify if a permit is needed before they begin a building protection project. Call 504-658-7200 or e-mail permitinfo@nola.gov. Permit applications can be submitted online via the City's One Stop Shop.

1. Acquisition/relocation: The ultimate solution to repetitive flooding is acquisition/relocation, which involves demolition or moving the building to higher ground, out of the flood hazard area. This measure is not included in this analysis for two reasons. First, it is only useful if the owners have a place to relocate. Because the entire City of New Orleans is considered a floodprone area, there is no high ground or flood-free location on this side of Lake Pontchartrain. Second, acquisition/relocation is only cost-effective in areas of deeper or high velocity flooding. As described in Chapter 3, that is not the flood hazard addressed in this repetitive loss area analysis.

2. Mitigation Reconstruction: This approach is followed when a building is not in good condition and is not worth the cost of elevating or retrofitting. The building is torn down and a new one is constructed on site. As a new building, it must meet all flood and building code standards in force at the time. In effect, the owner obtains a new home, and the community replaces a damage-prone house with one that meets all the building protection criteria. Mitigation reconstruction was used after Hurricane Katrina under the name "demo rebuild." At that time, it was a new experiment for federal funding programs. It has since become more widely accepted as an appropriate building protection measure.

Advantages of mitigation reconstruction:

- → best protection short of removing the building from the flood hazard area
- → Replaces a substantially damaged structure with one that meets code requirements
- → Reduces flood insurance premiums
- → eligible for most mitigation grants

Disadvantages of mitigation reconstruction:

- → can be expensive. It may be difficult for the owner of a building in disrepair to afford a new residence.

3. Elevation: Raising the building above the flood level on its existing site is considered the most effective approach short of removing the building. Portions of the building (and its contents) that are most at risk are high and dry during a flood, which flows under the building instead of into it.

	
This older home in the Freret neighborhood was elevated one story above grade.	This house in the Fairgrounds was elevated a full story above grade.

If a residential building located in the Special Flood Hazard Area is substantially improved or substantially damaged, the city's ordinance and National Flood Insurance Program regulations require the building to be elevated above the base flood elevation (see "Terminology" and "City Code Requirements," next page).

Building Protection Terminology

Flood Insurance Rate Map (FIRM): The map published by FEMA that identifies the Special Flood Hazard Area (SFHA) and provides other information for insurance rating and regulating new construction. New Orleans' FIRM can be found at LSU's FloodMaps Portal at https://lsuagcenter.com under "Services."

The FIRM for the area south of the University of New Orleans and east of the London Avenue Canal is shown to the right. The SFHA is shown in blue. Per the FIRM, the low parts, such as the streets, are the first to flood.

Special Flood Hazard Area (SFHA): The area mapped on the FIRM as subject to the base flood (also called the 1% chance or 100-year flood). It is the blue area on this map from LSU. On older maps, it is the shaded area designated with the letters "A" or "V" on the FIRM. "V" Zones are found along large bodies of water, like Lake Pontchartrain, and designate damaging wave action. The unshaded areas are "Zone X," outside the SFHA.

Properties in the SFHA are subject to development and construction regulations that are explained in Section 7. The SFHA is also the area where Federal law requires that flood insurance be purchased as a condition of Federal aid (including mortgages from federally regulated or insured lenders).

Base Flood Elevation (BFE): The elevation of the base flood in relation to sea level. In the example from the City's FIRM above, the BFE for the canal is "3," meaning 3 feet above sea level. "EL -1" means the BFE is one foot below sea level. There is no BFE provided in Zone X, outside the SFHA.

City Code Requirements: The City's flood rules are in Chapter 4 of the City's Code of Ordinances. Most of the rules are required as a condition of participating in the National Flood Insurance Program. The relevant rules are summarized in Section 4...

Substantial damage refers to "damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred." – City Code, Section 78-55 (45)

Substantial improvement is "any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before start of construction of the improvement. This term includes structures which have incurred substantial damage, regardless of the actual repair work performed." – City Code, Section 78-55 (46)

Minimum elevation required: "(a) The lowest floor elevation of new residential and non-residential construction and substantial improvements must, at a minimum, be elevated to one foot above the BFE as determined by the FIRM adopted by this article, or three feet above the highest adjacent curb (in the absence of curbing, three feet above the crown of the highest adjacent roadway), whichever is higher." – Section 78-81(a)

Depending on the foundation type, elevation can also be the most expensive measure. Most 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 elevate two feet. Elevation is usually most cost-effective for wood frame buildings on posts/piles or crawlspaces because it is easiest to get lifting equipment under the floor and disruption to the habitable part of the house is minimal. Elevating a slab house is more costly and disruptive.

Advantages of Elevation:

- → best protection for a building left on site
- → will bring a substantially damaged structure up to code requirements
- → can reduce flood insurance premiums
- → eligible for most mitigation grants
- → many knowledgeable contractors in the area

Disadvantages of Elevation:

- → can be expensive, especially for slab foundations (e.g., > $100,000)
- → area below the elevated floor must remain open and floodable (see "wet floodproofing" below)

4. Barriers: Small floodwalls, levees, or berms constructed around one or more properties are more dependable if flood depths are less than two feet and floodwaters rise and fall quickly. Levees and berms are more suitable for larger lots, and small floodwalls that are located close to the house are appropriate for urban neighborhoods with limited front and side yard space. The following provisions need to be considered in the design of a barrier:

- → Do not locate the barrier along a property line. It may divert floodwaters to the neighbor's property and invite a lawsuit.
- → Openings in the barrier, such as in the photo above, must be closed during a flood. Generally, this requires "human intervention," meaning someone needs to be available and have enough time to place sandbags or a moveable gate in the gap.
- → A system may be needed to prevent sanitary sewer backup from flowing into the building.
- → If floodwaters remain for several hours or days, internal drainage provisions are needed to manage seepage under the barrier. The more permeable the soil, the more floodwaters seep under the barrier. It is important to have a soil sample checked by an engineer to determine the rate of permeability. If the soil is not too permeable, seepage can be handled with a sump pump (in the below example).

Internal drainage provisions include:

- a system of drain tile (perforated pipes) that collects water that falls or seeps into the protected area and sends it to a collecting basin or "sump,"
- a sump pump to send the collected water outside the barrier, and
- power to operate the sump pump around the clock during a storm.

Photo Credit: UNO-CHART

When flooding is very shallow, a barrier may only be needed to keep water away from a low area. This owner in Jefferson Parish built a floodwall around the patio at the back of his house. The opening allows people to step over the wall, so the project does not require human intervention.

Photo Credit: UNO-CHART

This house on the West Bank of Jefferson Parish is surrounded by a low concrete floodwall. Water that seeps under the wall is collected and pumped over by a sump pump. This arrangement has worked during several repetitive floods. However, in 2005, the power went out during Hurricane Katrina and the pump did not work, resulting in some water damage to the building.

<u>Advantages of Barriers:</u>

→ lower cost; a berm of earth can be built by the owner

<u>Disadvantages of Barriers:</u>

→ will not fit on small lots with no room to set the barrier back from the property line

→ if human intervention is needed, there needs to be someone available on short notice to close openings, etc.
→ will not bring a substantially damaged structure up to code requirements
→ does not reduce flood insurance premiums
→ not eligible for most mitigation grants

5. Dry floodproofing: This technique involves making the building walls watertight and capable of withstanding water pressures. In effect, the walls and floor are the barrier to water. Therefore, it only works for a building with a waterproof floor, i.e., a building on a slab foundation.
The following provisions need to be considered in a dry floodproofing design:

→ Make sure there are no cracks in the slab.
→ Make the walls watertight. This is easiest to do for masonry walls. The walls can be covered with a waterproof sealant and with a brick or stucco veneer to camouflage the sealant (below, left). Houses with wood, vinyl, or metal siding need to be wrapped with plastic sheeting to make the walls watertight, and then covered with a veneer to protect the plastic sheeting.
→ Account for sewer backup and other sources of water entering the building. For shallow flood levels, this can be done with a floor drain plug or standpipe; although a valve system is more secure.


Floor drain float plug



Photo Credit: UNO-CHART
This home in Denham Springs has thin facing brick placed over the waterproofing materials. When this steel gate is closed, the gaskets seal the opening to the door.

→ Provide closures, such as removable shields or sandbags, for the openings, including doors (below, right), windows, dryer vents, and weep holes.
→ Do not attempt to dry floodproof more than 2 – 3 feet above the slab. Even if the building is in sound condition, tests by the Corps of Engineers have shown that water pressure on a typical house can collapse the walls and/or buckle the floor.

→ Not all parts of a structure need to be dry floodproofed. It is difficult to floodproof a garage door, for example, so some owners allow the garage to flood and floodproof the walls between the garage and the rest of the house. Appliances, electrical outlets, and other damage-prone materials located in the garage should be elevated above the expected flood levels (see example, page 56).

Advantages of Dry Floodproofing:

→ lower cost
→ does not divert water problems to the neighbors
→ will bring a substantially damaged, **non-residential** structure up to code requirements
→ can reduce flood insurance premiums for a **non-residential** structure
→ eligible for most mitigation grants for **non-residential** buildings

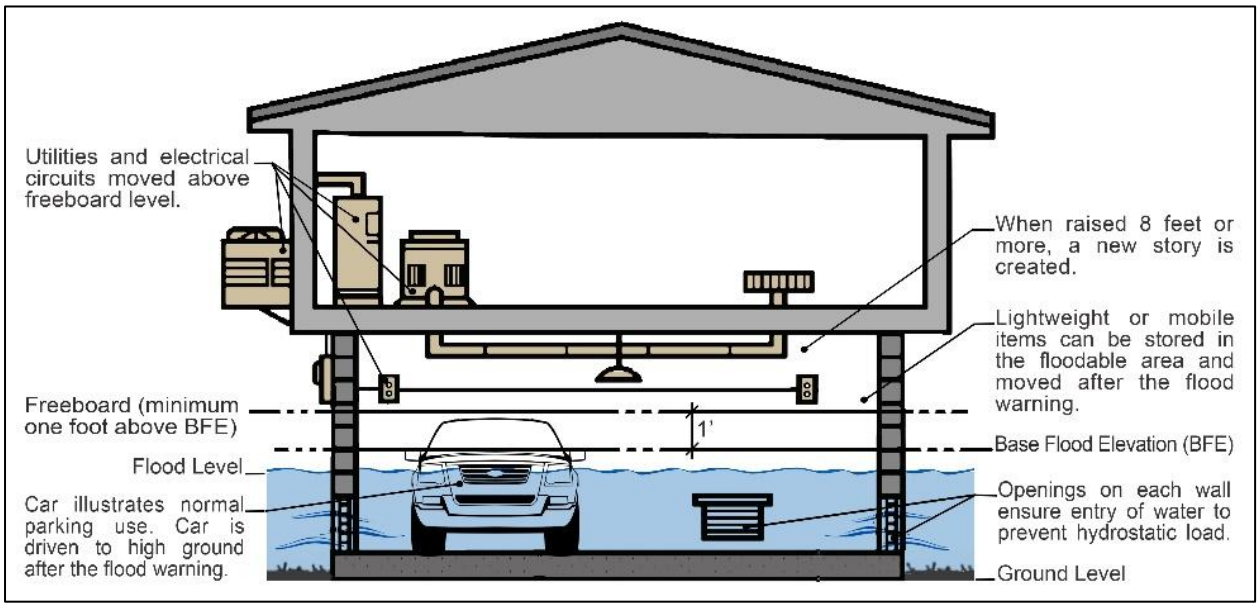
The owner of this house sealed the walls with concrete and built a short, sealed brick wall to keep water out of the garage.

This home in Jefferson Parish has permanent shields sealing the space under the windows.

Disadvantages of Dry Floodproofing:

→ not effective for elevated buildings or buildings on crawlspaces
→ if human intervention is needed, there needs to be someone available on short notice to close openings, etc.
→ will not bring a substantially damaged residential structure up to code requirements
→ does not reduce flood insurance premiums for a residential building
→ not eligible for most mitigation grants for residential buildings

6. Wet Floodproofing: The wet floodproofing approach allows water into the building. Items that could be damaged by a flood is removed or elevated above the flood level. Structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace and water heater are permanently relocated to a higher level.



Wet floodproofing only works for two types of buildings:

→ buildings with a second floor; there must be a level above the flooded area for everything that needs to stay dry

→ Elevated buildings and buildings on crawlspaces with furnaces, ductwork, or other utilities below the first floor; in these cases, the area below the first floor is wet floodproofed.

The following provisions need to be considered in a wet floodproofing design:

→ If items are kept or stored in the floodable area, there needs to be adequate warning time to remove damageable contents.

<u>Advantages of Wet Floodproofing:</u>

→ no matter how little is done, flood damage is reduced

→ lower cost

→ does not divert water problems to the neighbors

→ because the building will effectively be an elevated structure, wet floodproofing has these same benefits as elevation:

- will bring a substantially damaged structure up to code requirements
- can reduce flood insurance premiums
- eligible for most mitigation grants for buildings

<u>Disadvantages of Wet Floodproofing:</u>

→ the owner loses what might be a finished floor; while the area can still be used, there should be no carpeting, furniture, insulation, and other materials subject to water damage that cannot be removed in time

Thousands of dollars in damage can be prevented by simply elevating appliances in a garage or raising an air conditioning unit on blocks, above the flood level.

7. Yard Improvements: There are several things a property owner can do to the yard to protect the building from drainage problems and reduce the property's flooding problems. These include:

→ Ensure that the rain that falls on the back yard has a route to the drainage system. This usually means a clearing or digging a channel along or inside the property line from the back yard to the street. In some cases, a pipe can do the job (below).


The owner of this house in Jefferson Parish improved the yard drainage by routing roof runoff and standing water to a pipe that runs straight to the street.

→ Periodically inspect the yard and drainage swale and clearing away debris or other obstructions to flow.
→ Periodically inspect the street and street drain inlets and clearing away debris or other obstructions to flow. This is covered in more detail in Section 4.4 Catch Basins.
→ Dispose of leaves and other yard waste properly so they do not get washed into the street inlets.

→ Installing green infrastructure measures to reduce the amount of runoff that leaves their properties. See also Section 4.3.

Advantages of Yard Improvements:
→ prevents flooding from smaller rains
→ low cost
→ identifies problems before they cause a larger flood

Disadvantages of Yard Improvements:
→ only addresses smaller, more frequent problems
→ does not reduce flood insurance premiums
→ difficult for residents with disabilities that make physical labor difficult

5-2 Recommendations by Foundation Type

This section looks at the eight major types of buildings in the city and identifies the building protection measures most appropriate for each. The types of buildings included in this section are (1) slab–on-grade, (2) elevated, (3) elevated three feet or less above grade, (4) elevated more than three feet, (5) elevated one story or higher, (6) raised basement, (7) large buildings, and (8) floors below grade. The recommendations listed here are the basis for the summary data on building protection recommendations listed at the end of each district report in Chapter 6.

In all cases, a structure should be examined by a professional to ensure that it is sound and will be able to withstand the stresses of the mitigation measure, such as elevating it several feet or expecting the walls to hold back static water pressure.

1. **Slab–on-grade:** This category includes traditional slab-on-grade foundations and buildings on pilings (driven to resist subsidence) with slab floors poured over the pilings. Both types of buildings can be quite expensive to elevate. In areas of shallow flooding less than two feet deep, other approaches make economic sense. The below photo shows an example of a slab-on-grade building type.

Photo Credit: Google Maps

First choice protection recommendation: Barriers – berms or low walls that are a foot higher than the highest flood experienced (other than Katrina).

Second choice: Dry floodproof the building to a foot higher than the highest flood experienced (other than Katrina). However, do not dry floodproof a house more than three feet above the slab. A house's walls are not built to withstand a lot of pressure from the sides.

This low floodwall does not have any openings, so it provides protection even if no one is home.

This dry floodproofed building in Mandeville had the walls waterproofed and removable shields placed in the windows.

2. Elevated: Most of the older homes in New Orleans were elevated when they were built. The traditional shotgun houses (right) and other structures were constructed on piers or columns at a foot or more above ground level. One of the reasons for this was to build the lowest floor above local drainage problems. Many of these structures are not damaged by shallow repetitive flooding because the water flows under the first floor.

Photo Credit: Eliot Kamenitz / The Times-Picayune Archive

More recently, houses have been constructed on crawlspaces where the lower area is enclosed by a wall. In either case, the foundation needs to be open with walls that have vents or flood openings. In both cases, there must be a way for water to automatically flow through the lower area to prevent water pressure from damaging the walls or supports.
For the purposes of this report, there are four variations of elevated foundations: elevated $\leq$ 3 feet above grade, elevated > 3 feet, elevated one story or more, and raised basements.

3. Elevated three feet or less above grade: The photo above shows an example of the many homes in New Orleans where the top of the lowest floor is three feet or less above ground level. The bottom of the floor joists would get wet from a flood that is two feet deep or more, likely causing damage to the structure.

First choice protection recommendation:
Elevating higher is the best approach to add additional protection to an elevated building with a floor close to the ground. If a building on a crawlspace or elevated foundation has flooded over the first floor, it is relatively easy to elevate it higher because it already has the right foundation and it is relatively easy to put the lifting beams under the first floor.

Photo Credit: UNO-CHART

If the building is on a crawlspace foundation, the walls may need to be retrofitted by installing flood openings within one foot of ground level.

Second choice: Even if flooding does not reach the floor joists of a crawlspace or elevated foundation, there may still be utilities, air conditioning compressors, and/or other appliances under the floor that experience damage. These can be relocated to wet floodproof the area as in the example below.
If the floor is close to the ground and there is room on the lot, a less expensive (but less dependable) option would be a barrier.

Wet Floodproofing: After a flood destroyed the HVAC utilities in this house's crawlspace, the owner elevated the air conditioning compressor and relocated the furnace and ductwork into the attic (right). The result was a wet floodproofed crawlspace.

4. Elevated more than three feet: In most cases, repetitive flooding has been shallow - less than three feet deep. Many houses have been built with the floor three feet or more above grade. In the last 15 years, many houses have been elevated to three feet above street level if they were substantially damaged by Hurricane Katrina flooding.

First choice protection recommendation: For the purposes of this report, buildings with the lowest floor three feet or more above grade are considered protected from repetitive flooding, unless they have experienced a deeper flood. If they have flooded to a deeper level (other than by Katrina), then elevating higher is recommended. Elevating higher is also recommended if the owner is concerned about non-repetitive flooding, such as another Katrina like event, in which case the building should be elevated one or more feet above the base flood elevation or the Katrina flood level, whichever is higher.

Second choice: If repetitive flooding has not reached the floor joists of a crawlspace or elevated foundation, there may still be utilities, air conditioning compressors, and other appliances under the floor that get damaged. These can be relocated to wet floodproof the area as in the example on the previous page.

5. Elevated one story or higher: Because the bulk of the cost of elevation does not increase dramatically for higher raises, many homes have been built or retrofitted so the living floor is eight feet or more above grade. This leaves a useable storage area for items that are not damaged by water, such as garden tools and hoses, and provides a lot more flood protection (as in the graphic on page 55).

Photo Credit: UNO-CHART

Protection recommendation: For the purposes of this report, buildings elevated a full story, or more are considered protected from repetitive flooding, unless they have experienced a deeper flood. However, there may be utilities, appliances, or stored items in the lower area subject to flood damage that should be elevated or otherwise protected.

6. Raised basement: These structures are unique to New Orleans. They were originally constructed in areas of the city with drainage problems. Their lowest habitable floors were built seven or eight feet above ground level so water problems would not reach the improved area. The lower area was intended to be flooded. Over the years, the city improved the drainage system, installed pumps, etc., and the drainage problems lessened. The owners converted their lower areas to a series of improved rooms. In some cases, the lower areas became apartments, providing the owners with an additional source of income.

Photo Credit: UNO-CHART

Even though they are not protected from shallow, repetitive flood damage, raised basements are included in the raised foundation category because the field data collection process cannot confirm if the lower area of a raised foundation building has been improved or modified. They look the same from the street. Generally, only the owners know which type of raised foundation they have.

First choice protection recommendation:
The most cost-effective approach for a raised basement house is wet floodproofing. Remove the carpeting, cabinets, furniture, appliances, etc. to ensure nothing remaining below the flood level will be damaged by water (right).


Photo Credit: UNO-CHART

There must be openings in the walls to allow water in, but there are insulated vents that remain closed (keeping the area warm or cool) and that open automatically when flooded. This choice returns the lower area to its original building condition.

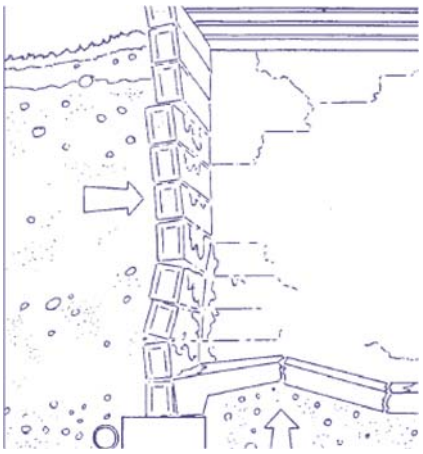
Second choice: If the owner cannot abandon the lower area, there are two options. If the flooding is deep and the owner wants to keep using the lower area, the building could be raised so the basement floor is above the flood level. A less expensive alternative would be appropriate if the flooding is shallow: treat the lower area as a building on a slab foundation and build a low barrier or dry floodproof the area.

7. Large buildings: Multi-storied businesses and apartment buildings are generally stronger than single family homes. Typically, they have been designed by an engineer and the owners have the finances to fund a thorough review of the structure and flood protection alternatives by an engineer or architect.
Most large buildings are built on slab foundations or pilings and have masonry walls; therefore, they would be treated the same as other buildings with slab foundations for protection from shallow flooding.


Photo Credit: University of New Orleans

First choice: A barrier, if there is room on the lot, is the first choice. An example is the floodwall on page 51.
Second choice: Dry floodproof the building to a foot higher than the highest flood experienced (other than Katrina). Note that a thorough structural engineering analysis is needed before dry floodproofing, especially if the building has a basement or similar area below ground level. While it looks like there is only two feet of water against the walls, a building with a basement may be facing ten or more feet of water pressure, as illustrated on the next page.

8. Floors below grade: These are called "basements" in other parts of the country. The lowest floor is below ground level on all sides. The likelihood of structural flood damage increases when the basement floor is deeper. Surface water saturates the ground. If the water is one foot deep on the surface, but the floor is six feet below grade, the building is faced with seven feet of water pressure. That can be enough to buckle walls and floors, especially block walls.



Floodwaters saturate the ground, putting water pressure on walls and floors. Deeper basement floors mean greater pressure.

This floor of this basement was eight feet below the flood level. It was buckled by water pressure.

First choice: The best approach to prevent structural damage is to equalize the water pressure on both sides of the walls and floor. This is done by letting the water in, i.e., wet floodproofing the area below grade.

Second choice: If the below grade area cannot be flooded, the basement can be dry floodproofed. This can be very expensive and is still risky. Several commercial and institutional buildings in Houston constructed dry floodproofed lower areas. The barriers buckled from the water pressure and water flowed in from above and through tunnels to other buildings, causing millions of dollars in damage.[42]

[42] https://www.uth.edu/news/story.htm?id=118ce093-32af-405a-ad1a-b2406f3517e8

5-3 Selecting a Building Protection Measure

This section reviews the process followed by UNO-CHART to identify the most appropriate building protection measures for the building review process explained in Section 3.3. The results are summarized in each district report in Chapter 6.

This process can also be used by readers to review their own buildings to identify which measures warrant further investigation. There are four steps:

Step 1. Is the building sound or not? If it is in poor condition, has a severely damaged foundation, or it will not hold up during elevation or withstand water pressures, then it is probably not worth the cost to both mitigate it *and* bring it up to a condition that meets safe and sanitary housing code requirements.

Step 2. If the building is in sound condition, determine the type of foundation and locate the lowest habitable floor for the building. The different foundation types are illustrated in Table 6 on the next page, with the arrows pointing to the lowest habitable floor for building protection purposes.

Step 3. Determine the repetitive flood depth, i.e., how high were past repetitive floods over the lowest habitable floor. The key factor is whether the repetitive flood levels have been more than two feet above the lowest habitable floor (> 2') or lower than two feet above the lowest habitable floor (≤ 2').

Note that for repetitive flooding, flood depth is not as deep as that experienced during Hurricane Katrina. Owners interested in protecting their buildings from a deep flood, such as Katrina, should elevate their building one or more feet above the Katrina level at the site or above the base flood elevation, whichever is higher (see the Mitigation Terminology box in Section 5.1).

Table 6 - Determining the Foundation Type and Lowest Habitable Floor

	**Slab-on-grade:** a concrete pad lies on the ground. The front door is typically less than a foot above ground level. The lowest habitable floor is the same floor as the front door.
	**Elevated:** If there are no walls around the lower area, the lowest habitable floor is the top of the first floor. If some or all of the lower area is enclosed, such as the garage to the left and the enclosure has

	vents like a crawlspace and water can flow into it, then the lowest habitable floor is the top of the second floor. If there are no vents or the lower area is improved, like a bedroom, treat this building as a slab on grade and the lowest habitable floor is the floor of the enclosure.
	**Elevated on a solid wall:** If there's a solid wall, and there are vents close to the ground to allow water to flow into the crawlspace, then the lowest habitable floor is the top of the first floor.
	**Raised basement** or other type of enclosure where the enclosure is furnished and used. There are no openings to allow water in. The lowest habitable floor is at ground level.

Step 4. Find the building type in Table 7 and select the line that reflects the type of walls and flood depth. The numbers under "Recommendation" are the 1st choice measure, 2nd choice, etc. If there is no number, then the building is considered mitigated against shallow, repetitive flooding, but not necessarily against a repeat of a Katrina level of flood.

Table 7 - Building Protection Selection Matrix

Building Type and Walls	Flood Depth[1]	Recommendation[2]						
		Reconstruction	Elevation	Barriers	Dry floodproofing	Wet floodproofing[3]	Flood insurance	Yard improvements
Dilapidated building	N/A	1					✓	✓
Slab-on-grade, stucco, block, or masonry walls	> 2'	2	1				✓	✓
	≤ 2'	4	3	1	2		✓	✓
Slab-on-grade, other types of walls	> 2'	2	1				✓	✓
	≤ 2'	3	2	1			✓	✓
Elevated foundation, lowest habitable floor more than three feet above ground level	N/A					1	✓	✓

Elevated foundation or crawlspace with vents, lowest habitable floor higher than past repetitive flood levels	N/A					1	✓	✓
Elevated foundation or crawlspace with vents, lowest habitable floor below past repetitive flood levels	N/A	3	1			2	✓	✓
Raised basement, stucco, block, or masonry walls	> 2'	3	2			1	✓	✓
	≤ 2'	5	4	1	2	3	✓	✓
Raised basement, other types of walls	> 2'	3	2			1	✓	✓
	≤ 2'	4	3	1		2	✓	✓
Large building	N/A	Requires individual on-site evaluation					✓	✓
Lowest floor below grade	N/A						✓	✓

1. "Flood depth" is the depth of past repetitive floods above the lowest habitable floor. ">2'" means that highest flood (other than Hurricane Katrina) was more than 2 feet over the lowest habitable floor (see Table 7 on locating that floor). Owners interested in protecting their buildings from a deep flood, such as Katrina, should elevate their building one or more feet above the Katrina level at the site.
2. Numbers under "Recommendation" are 1st choice, 2nd choice, etc.
3. Wet floodproofing measures are recommended for crawlspaces and other enclosed areas below an elevated floor. They include removing all items that could be damaged and installing openings to allow flood waters into the enclosed area to equalize water pressures.

5-4 Flood Insurance

Although not a measure that mitigates property damage from a flood, a National Flood Insurance Program (NFIP) flood insurance policy has the following advantages for the owner or renter:

This section only applies to policies sold under the National Flood Insurance Program. Insurance companies are selling private flood insurance policies. Check the fine print. Some have been canceled after the first claim payment.

- → Most of the 28 floods listed in Table 4 did not result in a disaster declaration. Flood insurance may be the only source of assistance to help owners of damaged property pay for cleanup and repairs.
- → A policy is always in effect − there is no need for human intervention.
- → A policy will cover damage caused by any flood. It is an excellent "backup" for a flood protection project where the flood is higher than the protection level.
- → Coverage is available for the contents of a building as well as for the structure.
- → Renters can buy contents coverage, even if the building owner does not buy coverage for the structure itself.
- → Owners of a policy on the structure may be eligible for funding for a building protection project after a flood through Increased Cost of Compliance (see page 67).

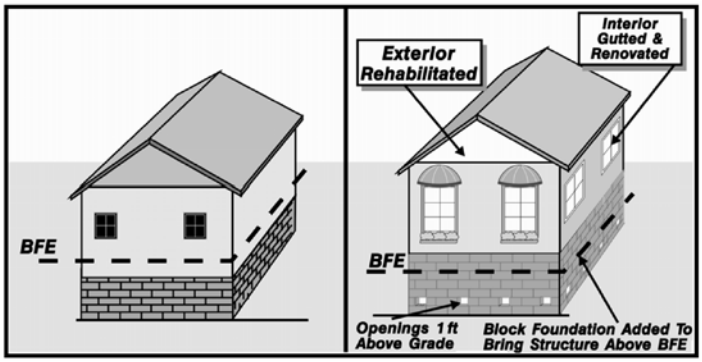
Premiums are increasing for all buildings, especially buildings that are not primary residences, repetitive loss properties, and those buildings constructed before the city joined the National Flood Insurance Program in August 1970.

Flood insurance premiums are based on several factors. The most important factor is how high the lowest floor is above ground level. The best way to reduce the cost of flood insurance is to elevate the building. Commercial structures that have been dry floodproofed can also benefit from lower premiums.

5-5 Regulatory Constraints

There are city ordinances that are designed to protect properties from flood damage and ensure that a developer or builder does not increase the flood hazard on neighboring properties. Some of these are required as a condition of participating in the NFIP. These regulations may restrict the owner's ability to implement a building protection measure.

The most important regulatory requirement is the substantial improvement requirement, also known as the "50% rule." If the cost of a project is more than 50% of the value of the existing building, then it will be considered a substantial improvement. A building that will be substantially improved must meet the same requirements as a new building.



After a flood, fire, or other damage to the building, if the cost to repair the building equals or exceeds the value of the building before the damage, then it is considered substantially damaged and the substantial improvement rule applies, too.

For a residence, this means that if a building protection or other building modification will be a substantial improvement or the building was substantially damaged, then the building must be mitigated using elevation, acquisition, or retrofitting/reconstruction. For a nonresidential building, dry floodproofing would be an additional allowable option. In both cases, the building must be protected to one foot above the base flood elevation or three feet above the highest adjacent curb, whichever is higher. Some historical buildings may be exempt.

If a building is elevated and the lower area is enclosed, there must be openings that allow water to flow freely into the enclosed area. The openings must be sized so that the total net open area has at least one square inch for every square foot of enclosed area.

These rules apply throughout the City. In V Zones, i.e., the coastal floodplains along Lake Pontchartrain and the eastern areas of the City on Lake Borgne, Lake Catherine, and the Gulf of Mexico, the added hazard presented by waves means:

- → Elevated buildings must be on pilings or columns,
- → The elevation requirement is measured from the bottom of the lowest horizontal structural member, whereas in A Zones it is measured from the top of the elevated floor,
- → Enclosing the lower area is not allowed unless it is done with breakaway walls, and
- → Barriers are not allowed.

It is recommended that property owners considering a building protection project or other alteration to their buildings review the regulatory requirements with the Department of Safety and Permits at 504-658-7200 or e-mail permitinfo@nola.gov.

5-6 Funding for Building Protection Projects

As noted in the review of the building protection measures, some can be expensive. There are three general sources of funds that might be available to help a property owner.

1. Federal Grants: FEMA has several programs that provide 75% of the cost of a building protection project. [43] The Building Resilient Infrastructure and Communities (BRIC) and the Flood Mitigation Assistance (FMA) programs fund acquisition, mitigation reconstruction, elevation projects, and some local drainage improvements. Dry floodproofing funding may be available for non-residential buildings. FMA is limited to properties that are insured by the NFIP. These funds are administered by the Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP).[44] Priority may be given to properties on FEMA's repetitive loss list. The city must apply for the funds with a list of projects and compete with other applications. In 2019, the city was awarded FMA funds to elevate 52 repetitively flooded houses.
The US Department of Housing and Urban Development's (HUD's) Community Development Block Grant (CDBG) program can also fund building protection projects. The city receives a designated amount each year. It does not have to compete with other communities, but mitigation competes with other city priorities for the use of the funds. Most recently the city was the recipient of over $141 million in Community Development Block Grant disaster Recovery (CDBG-DR) funding from (HUD) for the National Disaster Resilience Competition (NDRC) to fund urban water projects as part of the Gentilly Resiliency District. For more information see footnote.[45]

2. Post-Disaster Funds: If there is a flood or other disaster severe enough to warrant a federal disaster declaration, some additional building protection funding programs may be available. FEMA's Hazard Mitigation Grant Program allocates an amount to be managed by GOHSEP.[46] The city must apply for the funds and compete with other Louisiana communities.
There is a CDBG program to help communities and property after a disaster. [47]
The US Small Business Administration (SBA) makes disaster loans to individuals (not just businesses). The SBA can lend an additional amount to fund a building protection project. [48]

[43] https://www.fema.gov/hazard-mitigation-assistance
[44] https://gohsep.la.gov/GRANTS/RECOVERY-GRANTS/Hazard-Mitigation-Assistance/Hazard-Mitigation-Overview
[45] The City Of New Orleans (nola.gov)
[46] https://www.fema.gov/hazard-mitigation-grant-program
[47] https://www.hudexchange.info/programs/cdbg-dr/
[48] https://www.sba.gov/funding-programs/disaster-assistance

3. Flood Insurance: There is a special funding provision, Increased Cost of Compliance (ICC), in the NFIP for insured buildings that have been substantially damaged by a flood. ICC 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 elevation, relocation, demolition, and (for nonresidential buildings) dry floodproofing. It can also be used to help pay the owner's 25% share of a FEMA funded building protection project.
The building's flood insurance policy must have been in effect during the flood. This payment is in addition to the claim payment that would be made under the regular policy coverage, if the total claim does not exceed $250,000. Claims must be accompanied by a substantial or repetitive damage determination made by the floodplain administrator in the Department of Safety & Permits.[49]

[49] www.fema.gov/increased-cost-compliance-coverage

CHAPTER 6 REPETITIVE LOSS DISTRICT SUMMARIES

INTRODUCTION

This chapter provides detailed information for the nine repetitive loss planning districts and related neighborhoods. It does not repeat general information from the earlier chapters. There are three sections for each district:

1. The Repetitive Flood Problem facing the district is described, including the Flood Insurance Rate Map and flood insurance claims data. Background information on the repetitive flood problem for the whole City is provided in Chapter 1. Table 1 shows data on each district's repetitive loss properties and numbers of flood insurance claims. Each district has a similar table, broken down by neighborhood. The district's numbers may be compared to the same city-wide totals shown in Table 1.

Table 1 - FEMA Repetitive Loss Properties by District

Neighborhood	Buildings	Number	Percent	Number Claims	Pct. Of Buildings
Algiers	14,423	660	4%	8,933	62%
Bywater	10,507	470	4%	8,359	80%
Garden District	10,040	327	3%	5,695	57%
Gentilly	12,816	535	4%	15,352	120%
Lakeview	9,006	492	5%	10,601	118%
Lower Ninth Ward	3,5]69	202	6%	3,420	98%
Mid-City	14,925	692	5%	12,238	82%
New Orleans East	21,120	1,018	5%	24,686	117%
Uptown	18,440	1,840	10%	21,825	118%
City-wide total	114,846	6,236	10%	111,109	97%

Note: the number of claims is the number of claims submitted, including those closed without payment. The "city-wide total" does not include data for the French Quarter and CBD repetitive loss planning districts or for repetitive loss properties that could not be plotted on a map.

Table 2 is the city-wide version of the second table in each district summary, which reviews flood insurance claim payments for each neighborhood, both total and the non-Katrina share of payments. As reviewed in Chapter 5, the flood caused by Hurricane Katrina is not considered a repetitive flood. All other storm and flood events that resulted in flood insurance claim payments are included in what is counted as repetitive flood data.

Table 2 - Flood Insurance Claims Data by District

Neighborhood	All Claims			Without Katrina Claims				
	No. Claims	Claim Payments		Claims		Claim Payments		
		Avg.	Total	No.	Pct.	Avg.	Total	Pct.
Algiers	8,933	$8,589	$46,439,150	4,932	55%	$7,281	$28,257,455	61%

Bywater	8,359	$48,235	$329,445,142	3,721	45%	$9,036	$25,156,758	8%
Garden District	5,695	$36,523	$142,986,810	2,505	44%	$10,706	$20,522,665	14%
Gentilly	15,352	$81,853	$1,119,242,965	5,161	34%	$10,619	$41,882,364	4%
Lakeview	10,601	$139,130	$1,271,098,755	2,950	28%	$11,763	$26,771,634	2%
Lower Ninth Ward	3,420	$57,684	$167,975,472	1,401	41%	$5,495	$5,693,212	3%
Mid-City	12,238	$62,223	$658,071,262	4,430	36%	$11,667	$36,939,147	6%
New Orleans East	24,686	$99,088	$2,167,646,097	6,753	27%	$11,030	$51,056,255	2%
Uptown	21,825	$41,371	$747,242,329	12,928	59%	$8,409	$91,426,546	12%
City-wide total	111,109	$77,732	$6,650,147,982	44,781	40%	$11,910	$327,706,036	5%

Note: The number of claims include claims submitted, but not paid. The average and total payments are based on paid claims only. The "city-wide total" does not include data for the French Quarter and CBD repetitive loss planning districts or for repetitive loss properties that could not be plotted on a map.

2. Flood Control Measures include current and planned projects for the major drainage system, the roadside drainage system, and Green Infrastructure. Background information on these measures is in Chapter 4.
3. Building Protection Measures covers the types and conditions of the buildings in the district and its neighborhoods. This information helps determine which of the building protection measures described in Chapter 5 would be helpful. Each summary has a table similar to Table 3.

Table 3 - Building Data by District

District	No. Buildings	Percent Occupied	Percent Good Condition	Percent >1 Story	Type of Foundation		
					Slab	Elev ≤ 3 ft	Elev > 3 ft
Algiers	14,423	99%	95%	32%	70%	15%	15%
Bywater	10,471	96%	90%	20%	19%	37%	44%
Garden District	10,040	96%	97%	43%	19%	30%	51%
Gentilly	12,836	98%	94%	21%	42%	23%	35%
Lakeview	8,973	99%	99%	49%	39%	21%	40%
Lower Ninth Ward	3,504	91%	94%	14%	25%	32%	43%
Mid-City	14,925	96%	91%	28%	19%	27%	54%
New Orleans East	21,124	95%	96%	20%	83%	7%	10%
Uptown	18,440	98%	98%	42%	14%	28%	58%
City-wide total	114,736	97%	95%	30%	41%	22%	37%

Note: The number of claims include claims submitted, but not paid. The average and total payments are based on paid claims only. The "city-wide total" does not include data for the French Quarter and CBD repetitive loss planning districts or for repetitive loss properties that could not be plotted on a map.

Each summary also has a corresponding map like Figure 10, showing the building foundations. For the reasons described later in this chapter, these maps only include slab and elevated foundations.

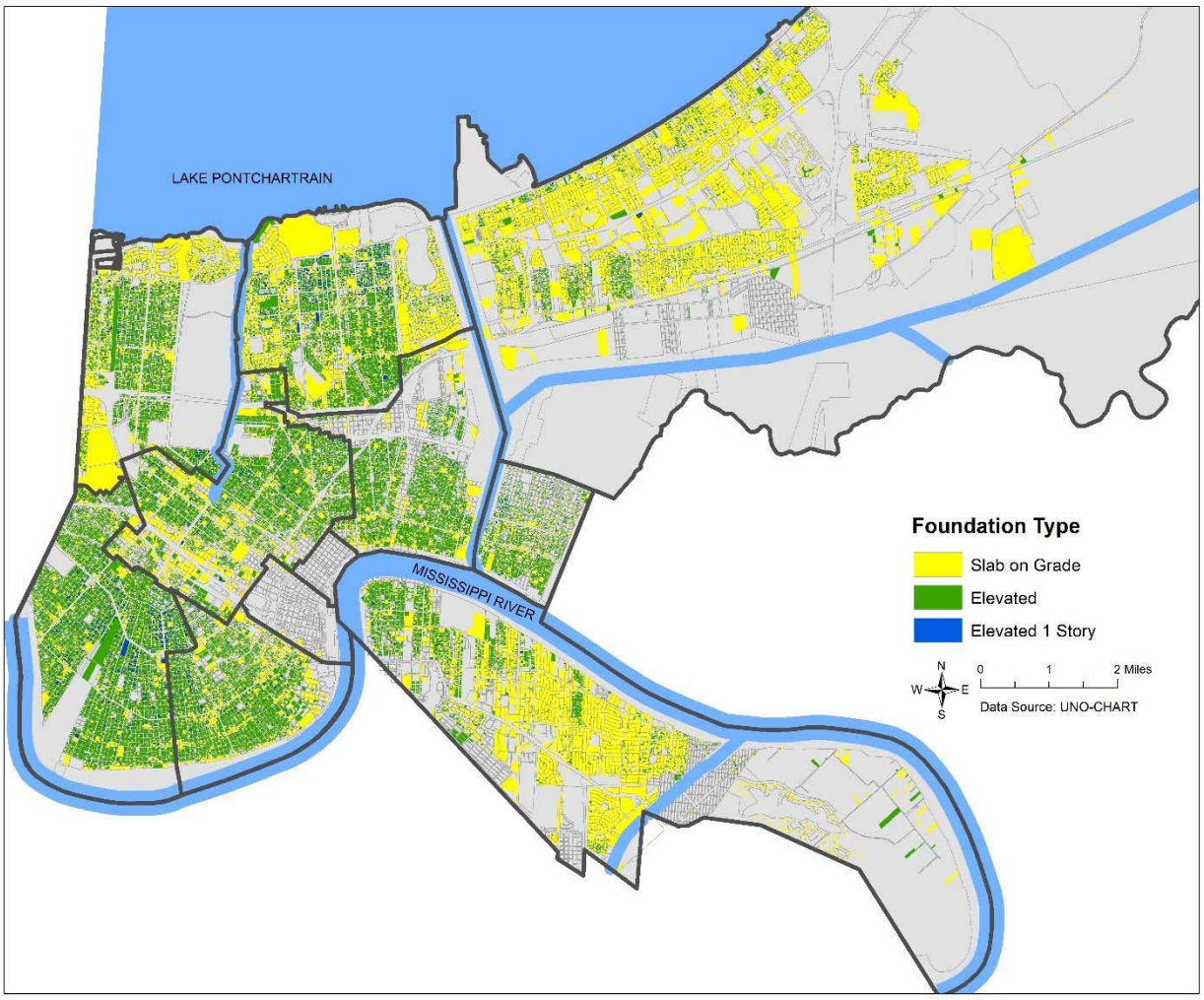


Figure 1 - City-Wide Foundation Types

Chapter 5, Section 5.2, introduced the foundation types that are appropriate for different building projection measures. Due to the different data collection approaches used, different information is available.

For example, the building analyses described in Section 1.3 looked at each building via photographs from the street. The reviewer could not tell if a building elevated one story on enclosed walls was a raised basement or an elevated building protected from flooding up to eight feet deep.
Here are how the building types discussed in Section 5.2 are addressed in the maps and tables in these district summaries:

Slab-on-grade: shown in the maps and the tables as "Slab."

Elevated three feet or less above grade: Shown in the tables as "Elev ≤ 3 ft" and included in the "Elevated" category on the maps.

Elevated more than three feet: Shown in the tables as "Elev > 3 ft," and included in the "Elevated" category on the maps.

Elevated one story or higher: Shown as a separate category in the maps, but not differentiated from raised basements. They are included in the numbers for "Elev > 3 feet" in the tables.

Raised basement: Not shown separately in the maps or tables. They are included in "Elevated 1 story" category in the maps and "Elev > 3 feet" in the tables.

Photo Credit: UNO-CHART

Home in the Gentilly District on a raised foundation, three feet above grade.

Large buildings: Buildings having four or more stories were counted as large buildings. They are typically included in the in the "slab" foundation category in the maps and tables. There are only 185 of these buildings outside of the Central Business District. There are no concentrations of them in any district, except on the few college campuses. Instead of selecting their protection measures using the method explained in Section 5.3, these buildings should have individual evaluations conducted by an engineer or an architect. Therefore, they are not discussed in this chapter's district sections.

Floors below grade: These could not be identified from the photographs taken from the street. They are not a separate category in either the maps or the tables. Generally, only the owner knows if there is a basement or other type of floor below grade.

Each district summary ends with recommendations. Each includes the recommendation that "Every owner of a building less than three feet above ground level should review their building protection measure alternatives."

The first step owners should take is to review the step by step review process in Section 5.3. Additional help, including a site visit, is available from the City's Department of Safety and Permits (504)658-7127.

1. ALGIERS

The Algiers Repetitive Loss Planning District is located in the southern part of the City on the west bank of the Mississippi River. It is bordered on the north by the Mississippi River, on the west and south by Plaquemines Parish, and on the east by St. Bernard Parish as shown in Figure 2.

The district has nine neighborhoods, which are also designated by the City's planning programs and are displayed in Figure 2.

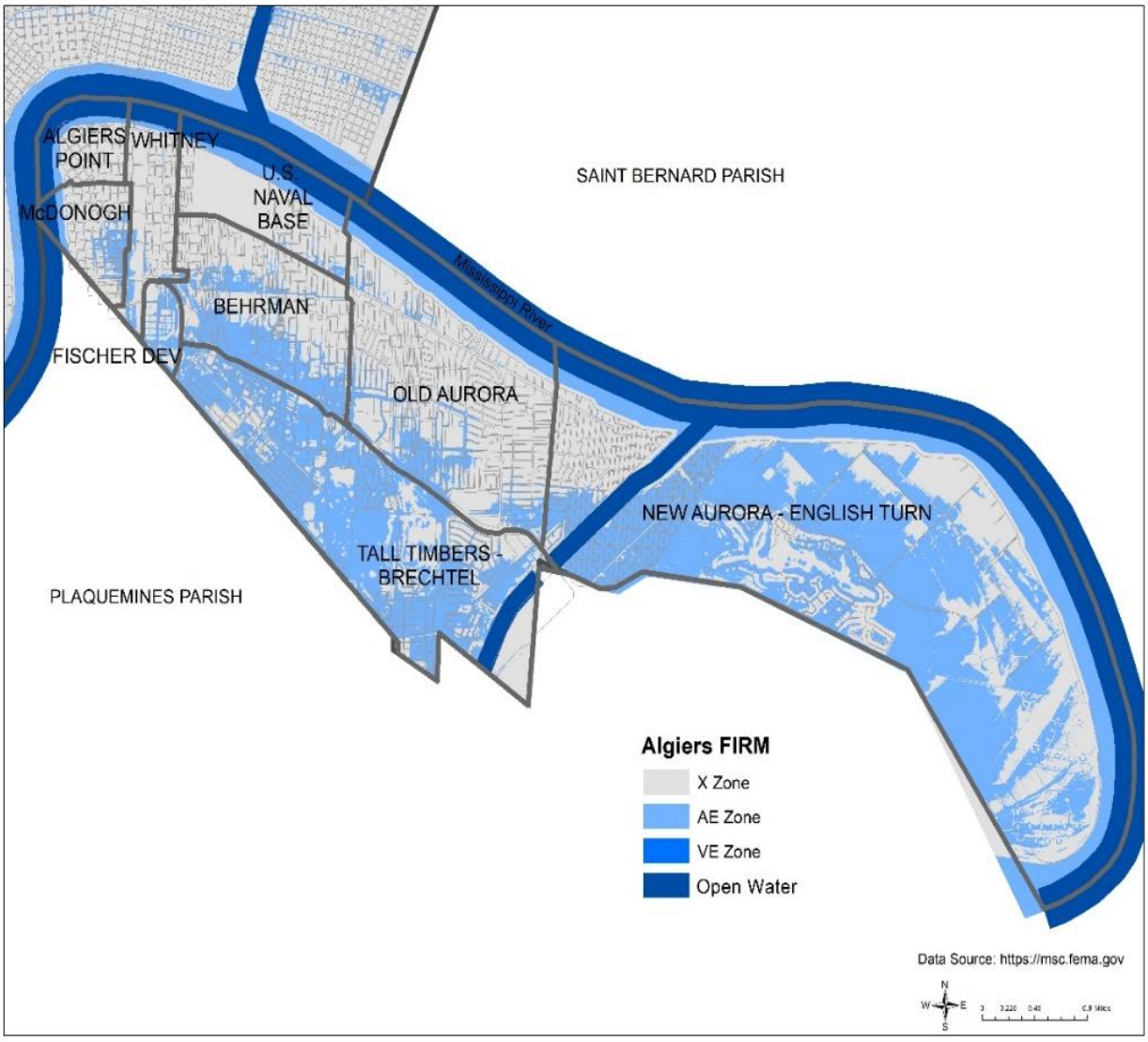


Figure 2 - Algiers District Flood Insurance Rate Map

The Repetitive Flood Problem

The flood zones on the FIRM are explained in the Mitigation Terminology page in Section 5.1. Per Figure 2, the Behrman, Tall Timbers – Brechtel, and New Aurora - English Turn neighborhoods have most of the District's higher flood risk areas (AE Zones).

Table 4 shows that of the 14,423 buildings reviewed in the district, 660 or 4%, have been officially listed by FEMA as repetitive loss properties. The neighborhoods with the most floodplain, Behrman, Tall Timbers – Brechtel, and New Aurora - English Turn, along Behrman and Fischer Dev, have the largest percentages of these properties.

Table 4 - FEMA Repetitive Loss Properties in Algiers

Neighborhood	Buildings	Number of RLs	Percent of RLs	Number Claims	Pct. Of Buildings with Claims
Algiers Point	834	4	1%	127	15%
Behrman	2,299	102	4%	1,284	56%
Fischer Dev	118	5	4%	102	86%
McDonogh	927	21	2%	281	30%
New Aurora - English Turn	1,717	74	4%	790	46%
Old Aurora	4,809	295	6%	3,769	78%
Tall Timbers - Brechtel	2,261	132	5%	2,171	96%
U.S. Naval Base	633	13	2%	214	34%
Whitney	825	14	1%	195	24%
District Total	14,423	660	4%	8,933	62%

Note: the number of claims is the number of claims submitted, including those closed without payment

Table 4 also shows numbers and percentages of buildings and claims. Because the number of buildings in the neighborhoods range from 118 to 4,809, it is more relevant to compare percentages. Of the 14,423 buildings reviewed in the district, 660 or 4% have been officially listed by FEMA as repetitive loss properties. The Old Aurora neighborhood has the highest percentage of repetitive loss properties, but it is only one or two percent higher than others. While 4% of the buildings in the district have been designated as repetitive loss properties, many more buildings have been flooded, resulting in 8,933 flood insurance claim payments between 1978 and 2018, the period for available data. In Tall Timbers – Brechtel, there have been almost as many claims (2,171) as there are buildings (2,261). Fischer Dev and Old Aurora also have a high percentage of claims to the number of buildings (86% and 78%, respectively). These three neighborhoods have larger floodplain areas than most of the other neighborhoods. High claim counts are likely related to having mapped AE Zone floodplains. Mapped floodplains tend to have (1) more flooding that causes property damage and (2) more properties covered by flood insurance (which is mandated under the Federal law that requires flood insurance as a condition of a federally-backed mortgage on a property in the AE Zone).

Table 5 - Algiers Flood Insurance Claims Data

Neighborhood	All Claims			Without Katrina Claims				
	No. Claims	Claim Payments		Claims		Claim Payments		
		Avg.	Total	No.	Pct.	Avg.	Total	Pct.
Algiers Point	127	$4,875	$234,038	31	24%	$6,868	$157,964	67%
Behrman	1,284	$10,410	$8,515,734	757	59%	$7,949	$4,761,562	56%
Fischer Dev	102	$4,775	$200,552	40	39%	$4,816	$173,374	86%
McDonogh	281	$4,296	$790,442	193	69%	$4,374	$712,988	90%
New Aurora-English Turn	790	$6,525	$3,021,013	369	47%	$4,458	$1,328,335	44%
Old Aurora	3,769	$7,579	$18,280,126	2,214	59%	$7,886	$14,124,144	77%
Tall Timbers-Brechtel	2,171	$11,966	$14,251,643	1,079	50%	$8,093	$6,272,345	44%
U.S. Naval Base	214	$4,430	$553,768	119	56%	$3,620	$322,182	58%
Whitney	195	$4,773	$591,834	130	67%	$3,781	$404,561	68%
District Total	8,933	$8,589	$46,439,150	4,932	55%	$7,281	$28,257,455	61%

Note: The number of claims include claims submitted, but not paid.
The average and total payments are based on paid claims only.

Table 5 provides data on all claims paid in the District. It notes that the National Flood Insurance Program has paid $46,439,150 in claim payments in Algiers between 1978 and 2018, the period for available data. Table 5 also provides data on claims that were paid for floods other than from Hurricane Katrina. These "without Katrina claims" represent the damage caused by repetitive flooding.

Of the 8,933 flood insurance claims in Algiers, 4,001 (45%) were due to Katrina. The other 4,932 (55%) claims were from all the other storms and floods that occurred between 1978 and 2018. These "without Katrina claims" represent the damage caused by repetitive flooding.

Flooding in Algiers during Katrina was not as deep or destructive as the flooding following the levee breaks on the other side of the Mississippi River. This is reflected in the flood insurance claim payments. For example, the average claim for non-Katrina flooding ($7,281) was not much less than the average claim from all flooding ($8,589). Sixty-one percent of all claim payments were from the non-Katrina (repetitive flooding) claims. This is by far the highest percentage of any of the districts (see Table 2)

Tall Timbers – Brechtel, Behrman, and Old Aurora have the highest average claims payment. While the neighborhoods with designated floodplains have the most repetitive flooding claims, other neighborhoods had higher average claim payments.

Flood Control Measures

Drainage System

The City's drainage system is explained in Section 4.1. The Sewerage & Water Board's part of the Algiers district's drainage system is shown in Figure 3.

Figure 3 shows that most of the Algiers District's drainage is collected and directed to Drainage Pump Stations 13 (DPS 13) and 11 (DPS 11); from there, it is pumped into the Algiers Canal.

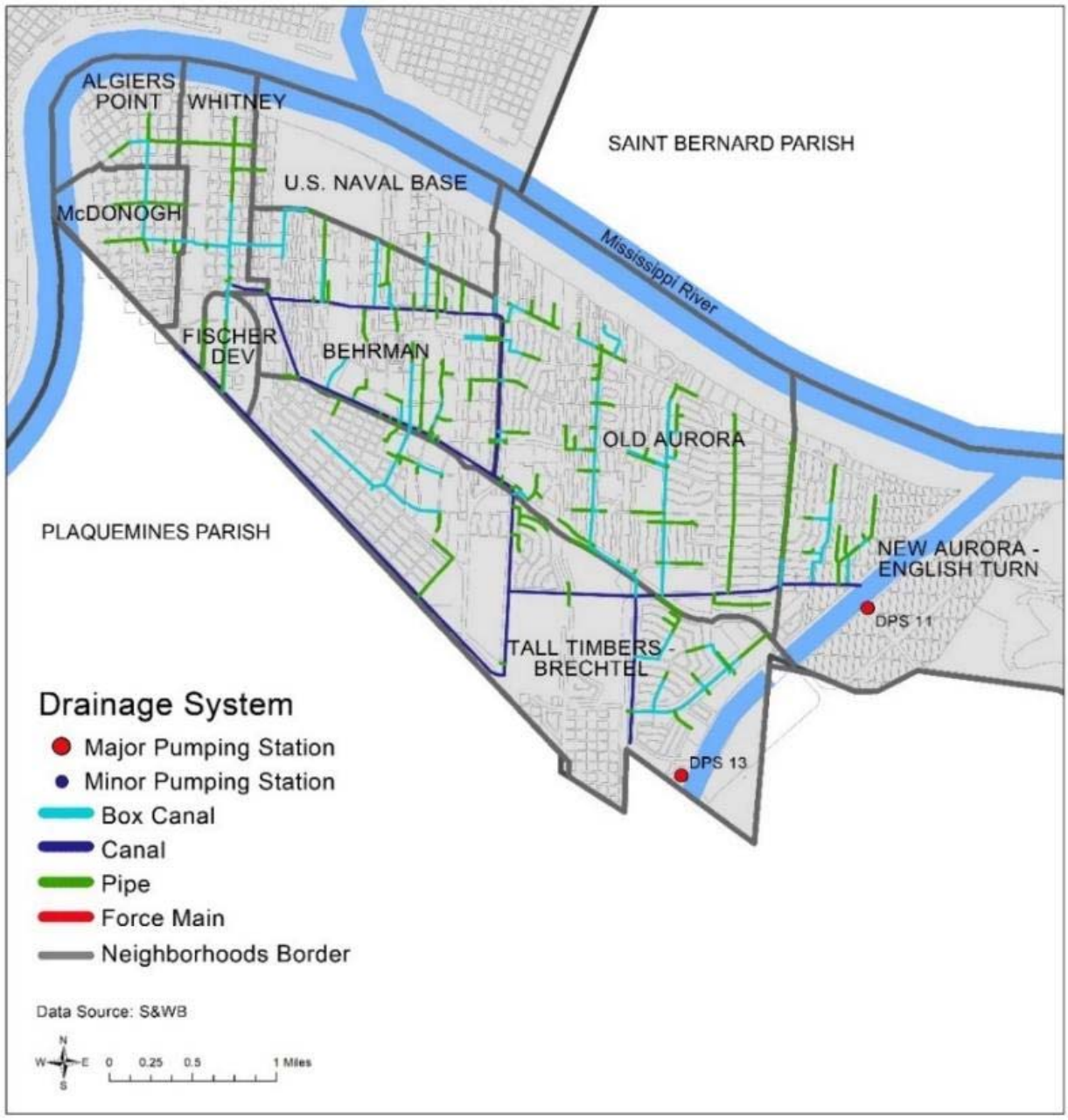


Figure 3 - Algiers Major Drainage System

Major Projects

In 2011 the U.S. Army Corps of Engineers completed its study and approval of the Algiers plan as part of the SELA program. The Algiers area drainage improvements consist of multiple projects shown in Figure 4. They include:

→ Widening and other improvements to the Algiers Canal, the Donner Canal, and the Nolan Canal and extension of the Algiers Canal along General DeGaulle Drive

→ Subsurface drainage additions to Lang Street, Eton Street culvert, Sandra Drive, Indiana Street, Holiday Drive and Memorial Park Drive
→ Additional pumping capacity to Drainage Pumping Station No. 13 (1,800 cubic

In 2019, the Corps of Engineers received $16 million to start construction. The total project cost for all Algiers area improvements is currently estimated at $506 Million according to 2020 estimates. The projects are funded through a cost share of 75/25% (Federal/Local) funds.

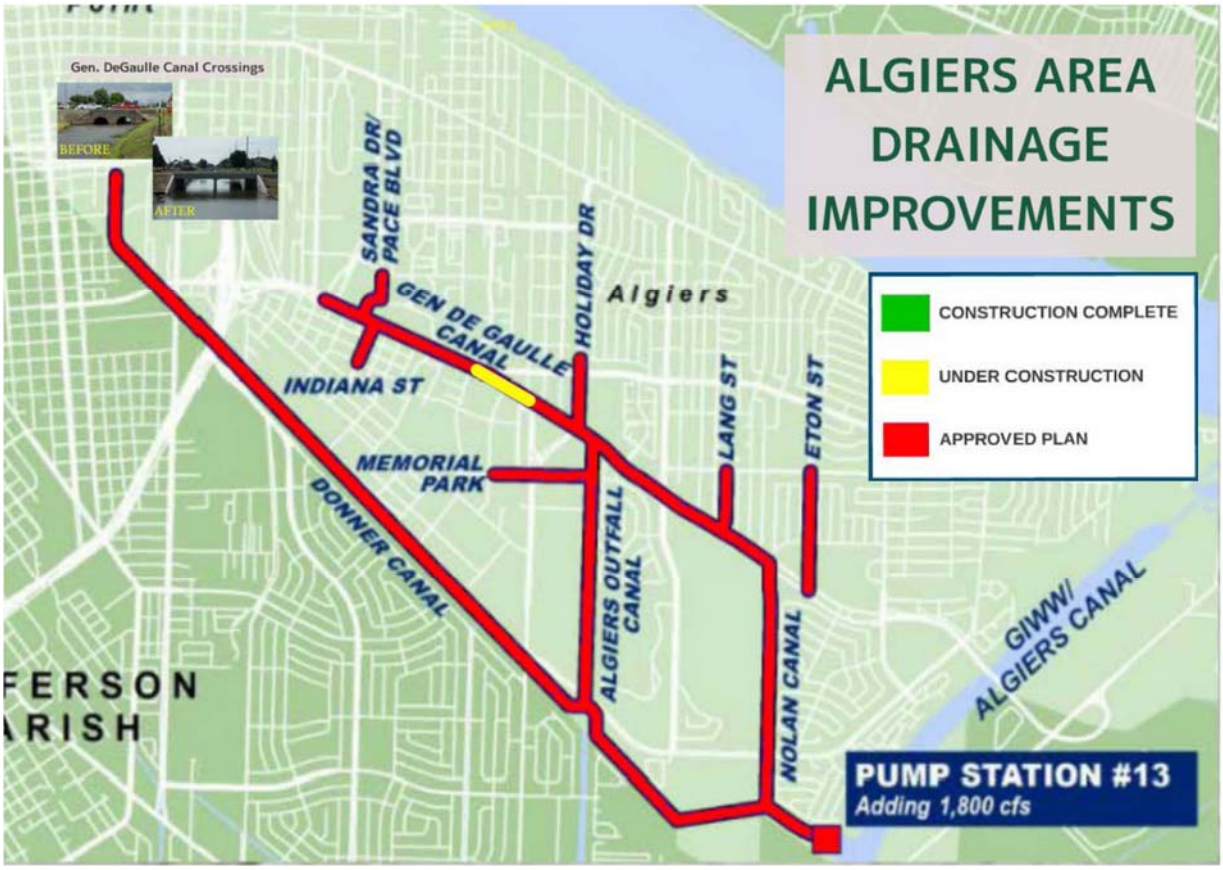


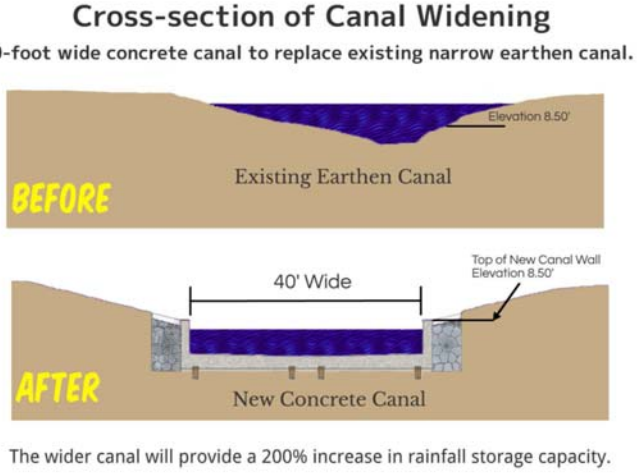
Figure 4 - Algiers Sub-Basin Project

The status is as of 2019. More segments have been constructed since then.

Source: US Army Corps of Engineers

Additional funds were made available for Option 3 in May 2021 for the extension of the project from Illinois Street to Wall Boulevard. The entire construction project has now been funded and

is estimated to be completed in December of 2022. As of May 2021, approximately 49% of the Algiers Area drainage improvements have been completed.



Source: US Army Corps of Engineers presentation on 11/21/2019

SELA projects include enlarging both channels and street crossings.
Source : http://www.swbnosela.com/selaorleans/gallery.aspx?gallery=42

Roadside Projects

The Department of Public Works received post-Katrina disaster assistance funding to help restore the streets and adjacent drainage facilities, as summarized in Section 4.2. These roadside projects will help drain the streets into the major drainage system's pipes and canals. Figure 5 shows the location and status for the District.

As of March 2021, all the roadside drainage projects have been completed. This is well above the number for the City as a whole: 32% have been completed and only 4% have been started.

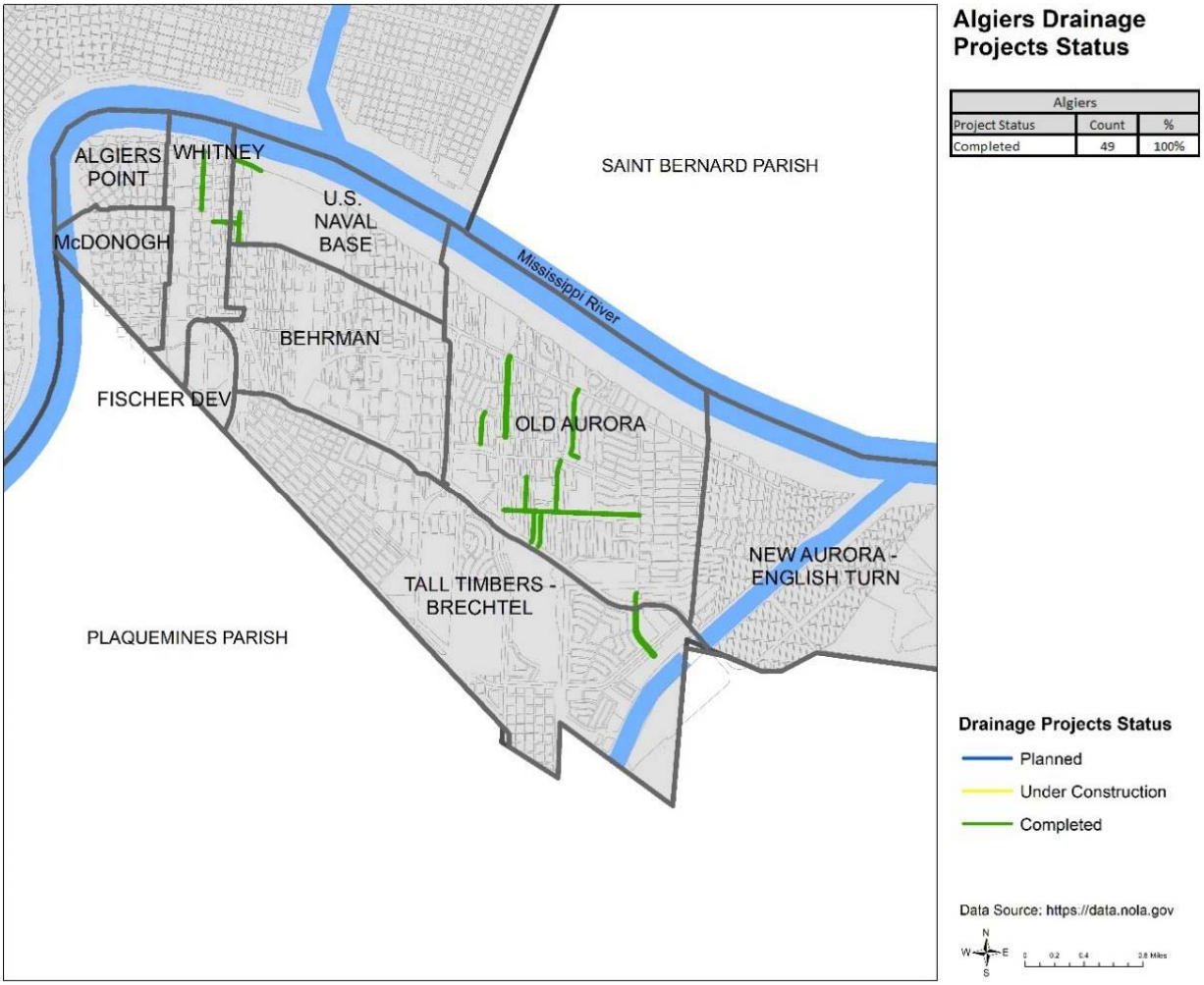


Figure 5 - Algiers Roadside Drainage Projects

One important part of the roadside drainage system is the catch basins that collect surface water and sends it into the subsurface pipes. As explained in Section 4.4, the more nearby residents do to keep them clean, the better the system works.

Green Infrastructure

As discussed in Section 4.3, the Green Infrastructure program relies on natural measures to handle drainage, such as letting rainwater soak into the ground in a rain garden. More information on Green Infrastructure can be found at https://ready.nola.gov/green-infrastructure/. Figure 6 shows Sewerage & Water Board stormwater projects to improve drainage and Green Infrastructure projects.

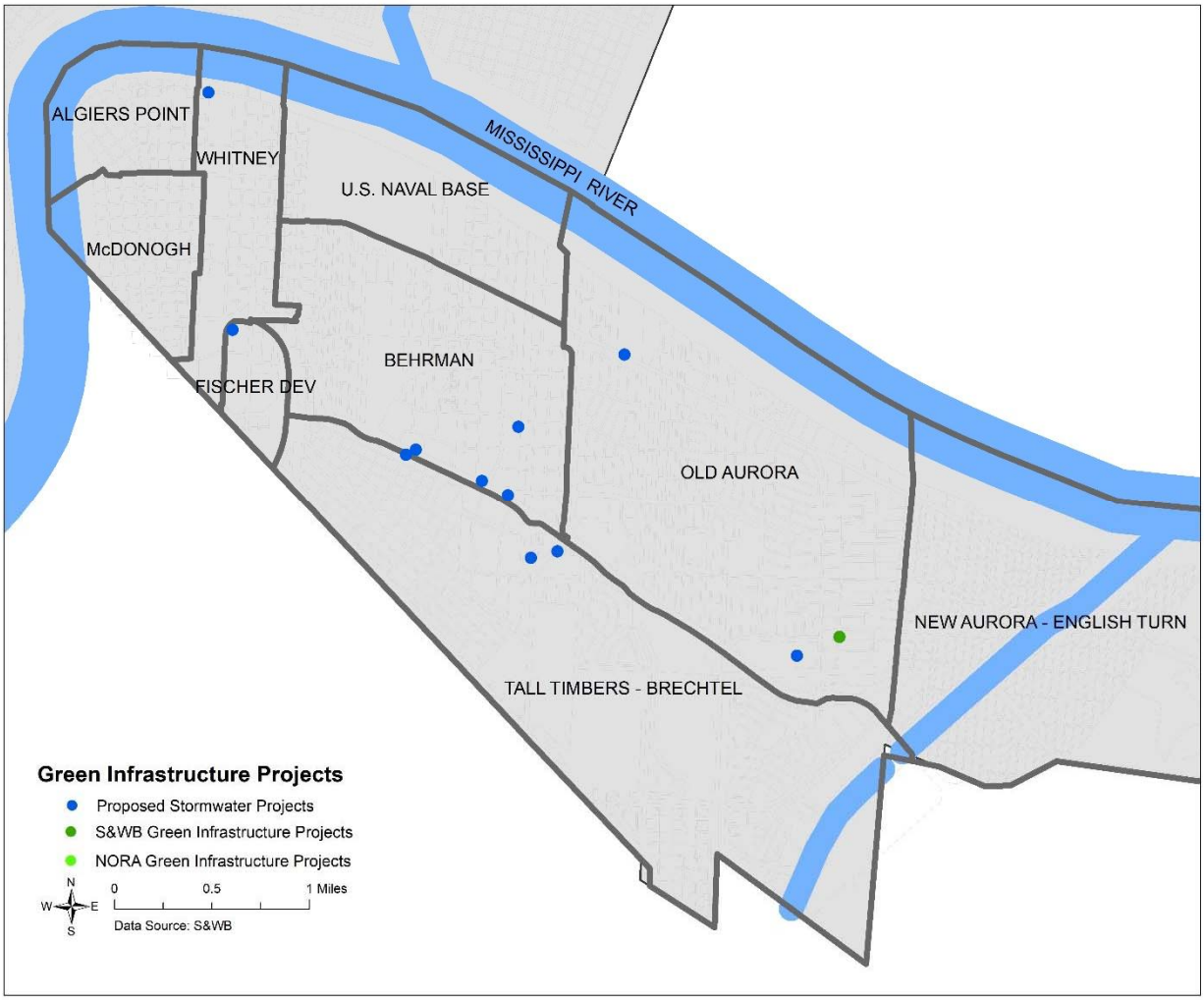


Figure 6 - Green Infrastructure Projects in Algiers

The Green Infrastructure program has received special funding from several different sources. The larger contributors are the Sewage and Water Board (S&WB) and the New Orleans Redevelopment Authority (NORA). The status of their projects is shown in Figure 6.

Green Infrastructure projects in Algiers include a bioswale and rain gardens on Mardi Gras Boulevard and a rain garden next to the Aurora Sewer Pump Station (right).

Aurora Rain Garden
Photo Credit: Gaia Consultants

Flood Control Measures Summary

The Algiers Repetitive Loss Planning District is drained by the same type of system that drains most of the rest of New Orleans: City streets and roadside collector pipes that flow to larger pipes and canals maintained by the Sewerage & Water Board. The roadside pipe improvements have been completed and the SELA project to improve the canals and Drainage Pump Station 13 is well underway. Green Infrastructure projects will help with the smaller, more frequent storms, but they will not increase the total capacity of the system. It is important to note that this system of flood control measures is designed to handle the 10-year storm.

Building Protection Measures

Buildings

As noted in Section 5.2, building protection measures depend on the type of foundation and the depth of repetitive flooding. Figure 7 is a map showing the types of foundations. Detached garages, park pavilions, and other minor structures are not counted as buildings for the purposes of this report. Some areas were not included by the City's blight survey, so not every building in the district was viewed. In most cases, grey areas are parks or vacant lots. For example, the large grey areas in New Aurora – English Turn include a golf course and undeveloped forests.

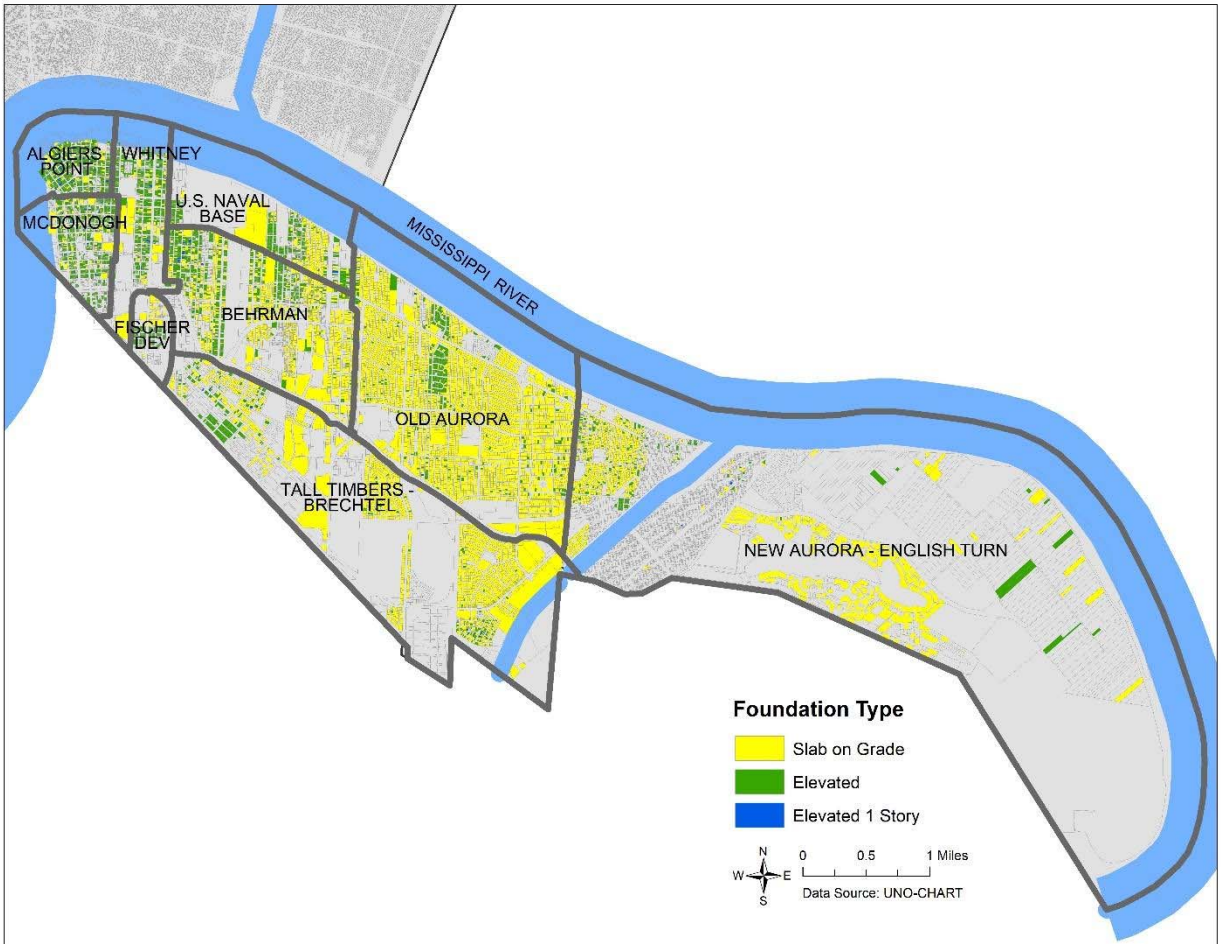


Figure *7* - Foundation Types in Algiers

The foundation types are explained in Section 5.1. The older, northern neighborhoods have more elevated buildings (green), while the newer areas to the south have mostly slab-on-grade foundations (yellow). Unlike other areas of the City that were flooded deeply during Katrina, there are few buildings elevated a full story or more.

The individual property reviews looked at 14,423 insurable buildings in the Algiers District. Table 6 summarizes the building data by neighborhood. There may be some that were not included in the survey and there are likely some new buildings that were constructed, elevated, or cleared since the blight program's ArcGIS Photo Survey was conducted beginning in 2010 and updated through 2019.[50]

Table 6 - Algiers District Building Data

Neighborhood	Number of Buildings	Percent Occupied	Percent in Good Condition	Percent >1 Story	Type of Foundation		
					Slab	Elev ≤ 3 ft	Elev > 3 ft

[50] BlightStatus Demolitions - Map | Data.NOLA.gov

Algiers Point	834	99%	91%	29%	16%	30%	54%
Behrman	2,299	98%	93%	24%	66%	20%	14%
Fischer Dev	118	99%	96%	25%	10%	52%	38%
McDonogh	927	96%	87%	12%	18%	39%	43%
New Aurora/English Turn	1,717	99%	97%	35%	86%	5%	9%
Old Aurora	4,809	99%	98%	35%	90%	6%	4%
Tall Timbers - Brechtel	2,261	99%	88%	59%	59%	31%	10%
U.S. Naval Base	633	97%	89%	5%	48%	32%	20%
Whitney	825	98%	89%	12%	25%	37%	38%
District Total	14,423	99%	95%	32%	70%	15%	15%

Buildings in good condition are more appropriate for elevation and other building protection measures that preserve the existing structure. There are two measures of whether a building is in good condition that were collected in the building survey: if it is occupied and if it looks in good condition from the street.

The building data in Table 6 show a strong healthy area with a very high occupancy rate (99%) and a very number of buildings that are in good condition (95%). These figures are very close to the City-wide numbers of 97% and 95%. The numbers are similar for all the neighborhoods. Buildings with more than one story have a building protection measure not available to single-story structures: the owner can permanently relocate valuable items, such as the furnace and air conditioner, to the upper story, above the flood level. There is some variance here, from 5% of the building stock on the Naval Base to 59% in Tall Timbers - Brechtel. The district is 32%, close to City-wide number of 30%.

Seventy percent of the buildings in Algiers are on slab foundations, well above the City average of 41%. This is significant because the first floors of buildings on slab foundations are closer to the ground than the first floors of buildings on crawlspaces or piers, making them more subject to damage from shallow, repetitive flooding. They are also more expensive to elevate above a flood level.

As seen on the map in Figure 7, Old Aurora and New Aurora – English Turn have the highest percentage of slab on grade foundations. Table 6 shows that these two neighborhoods have some of the highest average claim payments from the non-Katrina floods.

In the Algiers District, 15% of the buildings are elevated three feet or more above grade, lower than the City-wide average of 37%. These buildings are better protected from shallow, repetitive flooding.

Elevated house in Algiers, Sequin Street
Photo Credit: Google Maps

Building Protection Measures Summary:

The Algiers Repetitive Loss Planning District has over 14,000 insurable buildings, almost all of which are in good condition, making them more appropriate for elevation and other building protection measures that preserve the existing structures. The District, especially the more southern neighborhoods, are somewhat challenged by having a large percentage of their building stock on slab foundations. While these are more subject to flood damage and are more expensive to elevate, they do have some less expensive options, such as low berms and dry floodproofing.

Resident Comments

A virtual meeting was held on March 23, 2021, with 15 participants from the Algiers Neighborhood Presidents Council. After CHART gave an overview of the City's repetitive loss situation and preliminary contents of this report, residents submitted their comments. Those related to this report were related to increasing the number of catch basins in certain areas of the district and a variety of flood insurance questions.

Recommendations

1. The SELA and Green Infrastructure projects should continue.
2. The City should continue to advise residents on flood insurance costs, coverage, and ways policyholders can reduce premiums.
3. Every owner of a building less than three feet above ground level should review their building protection measure alternatives.
4. Every property owner and renter in every neighborhood should:
   a. Carry a flood insurance policy regardless of their FIRM zone, and
   b. Maintain the catch basins downstream of their property.

2. BYWATER

The Bywater Repetitive Loss Planning District is located in the southeast part of the city. It is bordered on the north by Hwy-90, on the west by the Seventh Ward, on the east by the Inner Harbor Navigation Canal, and on the south by the Mississippi River, as shown in Figure 8.
The District has seven neighborhoods which are also designated by the City's planning programs and are displayed in Figure 8. Note that the Bywater District has a neighborhood with the same name.

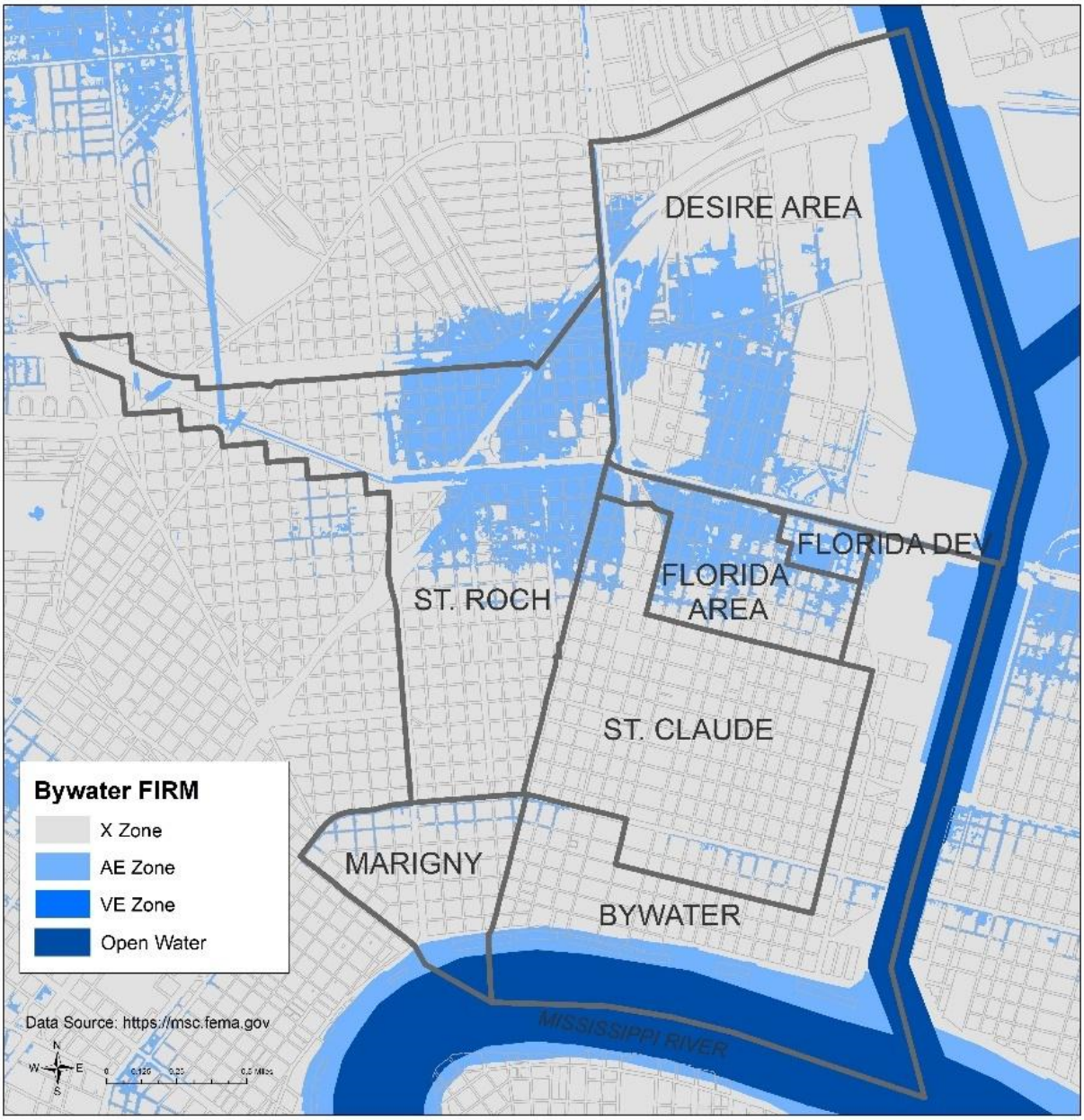


Figure 8 - Bywater District Flood Insurance Rate Map

The Repetitive Flood Problem

The flood zones on the FIRM are explained in the Mitigation Terminology page in Section 5.1. Per Figure 8, the St. Roch, Desire Area, Florida Area, and Florida Dev neighborhoods have most of the District's floodplain (AE Zones).

Table 7 - FEMA Repetitive Loss Properties in Bywater

Neighborhood	Buildings	Number of RLs	Percent of RLs	Number Claims	Pct. Of Buildings with Claims
Bywater	1,548	25	2%	705	46%
Desire Area	879	35	4%	863	98%
Florida Area	799	66	8%	1,017	127%
Florida Dev	2	0	0%	69	3,450%
Marigny	1,172	10	1%	419	36%
St. Claude	3,151	96	3%	2,127	68%
St. Roch	2,920	238	8%	3,159	108%
District Total	10,471	470	4%	8,359	80%

Note: the number of claims is the number of claims submitted, including those closed without payment

Table 7 shows numbers and percentages of buildings and claims. Because the number of buildings in the neighborhoods range from 2 to 3,151, it is more relevant to compare percentages. Of the 10,471 buildings reviewed in the district, 470 or 4% have been officially listed by FEMA as repetitive loss properties.

While 4% of the buildings in the district have been designated as repetitive loss properties, many more buildings have been flooded, resulting in 8,359 flood insurance claim payments between 1978 and 2018, the period for available data. There have been almost as many claims (8,359) as there are buildings (10,471).

There were more claims than buildings in the Florida Area and St. Roch neighborhoods, and the Desire neighborhood has had almost as many claims (98%). The Florida Dev percent of buildings is an outlier because the neighborhood has been cleared of most buildings since the claims were paid. This does not mean that there was a claim paid on every building because many of the buildings have had two or more claims. It is, however, an indication of where the most repetitively flooded properties are.

As noted above, these four neighborhoods (Florida Area, St. Roch, Desire, and Florida Dev) have the most mapped Special Flood Hazard Area of the seven neighborhoods that make up the Bywater district. This means they have (1) a higher risk of flooding that causes property damage and (2) more properties covered by flood insurance (which is mandated under the federal law

that requires flood insurance as a condition of a federally-backed mortgage on a property in the AE Zone).

The Bywater and Marigny neighborhoods have the lowest percentage of claims. Much of these neighborhoods are on the higher ground formed by the natural levee known as the "sliver near the river." Accordingly, it has less mapped floodplain and is less likely to have repetitive flooding, which is reflected in the percentages in Table 7.

Table 8 - Bywater Flood Insurance Claims Data

Neighborhood	All Claims			Without Katrina Claims				
	No. Claims	Claim Payments		Claims		Claim Payments		
		Avg.	Total	No.	Pct.	Avg.	Total	Pct.
Bywater	705	$46,641	$22,341,167	230	33%	$7,566	$1,240,879	6%
Desire Area	863	$82,351	$59,128,309	334	39%	$20,052	$4,351,421	7%
Florida Area	1,017	$38,867	$33,892,203	518	51%	$7,583	$3,033,251	9%
Florida Dev	69	$38,645	$2,009,516	14	20%	$4,752	$52,273	3%
Marigny	419	$26,934	$5,009,687	105	25%	$11,579	$880,039	18%
St. Claude	2,127	$53,779	$96,264,048	745	35%	$6,722	$3,435,165	4%
St. Roch	3,159	$40,542	$110,800,212	1,775	56%	$8,657	$12,163,730	11%
District Total	8,359	$48,235	$329,445,142	3,721	45%	$9,036	$25,156,758	8%

Note: The number of claims include claims submitted, but not paid.
The average and total payments are based on paid claims only.

Table 8 provides data on all claims paid in the District and those claims that were paid for floods other than from Hurricane Katrina. These "without Katrina claims" represent the damage caused by repetitive flooding.

The National Flood Insurance Program has paid $329,445,142 for all claims for flooded properties in Bywater. The impact of Katrina on the District can be seen in the fact that while 45% of all claims went for non-Katrina damage, only 8% of the claim dollars were paid for non-Katrina damage. In other words, 55% of all the claims from 1978 to 2018 were for Katrina flood damage but they accounted for 92% of all the dollars paid.

The neighborhood with the greatest percentage of claims from other than Katrina is the Marigny, which makes sense because it is on the high ground on the sliver near the river and therefore, had less Katrina damage than the other neighborhoods. Fewer Katrina claims and less Katrina damage means the relative importance of repetitive flooding is greater.

Flood Control Measures

Drainage System

The City's drainage system is explained in Section 4.1. The Sewerage & Water Board's part of the Bywater district's drainage system is shown in Figure 9.

Figure 9 - Bywater Major Drainage System

Figure 9 shows the canals and larger pipes collecting the runoff from the roadside drainage system and conveying it to three major pumping stations: Drainage Pump Stations (DPS) 3, 17, and 19. The pump stations pump the collected water in larger canals north to the London Avenue Canal or east into the Inner Harbor Navigation Canal. The Navigation Canal is part of the drainage system, so it is also shown as a dark blue line in Figure 9.

Major Projects

There is one major drainage project in the Bywater District. The SELA program is improving the canal along Florida Avenue (located in Figure 9 and detailed in Figure 10) and the system that collects the water to the canal.

As of June 2021, the first three phases 1-3 have been completed and Phase 4 is 60% completed with an estimated completion date of October 2021.

The estimated construction is $147.5 million. Phase 1 was funded entirely with federal funds and Phases 2-4 are split 65/35% (Federal/Local).

Photo Credit: Gallery (swbnosela.com)

Figure 10 - SELA Project in the Bywater District

(project status on this map is as of 2019)

The map in Figure 10 was taken from a US Army Corps of Engineers' presentation on 11/21/2019. More segments have been constructed since then.

Roadside Projects

The Department of Public Works received post-Katrina disaster assistance funding to help restore the streets and adjacent drainage facilities, as summarized in Section 4.2. These have been constructed over the years as road work is scheduled; more are planned.
Figure 11 shows the location and status for the District and that projects are scheduled throughout the district. The exception is the sliver near the river in the Marigny and Bywater neighborhoods. This area is like the "headwaters" of the drainage system as runoff and drainage flow downhill, i.e., south, away from the higher ground.

As of March 2021, 18% of the roadside drainage projects have been completed and 9% more have been started. The amount completed is lower than the City-wide number, 32%.
When completed, these roadside projects will help drain the streets into the major drainage system's pipes and canals. However, if the major system has blockages or is overloaded, the roadside system may not be able to drain the water from the streets.

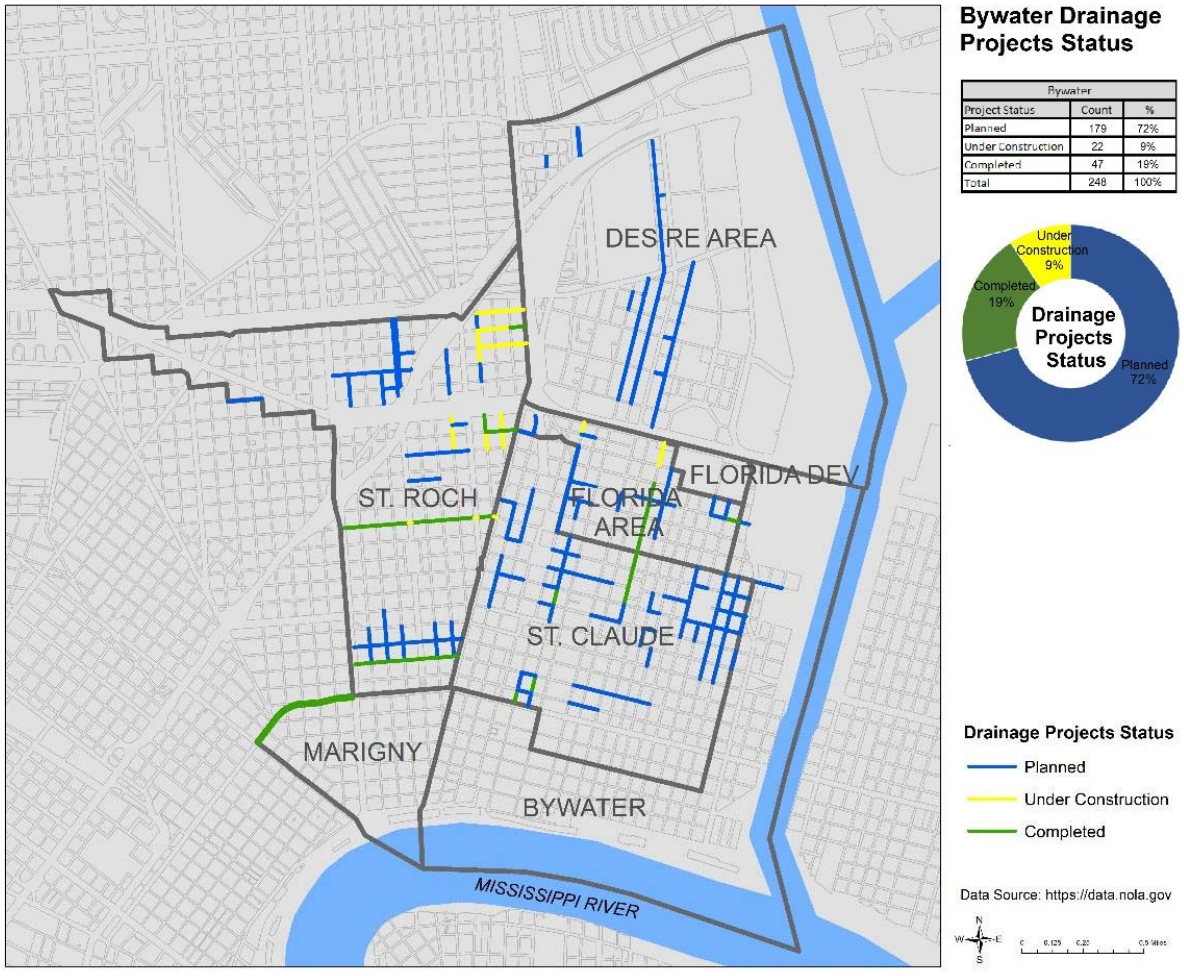


Figure 11 - Bywater Roadside Drainage Projects

One important part of the roadside drainage system is the catch basins that collect surface water and sends it into the subsurface pipes. As explained in Section 4.4, the more nearby residents do to keep them clean, the better the system works.

Green Infrastructure

As discussed in Section 4.3, the Green Infrastructure program relies on natural measures to handle drainage, such as letting rainwater soak into the ground in a rain garden. More information on Green Infrastructure can be found in the footnote below at https://ready.nola.gov/green-infrastructure/. Figure 12 shows Sewerage & Water Board stormwater projects to improve drainage and Green Infrastructure projects.

The Green Infrastructure program has received special funding from several different sources. The larger contributors are the Sewage and Water Board (S&WB) and the New Orleans Redevelopment Authority (NORA). The status of their projects is shown in Figure 12.

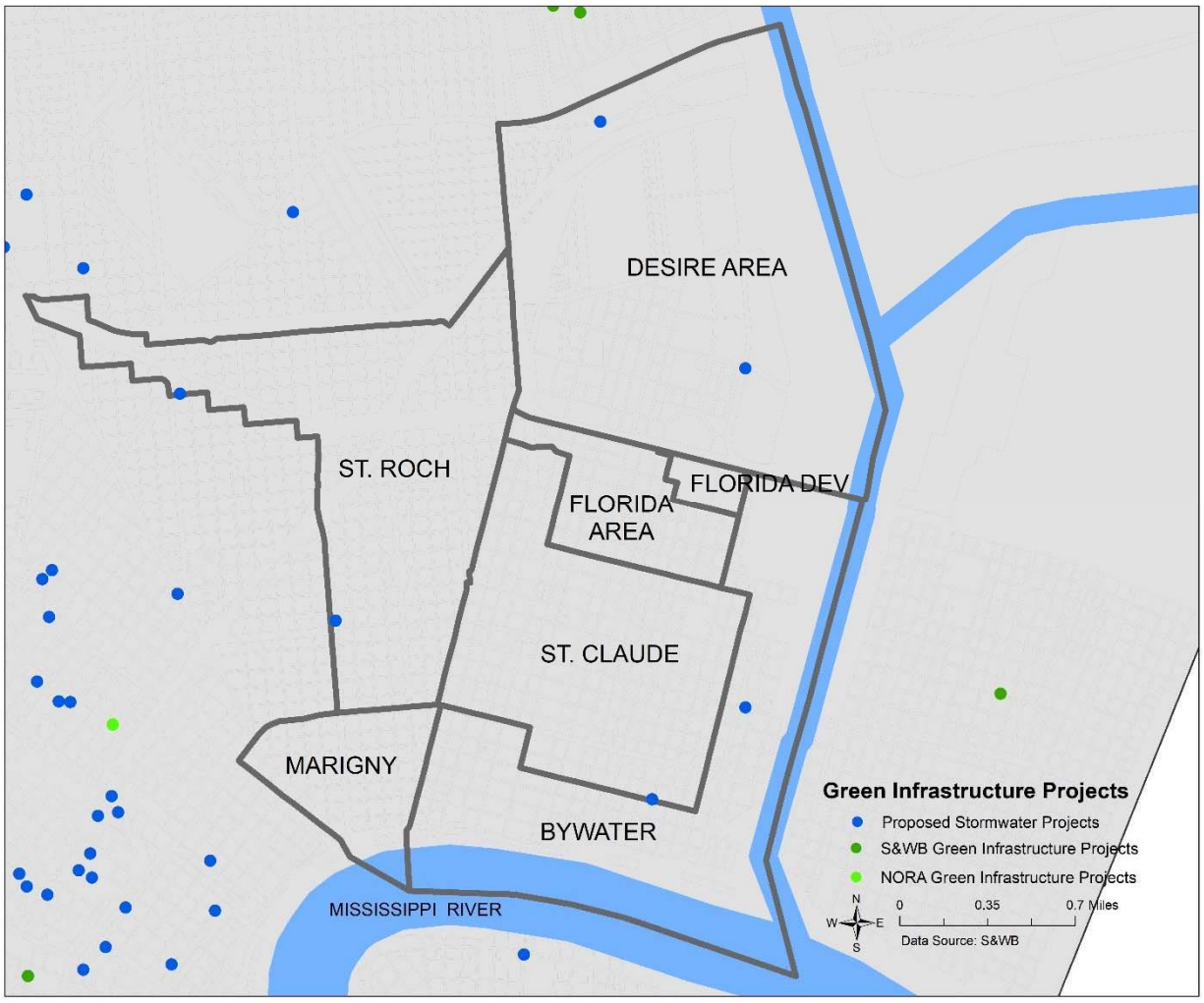


Figure 12 - Green Infrastructure Projects in Bywater

One of the Green Infrastructure projects calls for rebuilding the streets along 14 blocks in a section of the St. Roch neighborhood. Below are graphics that compare a current streetscape with the Green Infrastructure plan to reduce the amount of pavement and add more areas that absorb surface water.


Before and after concepts of the Green Infrastructure streetscape in the St. Roch project area Source: https://nola.gov/resilience-sustainability/resources/community-outreach/stroch-comm_1117/

An early presentation of the project in a 2017 neighborhood association meeting listed the following benefits and outcomes of the project:

- → Reduce Flooding & Improve Water Quality
- → Reduced Impervious Surfaces (less runoff)
  - o Existing Condition = 90% Impervious
  - o Proposed Condition = 64% Impervious
  - o 30% Reduction
- → On-street Parking More Organized
- → Plants & Shade
- → Improved Aesthetics
- → Storage Spaces Eliminate Standing Water
- → Reduce Mosquitos and Associated Health Risks
- → Reduce Resident Financial Burden[51]

Flood Control Measures Summary

The major drainage project, the SELA Florida Avenue Canal improvement, is almost complete. The roadside drainage and Green Infrastructure projects are underway. Together, these projects will have an impact on the smaller more frequent repetitive flooding, such as the 2- to 10-year storms.

[51] https://nola.gov/resilience-sustainability/resources/community-outreach/stroch-comm_1117/

Building Protection Measures

As noted in Section 5.2, building protection measures depend on the type of foundation and the depth of repetitive flooding. Figure 13 shows the types of foundations.

Detached garages, park pavilions, and other minor structures are not counted as buildings for the purposes of this report. As some areas were not included by the City's blight survey, not every building in the district was viewed. In most cases, grey areas are parks or vacant lots. For example, the large grey areas along the canal in the Desire Area and Bywater neighborhoods are mostly yards and storage areas related to shipping on the canal.

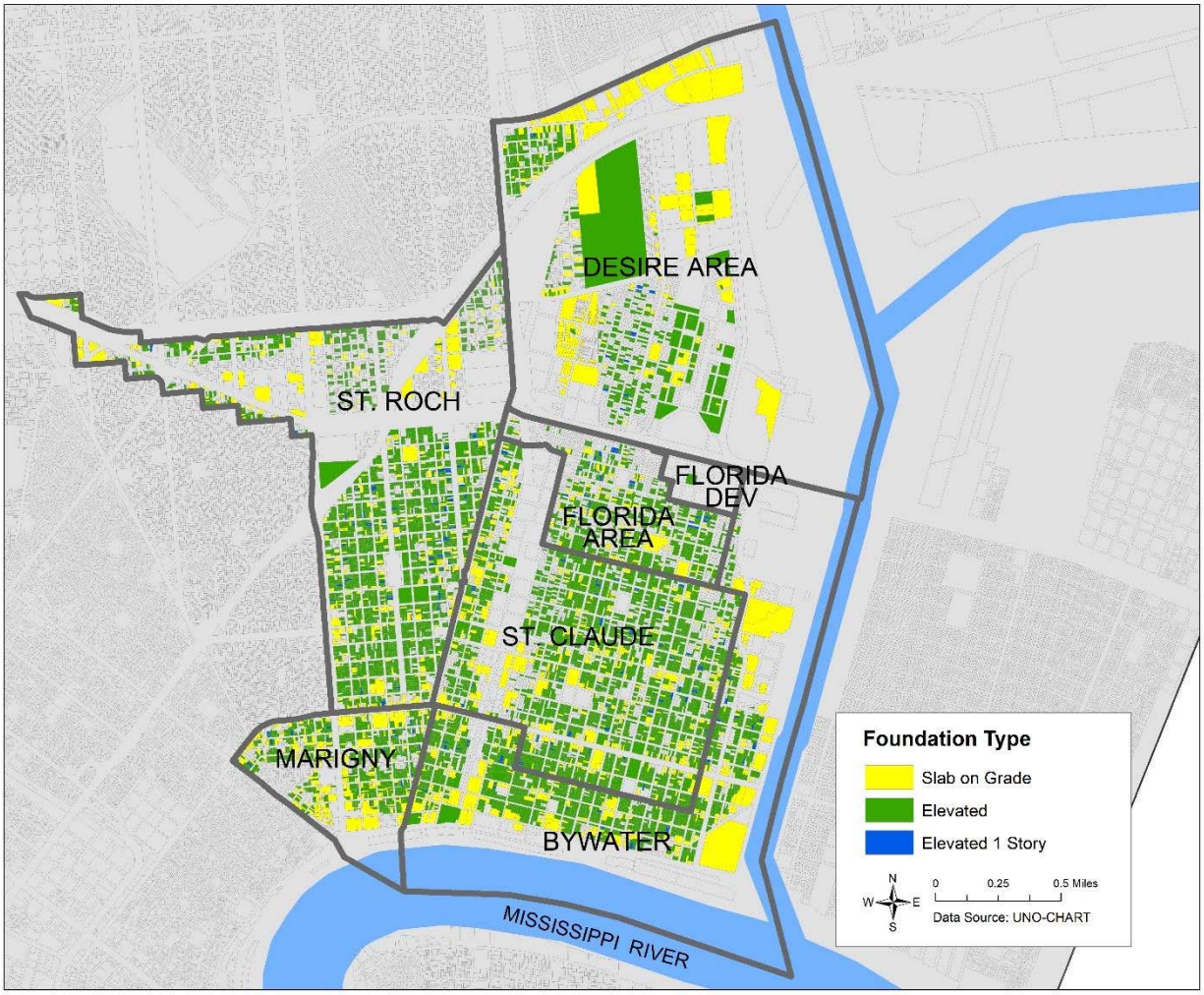


Figure 13 - Foundation Types in Bywater

Figure 13 shows a relatively even distribution of slab and elevated buildings throughout the district. The exception to this is the concentrations of slab structures (in yellow) along the Inner Harbor Navigation Canal and in the northern part of the Desire Area neighborhood. These are more industrial areas where slab foundations would be expected. Accordingly, there is a higher percentage of elevated buildings in the residential areas of the rest of the district.

The project team reviewed building types and conditions for 10,471 primary structures in the Bywater District. There may be some that were not included in the survey and there are likely some new buildings that were constructed, elevated, or cleared since the blight program's ArcGIS Photo Survey was conducted beginning in 2010 and updated through 2019. A summary of the findings is in Table 9.[52]

Table 9 - Bywater District Building Data

Neighborhood	Number of Buildings	Percent Occupied	Percent In Good Condition	Percent >1 Story	Type of Foundation		
					Slab	Elev ≤ 3 ft	Elev > 3 ft
Bywater	1,548	97%	91%	23%	20%	39%	41%
Desire Area	879	91%	87%	26%	43%	22%	35%
Florida Area	799	94%	91%	16%	15%	31%	54%
Florida Dev	2	100%	100%	0%	0%	0%	100%
Marigny	1,172	98%	96%	44%	23%	43%	34%
St. Claude	3,151	96%	90%	13%	14%	42%	44%
St. Roch	2,920	96%	89%	15%	17%	34%	49%
District Total	10,471	96%	90%	20%	19%	37%	44%

Buildings in good condition are more appropriate for elevation and other building protection measures that preserve the existing structure. There are two measures of whether a building is in good condition that were collected in the building survey: if it is occupied and if it looks in good condition from the street.

Table 9 shows a high occupancy rate (96%) and a good percentage of buildings in good condition (90%), while slightly lower than the City-wide data (97% and 95%, respectively) these numbers show that most of the structures are appropriate for building protection measures. Buildings with more than one story have a building protection measure not available to single-story structures: the owner can permanently relocate valuable items, such as the furnace and air conditioner, to the upper story, above the flood level. As seen in Table 9, this applies to only 20% of the buildings in the Bywater District. Most of the neighborhoods have 14% - 20% of their buildings with slab foundations, but the Desire Area has 43%, a higher number because so much of it is commercial and industrial development.

The first floors of buildings on slab foundations are closer to the ground than the first floors of the elevated buildings on crawlspaces or piers and therefore, apt to flood more often. As explained in Chapter 5, the building protection options are limited for buildings that are not already elevated. Elevating a slab on grade foundation is more expensive than elevating a building that already has its lowest floor above the ground.

[52] BlightStatus Demolitions - Map | Data.NOLA.gov

Nineteen percent of the buildings in the district are on slab foundation which is lower than the 41% for the City as a whole. This is likely due to the fact that district is an older area than areas along Lake Pontchartrain (for example) or completely new buildings constructed after Katrina. Note that Table 9 shows two categories of elevated buildings – those elevated up to three feet above grade and those elevated higher. Due to different data sources, Figure 13 shows two different kinds of elevated buildings – those elevated up to eight feet and those elevated one story or more.

Eighty-one percent of the buildings in the Bywater District are on elevated foundations and more than half of the elevated floors are more than three feet above grade. These numbers mean that 44% of the buildings in the district are considered protected from shallow, repetitive flooding (provided the areas below the elevated floor are not used in a way that would be damaged by water, such as converting it to a raised basement).


Elevated home in the St. Roch neighborhood
Photo Credit: UNO-CHART

Building Protection Measures Summary

The Bywater District has many buildings that are considered already protected from shallow, repetitive flooding (44%). This is higher than the City-wide number of 37%. It also has a relatively small number of buildings on slab foundations (20% vs. the City-wide 41%). Some of those buildings are industrial, where there are more options for property protection measures than for residential buildings.

While these numbers look good for property protection when comparing Bywater's numbers with City-wide data, 57% of the buildings are not protected. That means there are nearly 6,000 structures that warrant attention.

Resident Comments

A virtual meeting was held on March 9, 2021, with 15 participants from the Bywater Neighborhood Association. After CHART gave an overview of the City's repetitive loss situation and the preliminary contents of this report, residents submitted their comments. Concerns focused on improving the drainage system, incentives for Green Infrastructure-type projects on private property, and funding of building protection projects.

Recommendations

1. The SELA, roadside drainage improvement, and Green Infrastructure projects should continue.
2. Every owner of a building less than three feet above ground level should review their building protection measure alternatives.

3. The City should provide information to the public on the Green Infrastructure and building protection measures and sources of financial support.
4. Every property owner and renter in every neighborhood should:
    a. Carry a flood insurance policy regardless of their FIRM zone, and
    b. Maintain the catch basins downstream of their property.

3. GARDEN DISTRICT

The Garden District Repetitive Loss Planning District is in the southern part of the City along the east bank of the Mississippi River. It generally is bordered on the west by Napoleon Avenue, on the north by US Highway 90-Business (the Pontchartrain Expressway), and on the east and south by the east bank of the Mississippi River.

The District has eight neighborhoods which are also designated by the City's planning programs and are displayed in Figure 14. Note that the Garden District Repetitive Loss Planning District has a neighborhood with the same name.

Figure 14 - Garden District Flood Insurance Rate Map

The Repetitive Flood Problem

The flood zones on the FIRM are explained in the Mitigation Terminology page in Section 5.1. The highest part of the Garden District is the bank of the Mississippi River. A natural levee was formed over the centuries where the flooding river dropped sediment on its banks, known as the "sliver near the river." Surface water drains away from the river and flows north to the lower ground. As a result, the northern part of the district, the Milan and Central City neighborhoods, have most of the District's floodplain (AE Zones).

Table 10 - FEMA Repetitive Loss Properties in Garden District

Neighborhood	Buildings	Number of RLs	Percent of RLs	Number Claims	Pct. Of Buildings with Claims
Central City	3,195	84	3%	1,703	53%
East Riverside	1,045	2	0%	194	19%
Garden District	589	10	2%	306	52%
Irish Channel	1,224	4	0%	300	25%
Lower Garden District	1,222	30	2%	601	49%
Milan	1,615	175	11%	2,054	127%
St. Thomas Dev	304	2	1%	45	15%
Touro	846	20	2%	492	58%
District Total	10,040	327	3%	5,695	57%

Note: the number of claims is the number of claims submitted, including those closed without payment

Table 10 shows numbers and percentages of buildings and claims between 1978 and 2018, the period for available data. Because the number of buildings in the neighborhoods range from 304 to 3,195, it is more relevant to compare percentages. Of the 10,040 buildings reviewed in the district, 327 or 3% have been officially listed by FEMA as repetitive loss properties.
More than ¾ of the repetitive loss properties are in the two northern neighborhoods with the mapped floodplains, Central City and Milan. Their claims numbers are the highest probably because of the mapped AE Zone floodplains; as a result, they tend to have (1) more flooding that causes property damage and (2) more properties covered by flood insurance (which is mandated under the federal law that requires flood insurance as a condition of a Federally-backed mortgage on a property in the AE Zone).

While only 3% of the buildings in the district have been designated as repetitive loss properties, many more buildings have been flooded, resulting in 5,695 flood insurance claim payments. The Milan neighborhood has been the hardest hit as evidenced by the fact that there have been more claims than there are buildings in the neighborhood.

Four neighborhoods have had roughly half as many claims as their building count: Central City, Garden District, Lower Garden District, and Touro. These are located between the low ground to the north and the high ground near the river. The neighborhoods closest to the river have the fewest numbers of claims: East Riverside, Irish Channel, and St. Thomas Development.

Table 11 - Garden District Flood Insurance Claims Data

Neighborhood	All Claims			Without Katrina Claims				
	No. Claims	Claim Payments		Claims		Claim Payments		
		Avg.	Total	No.	Pct.	Avg.	Total	Pct.
Central City	1,703	$45,190	$60,148,127	626	37%	$17,465	$8,121,310	14%
East Riverside	194	$9,605	$624,349	43	22%	$9,820	$245,497	39%
Garden District	306	$11,063	$1,261,190	118	39%	$7,167	$544,726	43%
Irish Channel	300	$6,968	$731,641	93	31%	$7,568	$416,241	57%
Lower Garden District	601	$25,290	$7,258,123	288	48%	$11,865	$2,491,548	34%
Milan	2,054	$38,763	$68,881,432	1,135	55%	$7,972	$7,366,520	11%
St. Thomas Dev	45	$7,944	$135,054	17	38%	$4,516	$45,159	33%
Touro	492	$18,022	$3,946,894	185	38%	$8,498	$1,291,664	33%
District Total	5,695	$36,523	$142,986,810	2,505	44%	$10,706	$20,522,665	14%

Note: The number of claims include claims submitted, but not paid.
The average and total payments are based on paid claims only.

Table 11 notes that the National Flood Insurance Program has paid $142,986,810 in claim payments in the Garden District. Table 11 also provides data on claims that were paid for floods other than from Hurricane Katrina. These “without Katrina claims” represent the damage caused by repetitive flooding.

Of the 5,695 flood insurance claims in the Garden District, 3,190 (56%) were submitted after Hurricane Katrina. The rest are shown as the 2,505 “without Katrina claims” in Table 11. While without Katrina claims represent 44% of the number of claims, they were only 14% of the dollars paid. The average non-Katrina claim in the Garden District was $10,706, lower than the City-wide average of $11,910.

As with the numbers of claims, the Central City and Milan neighborhoods have had the greatest number of non-Katrina claims and the highest total claim payments. However, they have the smallest percent of non-Katrina claim payments, 14% and 11%. This is due to the fact that Katrina flooded these neighborhoods deeper than it did the other six neighborhoods to the south, on higher ground. While repetitive flooding hits these two neighborhoods more than the others, Katrina resulted in much more property damage.

Flood Control Measures

Drainage System

The City's drainage system is explained in Section 4.1. The Sewerage & Water Board's part of the Garden District district's drainage system is shown in Figure 15.

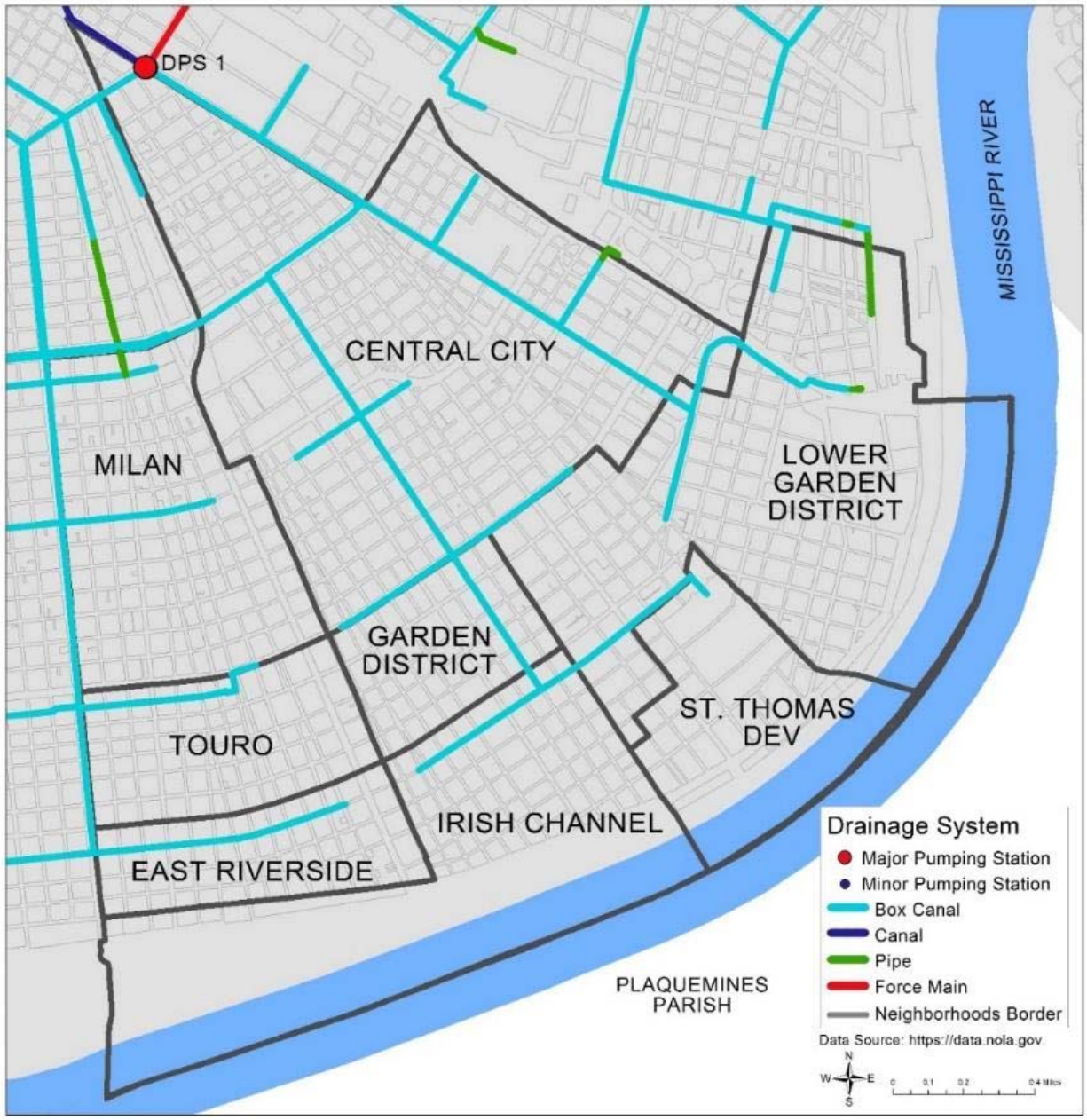


Figure 15 - Garden District Major Drainage System

Figure 15 shows the canals and larger pipes that collect the runoff from the roadside drainage system and convey it by gravity to the lower areas to the north. It is collected at Drainage Pump

Station DPS 1. From there, it is pumped northwest through a canal to the 17th Street Canal which carries it to Lake Pontchartrain.

Major Projects

The Southeast Louisiana Urban Flood Control Program (SELA) has completed the project that most helps the Garden District. The work enlarged canals and underground conduits, along Jefferson, Napoleon, and Louisiana Avenues, that collect and carry high flows to Drainage Pump Station 1.

Figure 16 - SELA projects in the Garden District

The Napoleon Avenue segments were completed in 2017 and the Louisiana Canal portion was completed in 2019. The most recent work on this project was to restore the surface area, such as with grassed and planted medians over the conduits, as seen in the graphic below.

Roadside Projects

The Department of Public Works received post-Katrina disaster assistance funding to help restore the streets and adjacent drainage facilities. These have been constructed over the years as road work is scheduled; more are planned. Figure 17 shows the location and status for the Garden District.

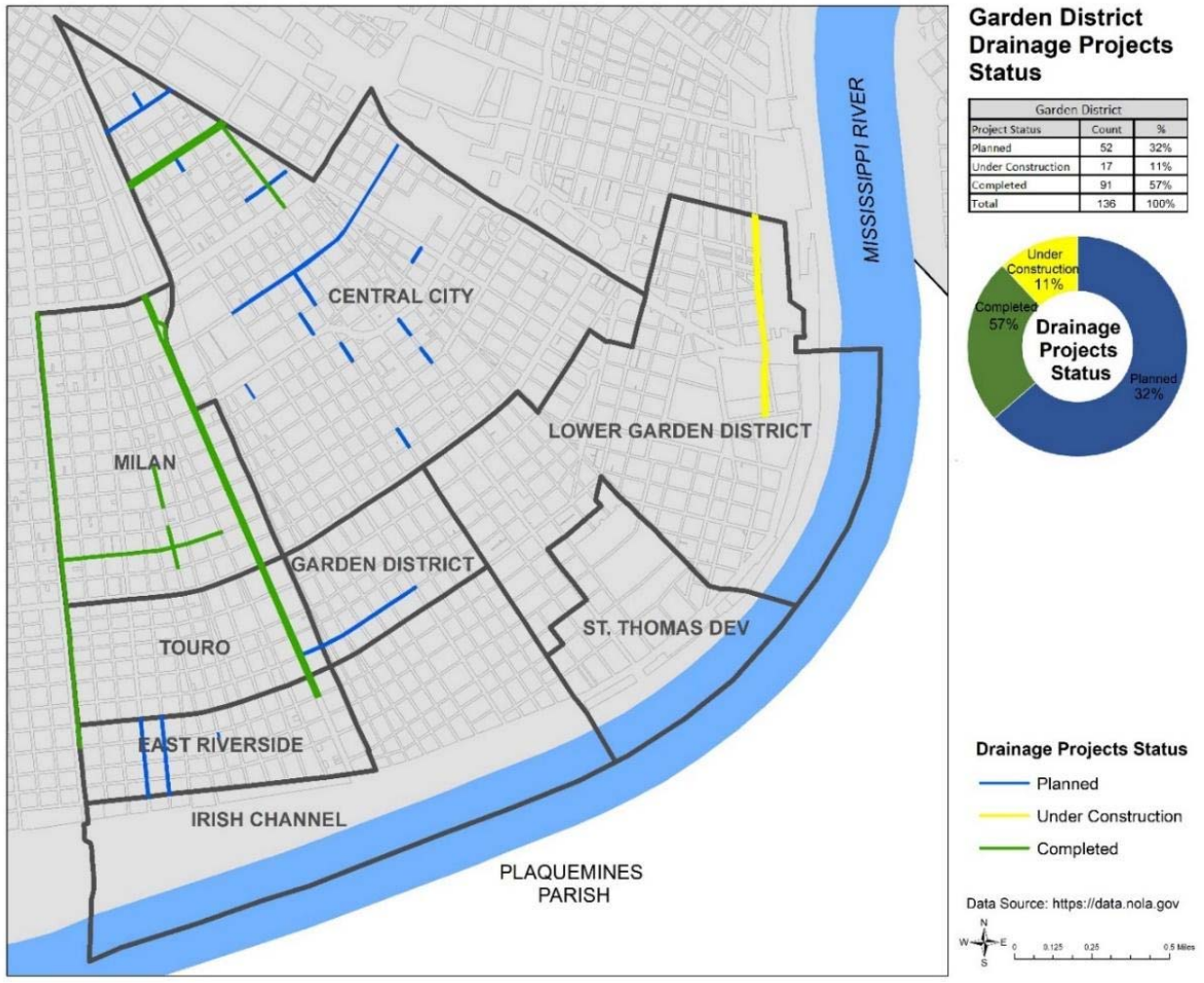


Figure 17 - Garden District Roadside Drainage Projects

As of March 2021, 57% of the projects have been completed and 11% more have been started. This schedule is ahead of the City as a whole: 32% and 4%, respectively. The completed work is mostly on the western side, where the drainage system feeds into the recently completed SELA projects on Louisiana and Napoleon Avenues.

When completed, these roadside projects will help drain the streets into the major drainage system's pipes and canals. However, if the major system has blockages or is overloaded, the roadside system may not be able to drain the water from the streets.

One important part of the roadside drainage system is the catch basins that collect surface water and send it into the subsurface pipes. As explained in Section 4.4, the more nearby residents do to keep them clean, the better the system works.

Green Infrastructure

As discussed in Section 4.3, the Green Infrastructure program relies on natural measures to handle drainage, such as letting rainwater soak into the ground in a rain garden. More information on Green Infrastructure can be found at https://ready.nola.gov/green-infrastructure/.

The Green Infrastructure program has received special funding from several different sources. The larger contributors are the Sewage and Water Board (S&WB) and the New Orleans Redevelopment Authority (NORA). Figure 19 on the next page shows Sewerage & Water Board stormwater projects to improve drainage and Green Infrastructure projects.

One of the Sewerage & Water Board's Green Infrastructure projects that will help properties in the eastern part of the Garden District Repetitive Loss Planning District is shown in Figure 18. It improves the drainage system that flows to Drainage Pump Station 1, reducing the load on DPS 1. As noted in the Fact Sheet, four public open space areas "will have subsurface storage, reducing standing water on the fields. Nine vacant lots in the study area will be designed to collect water off of the streets and temporarily store the water ...The water will be temporarily stored in subsurface tanks and then eventually flow into the City's drainage system. Because of the green infrastructure design, residents will be able to use the park's fields more quickly after storm events."

Figure 18 - Drainage Pump Station 01 Watershed
Resilience New Orleans Fact Sheet
https://www.nola.gov/resilience-sustainability/resources/fact-sheets/dps01-factsheet

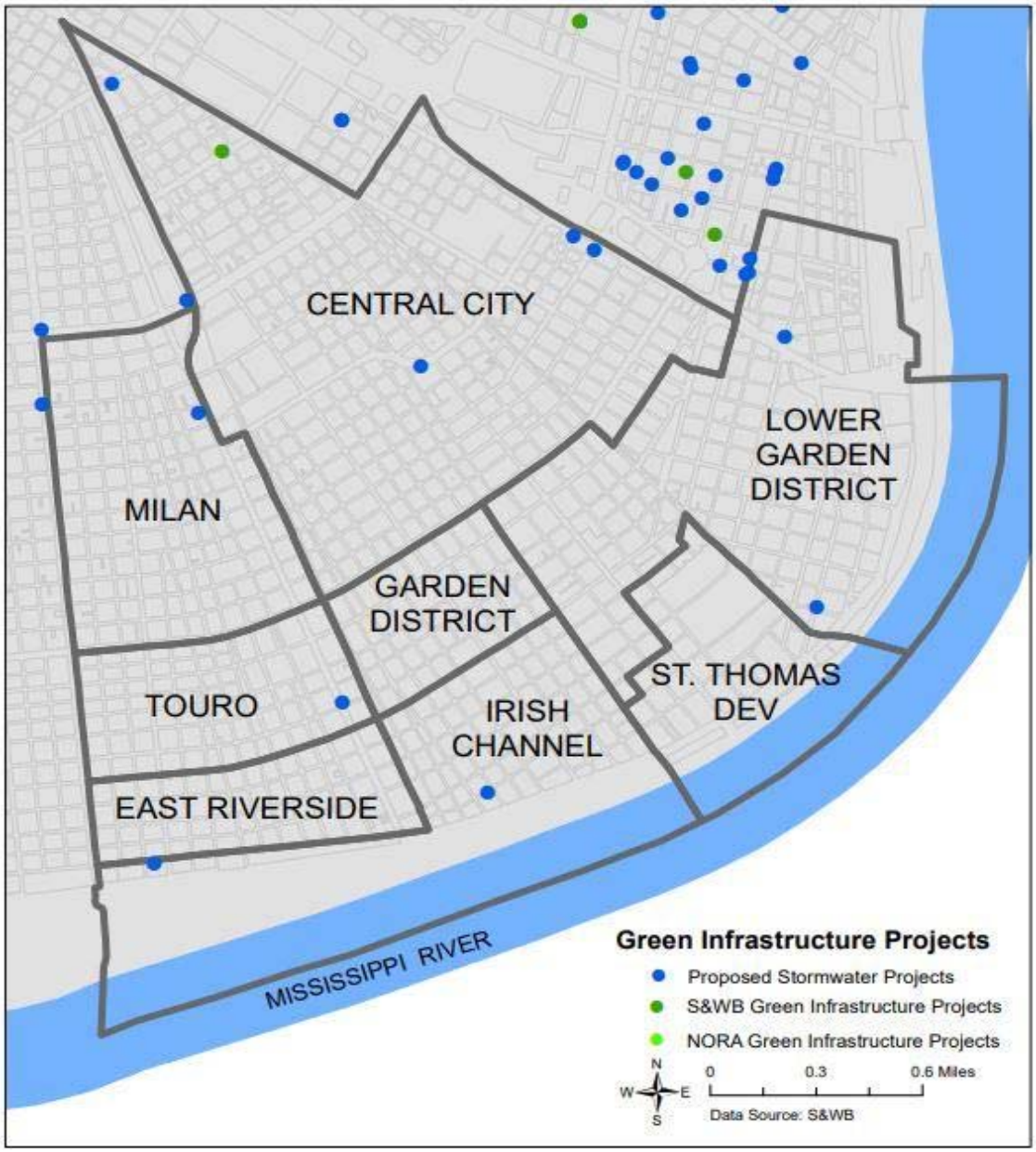


Figure 19 - Garden District Green Infrastructure Projects

Flood Control Measures Summary

Plans and projects to reduce localized, repetitive flooding in the Garden District Repetitive Loss Planning District are well underway. The SELA major drainage improvement project is complete as are the majority of the planned roadside improvement projects. Green Infrastructure projects have also been completed and more are on the way. These should reduce the frequency of localized, shallow repetitive flooding, but may not have an impact on the larger, less frequent floods.

Building Protection Measures

As noted in Section 5.2, building protection measures depend on the type of foundation and the depth of repetitive flooding. Figure 20 is a map showing the types of foundations. Detached garages, park pavilions, and other minor structures are not counted as buildings for the purposes of this report. As some areas were not included by the City's blight survey, not every building in the district was viewed. In most cases, grey areas are parks or vacant lots. For example, the large grey areas in the Lower Garden District neighborhood are mostly yards and storage areas related to shipping on the Mississippi River.

Figure 20 shows a relatively even distribution of buildings on slab and elevated foundations with more slab structures along the northeastern edge of the district. These areas have more industrial and commercial properties where slab construction is more common.

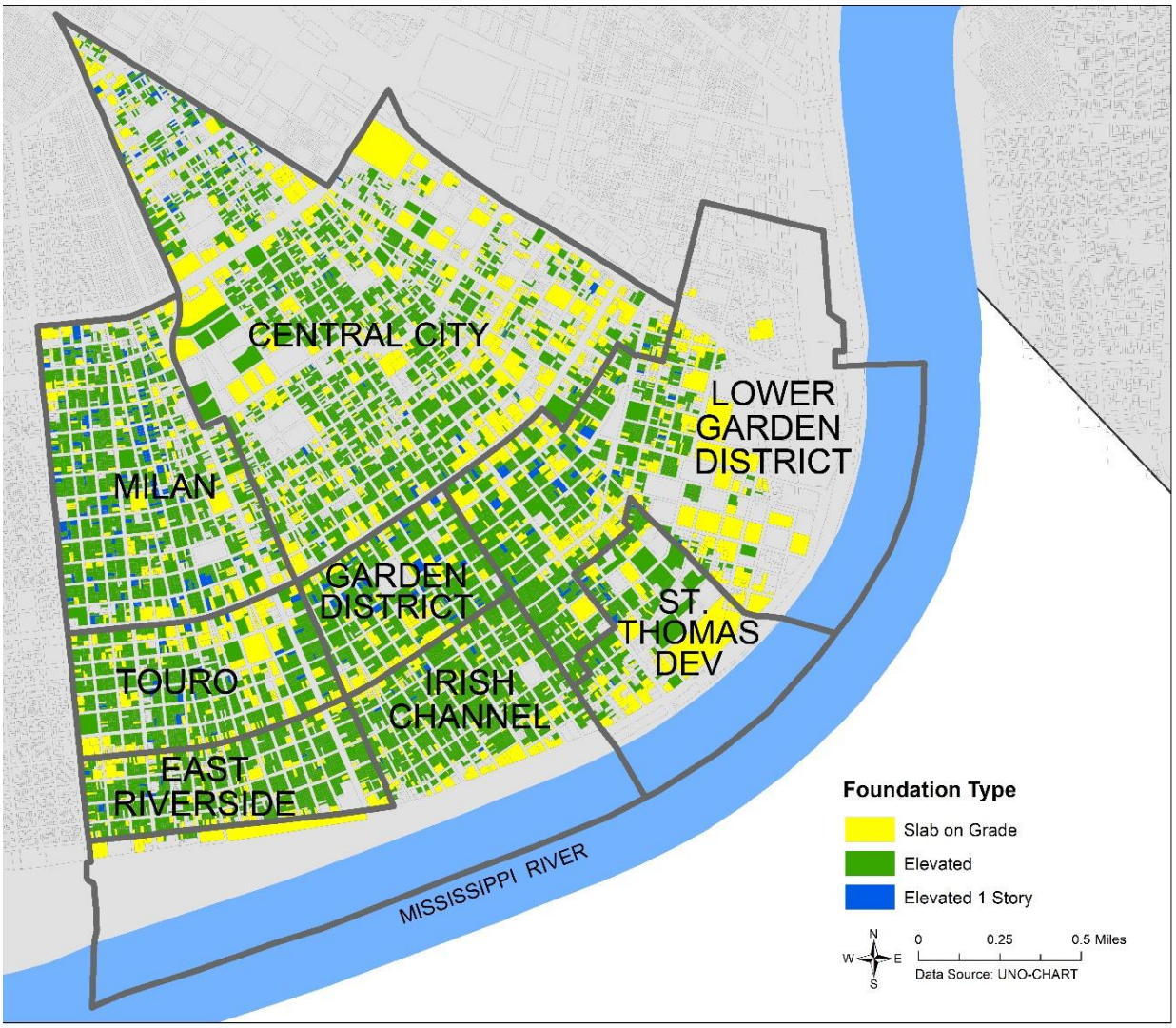


Figure 20 - Foundation Types in the Garden District Repetitive Loss Planning District

The project team reviewed building types and conditions for 10,040 primary structures in the Garden District Repetitive Loss Planning District. There may be some that were not picked up in the survey and there are likely some new buildings that were constructed, elevated, or cleared since the blight program's ArcGIS Photo Survey was conducted beginning in 2010 and updated through 2019. A summary of the findings is in Table 12.[53]

Table 12 - Garden District Building Data

Neighborhood	Number of Buildings	Percent Occupied	Percent in Good Condition	Percent >1 Story	Type of Foundation		
					Slab	Elev ≤ 3 ft	Elev > 3 ft
Central City	3,195	93%	94%	35%	22%	30%	48%
East Riverside	1,045	99%	99%	26%	15%	33%	52%
Garden District	589	99%	100%	74%	21%	27%	52%
Irish Channel	1,224	98%	99%	28%	13%	41%	46%
Lower Garden Dist.	1,222	98%	99%	64%	26%	24%	50%
Milan	1,615	97%	98%	48%	14%	27%	59%
St. Thomas Dev	304	97%	97%	44%	17%	41%	42%
Touro	846	98%	99%	54%	18%	24%	58%
District Total	10,040	96%	97%	43%	19%	30%	51%

Buildings in good condition are more appropriate for elevation and other building protection measures that preserve the existing structure. There are two measures of whether a building is in good condition that were collected in the building survey: if it is occupied and if it looks in good condition from the street.

The building data in Table 12 show an area with a high occupancy rate (96%) and a high number of buildings that are in good condition (97%). These figures are close to the City-wide numbers of 97% and 95%.

Buildings with more than one story have a building protection measure not available to single-story structures: the owner can permanently relocate valuable items, such as the furnace and air conditioner, to the upper story, above the flood level. The Garden District and Lower Garden District neighborhoods have high percentages of buildings with more than one story and the district as a whole is above the City-wide number, 43% vs. 30%.
The first floors of buildings on slab foundations are closer to the ground than the first floors of the elevated buildings on crawlspaces or piers and therefore apt to flood more often. The Garden District, the Lower Garden District and Central City neighborhoods have a slightly higher percentage of slab on grade foundations. As noted above, two of these neighborhoods have more commercial and industrial structures than the rest of the district to the west. All in all, the

[53] BlightStatus Demolitions - Map | Data.NOLA.gov

district has relatively a small percentage of slab foundations, 19%, as opposed to the City-wide figure of 41%

Elevated buildings are the easiest to raise to a higher, flood protected, level. The Garden District Repetitive Loss Planning District has one of the highest percentages of elevated buildings. Over half of the buildings in the district are elevated more than three feet.

Building Protection Measures Summary

Just over half of the buildings in the Garden District Repetitive Loss District are considered protected from shallow, repetitive flooding because they are elevated more than three feet above grade. Two-thirds of the rest of the buildings could be protected by being elevated higher. The remaining buildings on slab foundations are likely in good shape, making building protection measures for them more viable.

Elevated house on South Saratoga Street in the Garden District Loss Planning District.

Photo Credit: UNO-CHART

Recommendations

1. The roadside drainage improvement and Green Infrastructure projects should continue.
2. Every owner of a building less than three feet above ground level should review their building protection measure alternatives.
3. Every property owner and renter in every neighborhood should:
   a. Carry a flood insurance policy regardless of their FIRM zone, and
   b. Maintain the catch basins downstream of their property.

4. GENTILLY

The Gentilly Repetitive Planning Loss District is located in the north central part of the City. It is bordered on the north by Lake Pontchartrain, on the west by Bayou Saint John, on the east by the Industrial Canal and on the south by I-610 as shown in Figure 21.

The district has eight neighborhoods, which are also designated by the City's planning programs and are displayed in Figure 21.

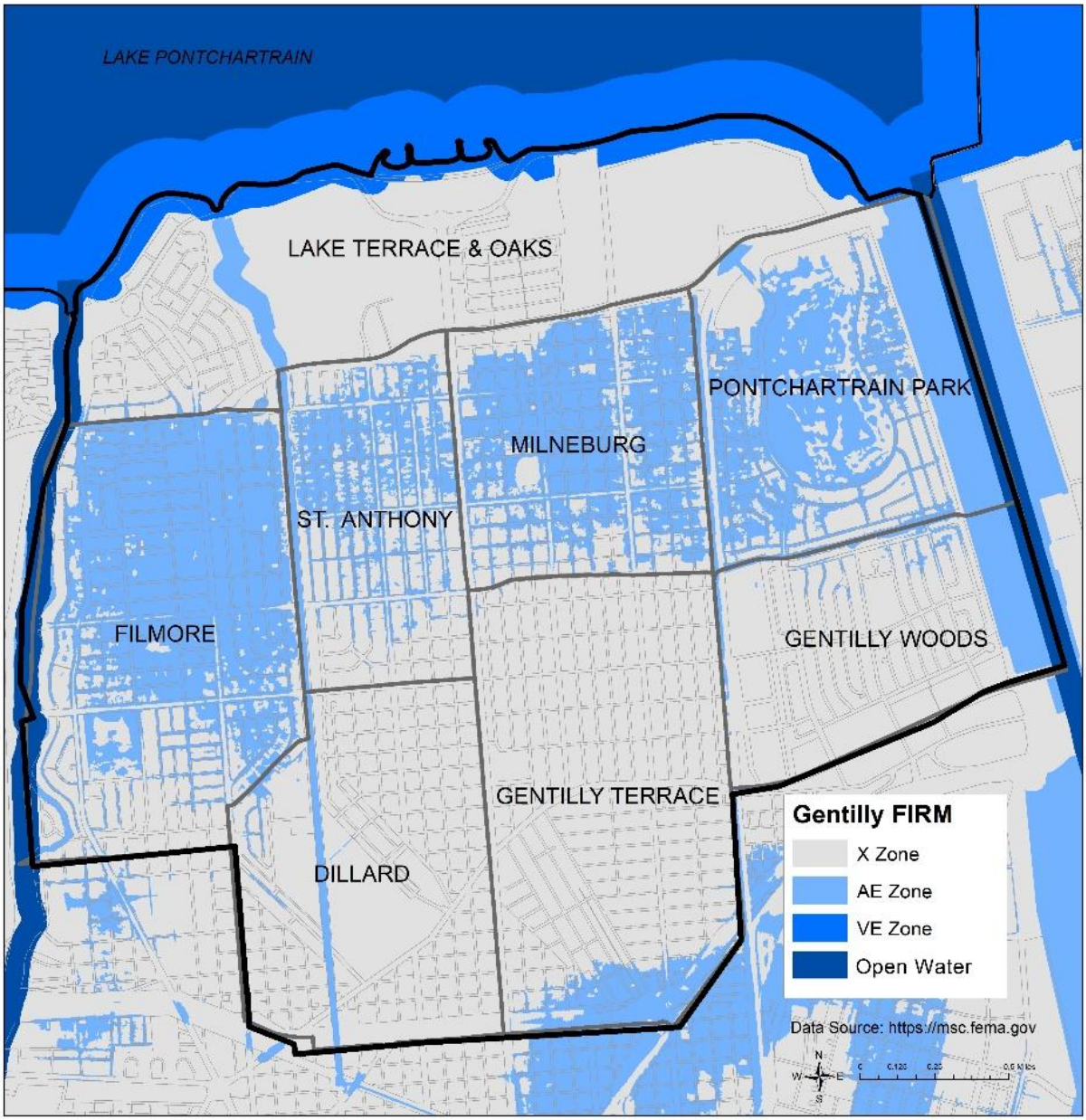


Figure 21 - Gentilly District Flood Insurance Rate Map

The Repetitive Flood Problem

The flood zones on the FIRM are explained in the Mitigation Terminology page in Section 5.1. The Filmore, St. Anthony, Milneburg, and Pontchartrain Park neighborhoods have most of the District's high-risk flood zones (AE Zones) shown on the current FIRM. They are the lowest areas, being closest to the original shoreline of Lake Pontchartrain. Lake Terrace and Oaks was built on fill in the Lake during the 1920s, so it is higher than the areas to the south.

Table 13 - FEMA Repetitive Loss Properties in Gentilly

Neighborhood	Buildings	Number of RLs	Percent of RLs	Number Claims	Pct. Of Buildings with Claims
Dillard	1,755	52	3%	1,296	74%
Filmore	2,307	92	4%	3,313	144%
Gentilly Terrace	3,420	103	3%	2,671	78%
Gentilly Woods	967	141	15%	1,901	197%
Lake Terrace & Oaks	668	6	1%	624	93%
Milneburg	1,543	94	6%	2,623	170%
Pontchartrain Park	783	32	4%	1,162	148%
St. Anthony	1,393	15	1%	1,762	126%
Gentilly District	12,836	535	4%	15,352	120%

Note: the number of claims is the number of claims submitted, including those closed without payment

Table 13 shows numbers and percentages of buildings and claims in Gentilly between 1978 and 2018, the period for available data. Of the 12,836 buildings reviewed in Gentilly, 535 or 4% have been officially listed by FEMA as repetitive loss properties. Gentilly Woods has the largest percentage of buildings listed as repetitive loss properties.

There have been 15,352 National Flood Insurance Program claims in Gentilly. Because of repetitive flooding, there have been more claims (15,352) than there are buildings (12,836). This is true for all the neighborhoods at the lower elevations, i.e., those in the middle of the district with the most AE Zones. High claim counts are also likely related to having mapped AE Zone floodplains. Not only do mapped floodplains have more flooding that causes property damage, but they also tend to have more properties covered by flood insurance (which is mandated under the federal law that requires flood insurance as a condition of a federally-backed mortgage on a property in the AE Zone).

The neighborhoods on the north and south sides of the district (Dillard, Gentilly Terrace, and Lake Terrace & Oaks) have the lowest percent of claims per building. These are also mostly in the X Zone, on higher ground.

Table 14 - Gentilly Flood Insurance Claims Data

Neighborhood	All Claims		Without Katrina Claims	
		Claim Payments	Claims	Claim Payments

	No. Claims	Avg.	Total	No.	Pct.	Avg.	Total	Pct.
Dillard	1,296	$84,681	$96,621,531	343	26%	$4,754	$1,055,395	1%
Filmore	3,313	$108,947	$328,802,920	1,054	32%	$16,122	$13,107,440	4%
Gentilly Terrace	2,671	$83,803	$198,027,515	665	25%	$4,504	$2,022,448	1%
Gentilly Woods	1,901	$64,797	$111,256,516	883	46%	$11,679	$8,478,985	8%
Lake Terrace/Oaks	624	$126,006	$47,882,282	118	19%	$4,796	$326,187	1%
Milneburg	2,623	$62,258	$147,489,515	1,172	45%	$9,520	$9,091,495	6%
Pontchartrain Park	1,162	$66,893	$72,178,409	409	35%	$16,721	$5,685,364	8%
St. Anthony	1,762	$74,465	$116,984,277	517	29%	$5,875	$2,115,050	2%
Gentilly District	15,352	$81,853	$1,119,242,965	5,161	34%	$10,619	$41,882,364	4%
Note: The number of claims include claims submitted, but not paid. *The average and total payments are based on paid claims only.*								

Table 14 shows the dollar amounts of claim payments and "without Katrina" claims. While the NFIP has spent over $1 billion on claims in Gentilly, only 4% of that amount was for non-Katrina flooding. These "without Katrina claims" represent the damage caused by repetitive flooding. The average of these flood insurance claim has been $10,619, much lower than the average of all claims because the average for all claims is skewed by the Katrina data.

Table 14 reinforces the fact that the lower neighborhoods, i.e., those in the floodplain (AE Zones), suffer more from repetitive flooding. Filmore, Gentilly Woods, Milneburg, and Pontchartrain Park have the highest average non-Katrina claim payments, all of them over $9,500. The other four neighborhoods have had average repetitive flood insurance claim payments ranging from $4,500 to $5,875.

Lake Terrace & Oaks has the fewest number of repetitive loss properties, but the highest average claims payment. This is probably due to two reasons: (1) it is the most recently built area, so it has the newest buildings and (2) it has the fewest number of claims. While the District average is 34% of the claims being from non-Katrina flooding, the number is 19% for Lake Terrace & Oaks. This means most of the claims were from the single deepest, most severe, flood. The small number of repetitive flood claims (only 1% of all claims) averaged only $4,796.

Flood Control Measures

Drainage System

The City's drainage system is explained in Section 4.1. The Sewerage & Water Board's part of the Gentilly district's drainage system is shown in Figure 22. The map shows that most of Gentilly's drainage is collected and directed to Drainage Pumping Station 4 (DPS4). From there, it is pumped over the levee, into the London Avenue Canal and on to Lake Pontchartrain.

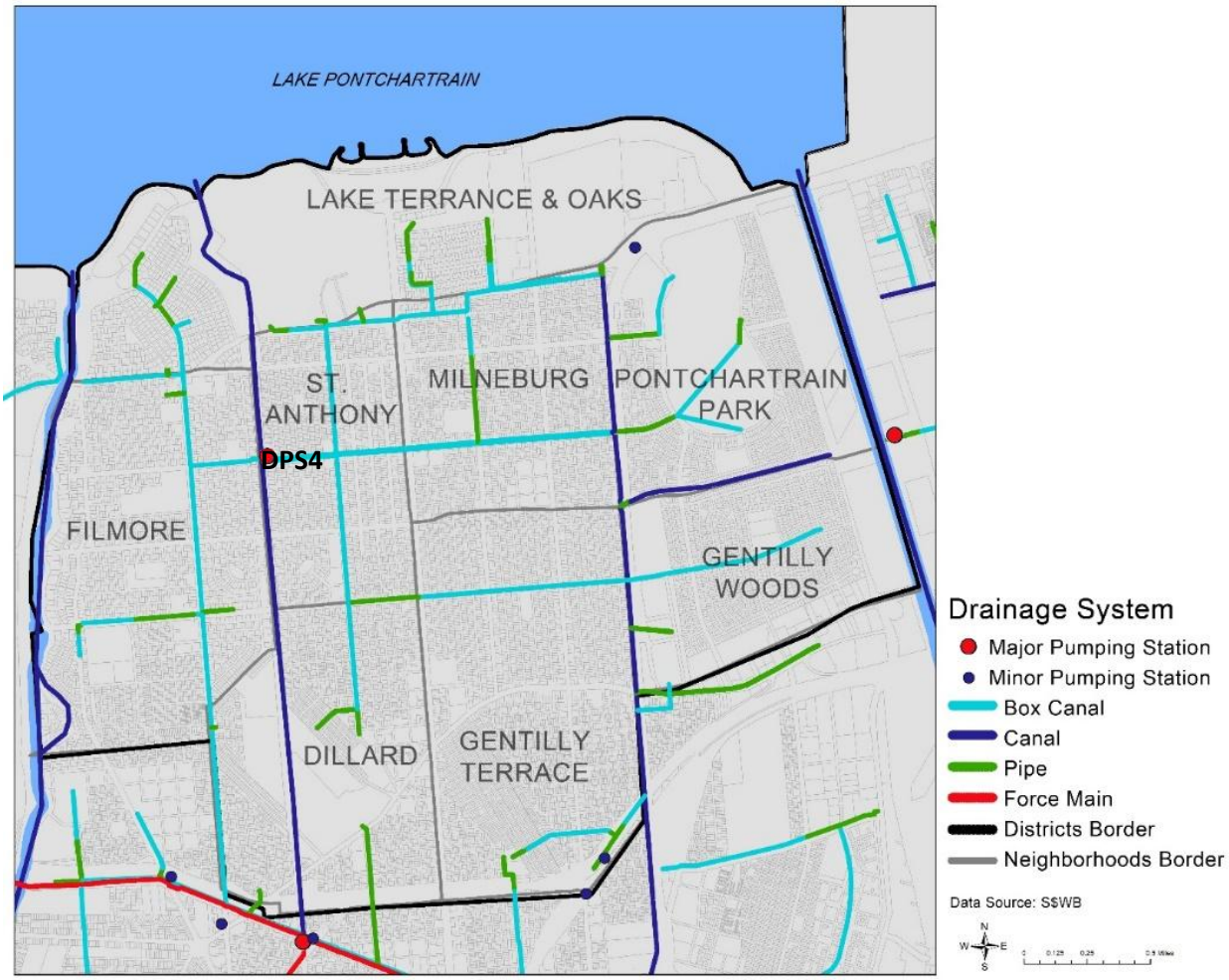


Figure 22 - Gentilly's Major Drainage System

Major Projects

There has been only one SELA project in the Gentilly district - the London Avenue Canal Interim Control Structure (ICS). After Hurricane Katrina, the Corps built Interim Closure Structures at the mouths of the three outfall canals to provide 100-year level of storm surge risk reduction. The London Avenue Canal ICS is located at Drainage Pumping Station 4, which drains most of Gentilly ((Figure 22). There was another project called Permanent Canal Closures & Pumps that was also funded by the Corps of Engineers. Because both projects are designed to keep Lake Pontchartrain storm surge out of the canal, they will not have much impact on collecting stormwater drainage in Gentilly and discharging it into the Lake.

However, there is discussion about proposing a SELA project to increase the capacity of Pump Station 4. On March 9, 2021, the City Council passed a proclamation to support the Sewerage & Water Board fully funding the local share of projects, including evaluations to expand drainage capacities in Lakeview and Gentilly.

Roadside Projects

The Department of Public Works received post-Katrina disaster assistance funding to help restore the streets and adjacent drainage facilities. These have been constructed over the years as road work is scheduled; more are planned. Figure 23 shows their location and status for the Gentilly district. As of October 3, 2019, only 14% of the projects have been completed and only 1% more have been started. City-wide, these numbers are 32% and 4%.

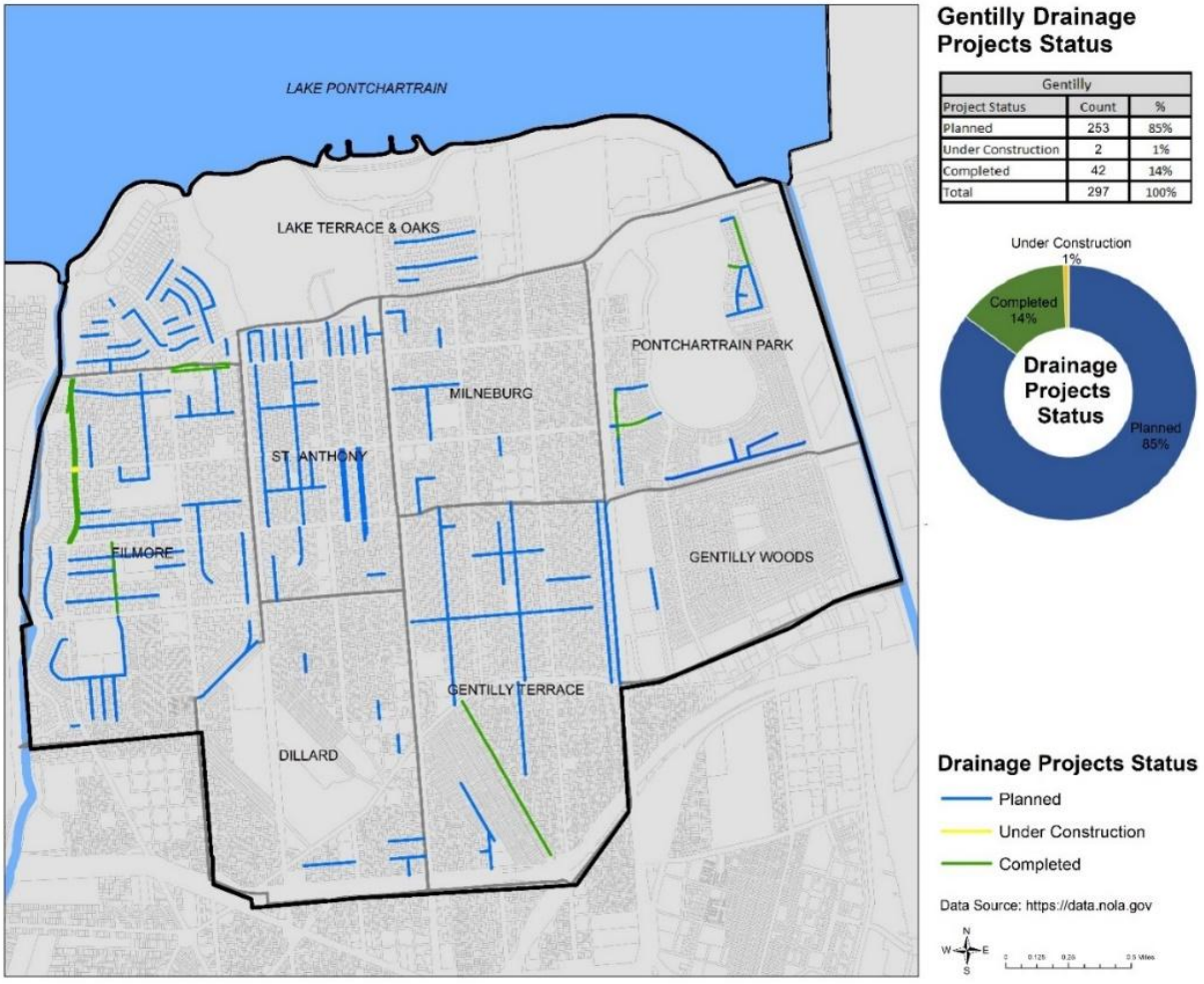


Figure 23 - Roadside Drainage Projects in Gentilly

One important part of the roadside drainage system is the catch basins that collect surface water and send it into the subsurface pipes. As explained in Section 4.4, the more nearby residents do to keep them clean, the better the system works.

Green Infrastructure

As discussed in Section 4.3, the Green Infrastructure program relies on natural measures to handle drainage, such as letting rainwater soak into the ground in a rain garden. The Green Infrastructure program has received special funding from several different sources. Gentilly is the first area in which projects will be implemented. Figure 24 shows Sewerage & Water Board stormwater projects to improve drainage and Green Infrastructure projects.

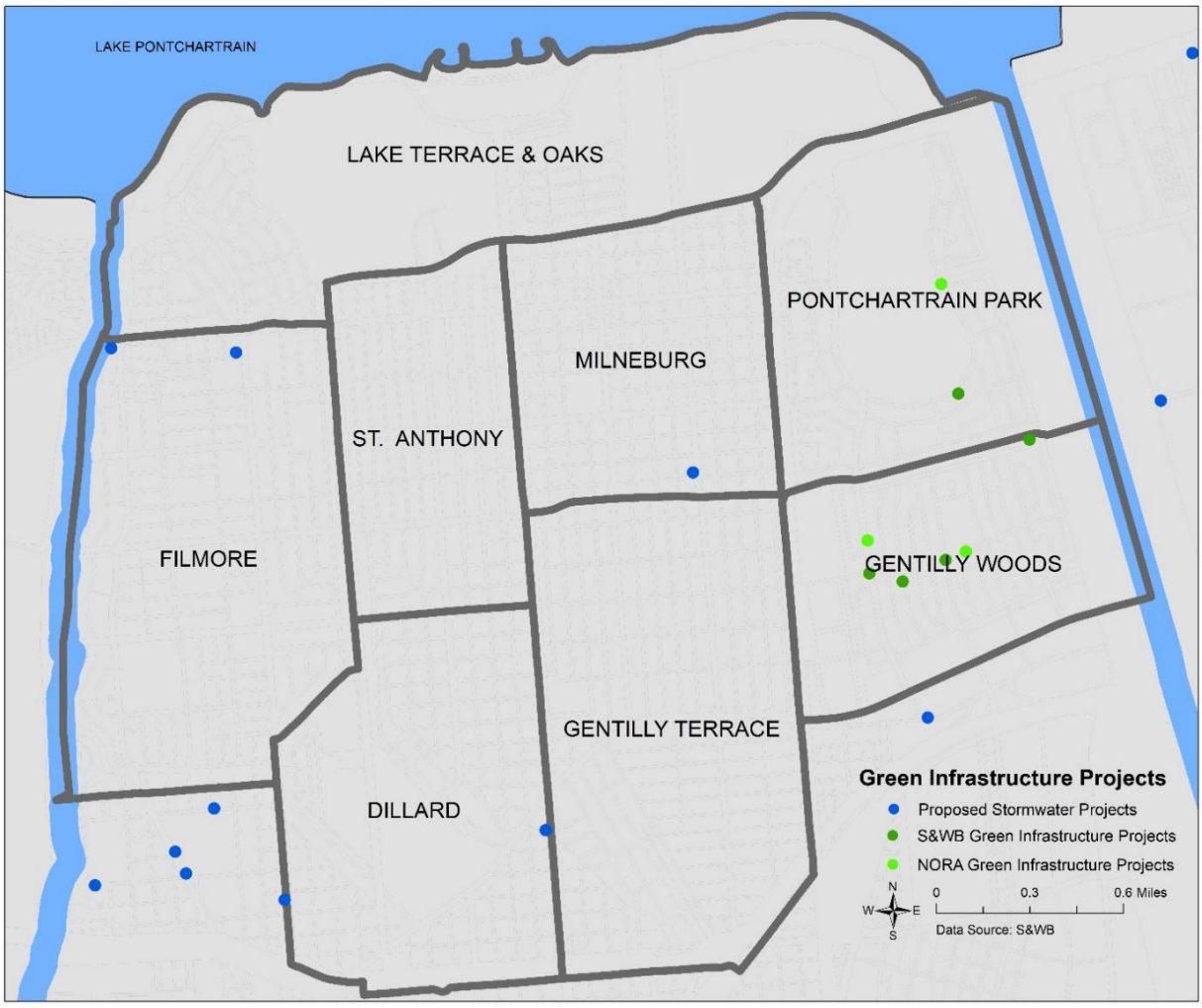


Figure 24 - Green Infrastructure Projects in Gentilly

Gentilly Resilience District

Is the city's first Resilience District that uses various approaches to water and land use in an effort to provide benefits at the neighborhood level. The outcomes of this pilot program are to improve community health, provide increased economic opportunity, facilitate environmental education, and recreation at the neighborhood level. More information on the Gentilly Resilience District can be found at [Resilience & Sustainability - Areas of Focus - Green Infrastructure - National Disaster Resilience Competition - Gentilly Resilience District - City of New Orleans (nola.gov)](#).

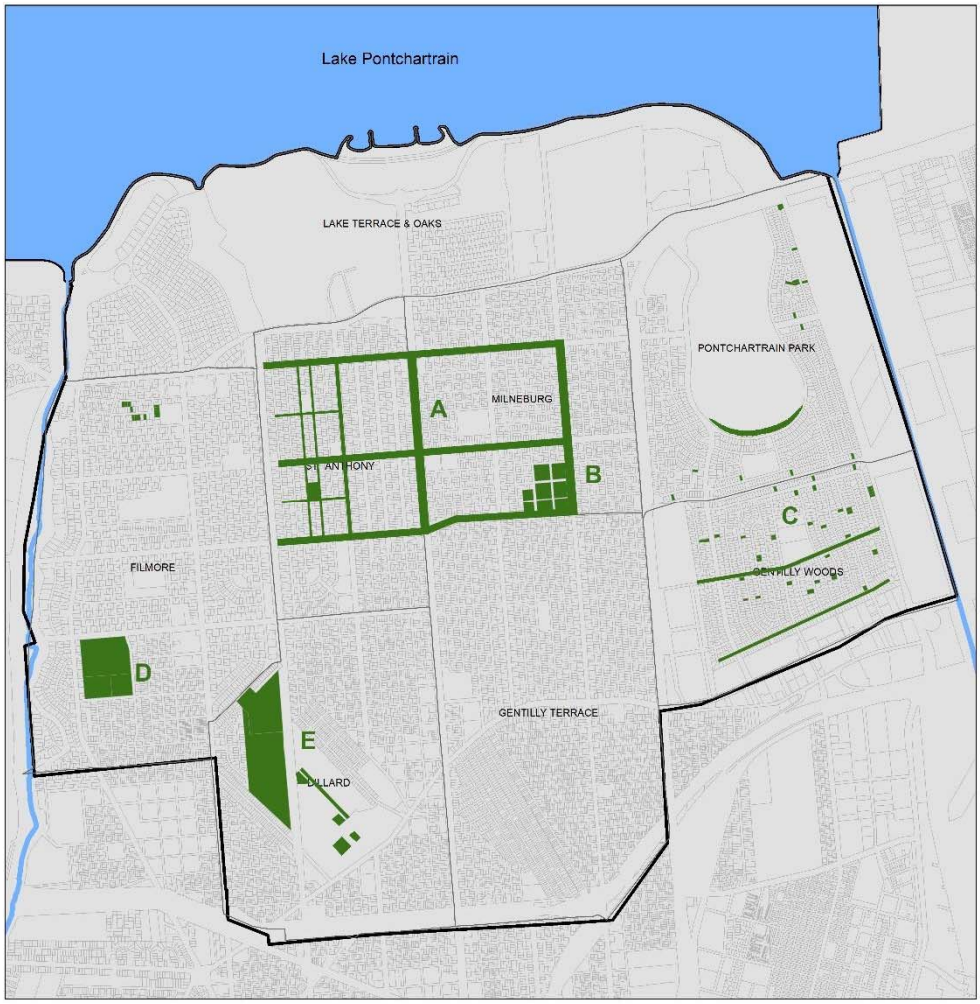


Figure 8 - Gentilly Resilience District

The Gentilly Resilience District includes the following projects:

- Blue & Green Corridors[54]

[54] https://nola.gov/resilience-sustainability/gentilly-resilience-district/blue-green-corridors/

- Dillard Wetlands[55]
- London Avenue Canal – Public Art / Placemaking[56]
- Mirabeau Water Garden Phase II[57]
- Pontilly Neighborhood Stormwater Network – Phase II / Dwyer Canal Public Improvements[58]
- St. Anthony Green Streets[59]
- St. Bernard Neighborhood Campus[60]

More information on Green Infrastructure can be found at https://ready.nola.gov/green-infrastructure and https://www.swbno.org/Projects/InteractiveGuideToGreenInfrastructure.

Flood Control Measures Summary

The Gentilly Repetitive Loss Planning District is drained by the same system that drains most of New Orleans: City streets and roadside collector pipes drain to larger pipes and canals maintained by the Sewerage & Water Board. This system is designed to handle the 10-year storm. The roadside pipes are being improved over time and Green Infrastructure projects will help with the smaller, more frequent storms, but they will not increase the total capacity of the system. There may be a SELA study to improve the capacity of Drainage Pumping Station 4.

Building Protection Measures

As noted in Section 5.2, building protection measures depend on the type of foundation and the depth of repetitive flooding. Figure 25 is a map showing the types of foundations. Detached garages, park pavilions, and other minor structures are not counted as buildings for the purposes of this report. Some areas were not included by the City's blight survey, so not every building in the district was viewed. In most cases, grey areas are parks or vacant lots. For example, the large grey areas along the canal in the middle of the Pontchartrain Park neighborhood is a municipal golf course.

[55] https://nola.gov/resilience-sustainability/gentilly-resilience-district/dillard-wetlands/
[56] https://nola.gov/resilience-sustainability/gentilly-resilience-district/pontilly-neighborhood-ii/
[57] https://nola.gov/resilience-sustainability/ndr-grd-projects-programs/mirabeau-water-garden-phase-ii/
[58] https://nola.gov/resilience-sustainability/ndr-grd-projects-programs/dwyer-canal/
[59] https://nola.gov/resilience-sustainability/ndr-grd-projects-programs/st-anthony-green-streets/
[60] https://nola.gov/resilience-sustainability/ndr-grd-projects-programs/st-bernard-neighborhood-campus/

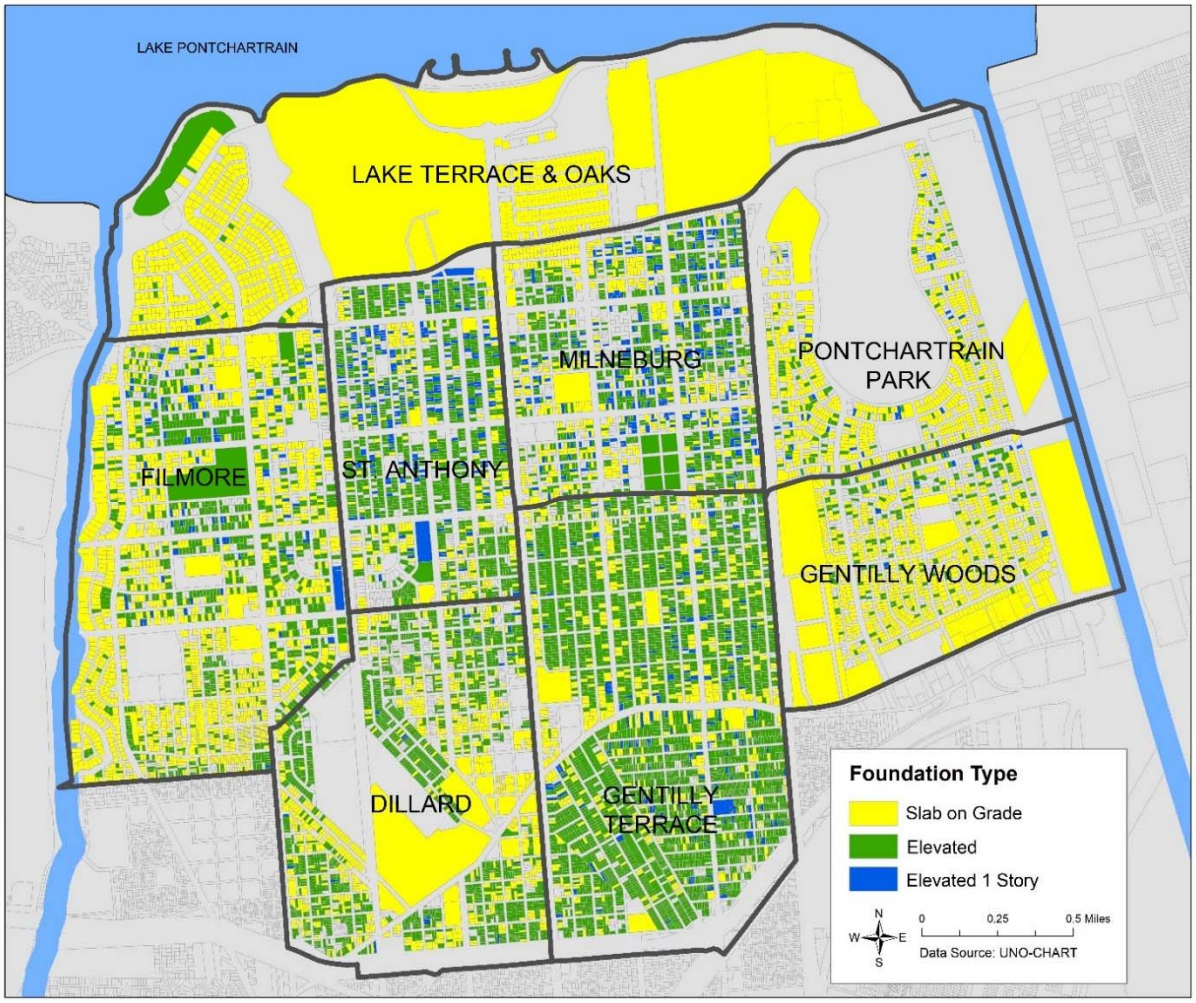


Figure 25 - Foundation Types in Gentilly

Figure 25 shows a relatively even distribution of slab and elevated foundations in the central neighborhoods. Lake Terrace & Oaks is almost 100% slab foundations, the common construction approach when this area was built, later than the other neighborhoods. Pontchartrain Park and Gentilly Woods have large parcels with slab foundations on the east side of the neighborhoods. These are canal-related warehouse and industrial buildings. The yellow blocks on the west side of Gentilly Woods are mostly apartment complexes. The large yellow area in the Dillard neighborhood are Dillard University buildings.

The project team reviewed building types and conditions for 12,826 primary structures in the Gentilly Repetitive Loss Planning District. There may be some that were not included in the survey and there are likely some new buildings that were constructed, elevated, or cleared

since the blight program's ArcGIS Photo Survey was conducted beginning in 2010 and updated through 2019. A summary of the findings is in Table 15.[61]

Table 15 - Gentilly District Building Data

Neighborhood	Number of Buildings	Percent Occupied	Percent In Good Condition	Percent >1 Story	Type of Foundation		
					Slab	Elev ≤ 3 ft	Elev > 3 ft
Dillard	1,755	98%	94%	18%	35%	39%	26%
Filmore	2,307	99%	97%	27%	62%	9%	29%
Gentilly Terrace	3,420	98%	93%	23%	18%	44%	38%
Gentilly Woods	967	98%	96%	15%	79%	3%	18%
Lake Terrace & Oaks	668	99%	97%	20%	98%	2%	1%
Milneburg	1,543	97%	93%	18%	30%	22%	48%
Pontchartrain Park	783	98%	95%	10%	81%	2%	17%
St. Anthony	1,393	97%	93%	27%	19%	25%	56%
District Total	12,836	98%	94%	21%	42%	23%	35%

Buildings in good condition are more appropriate for elevation and other building protection measures that preserve the existing structure. There are two measures of whether a building is in good condition that were collected in the building survey: if it is occupied and if it looks in good condition from the street.

The building data in Table 15 show a strong healthy area with a very high occupancy rate (98%) and a very high number of buildings that are in good condition (also 98%). These figures are slightly higher than the City-wide numbers of 97% and 95%. The numbers are similar for all the neighborhoods.

Buildings with more than one story have a building protection measure not available to single-story structures: the owner can permanently relocate valuable items, such as the furnace and air conditioner, to the upper story, above the flood level. Twenty-one percent of the district's buildings are more than one story tall. The neighborhoods range from 10% to 27% of their buildings having more than one story.

Forty-two percent of the buildings in Gentilly are on slab foundations. The first floors of buildings on slab foundations are closer to the ground than the first floors of the elevated buildings on crawlspaces or piers and therefore apt to flood more often. The newer areas, such as Lake Terrace & Oaks (which was built on lakefront fill that was brought in during the 1920s), have a higher percentage of slab buildings. This usually means they are more floodprone, but in Lake Terrace & Oaks, the filling resulted in ground that is higher than in the older

[61] BlightStatus Demolitions - Map | Data.NOLA.gov

neighborhoods to the south and much of the area was not significantly flooded during Hurricane Katrina.

Fifty-eight percent of the buildings in Gentilly are on elevated foundations, 35% of them are elevated more than three feet above the ground. These higher foundations are spread throughout all the neighborhoods except for Lake Terrace & Oaks, with the highest percentages in St. Anthony and Milneburg. Except for Dillard, Gentilly Terrace, and Lake Terrace & Oaks, most of the elevated buildings in the Gentilly district are already elevated at least three feet above grade. These buildings were either elevated when they were first constructed or elevated after Katrina by the owners, often with grant funds. In other words, building protection measures have been actively implemented in recent years and future repetitive loss claims should be reduced.

2006 Post-Katrina Gentilly home elevation.

Photo Credit: ROBERT KAUFMANN/FEMA

As explained in Chapter 5, the building protection options are limited for buildings that are not already elevated. Elevating a slab on grade foundation is more expensive than elevating a building that already has its lowest floor above the ground. Buildings with more than one story have the option of moving equipment, furniture, and valuables up one floor - above flood levels. As seen in Table 15, this applies to only 21% of the buildings in Gentilly.

Building Protection Measures Summary

The Gentilly Repetitive Loss Planning District has 12,836 insurable buildings, almost all of which are in good condition, making them more appropriate for elevation and other building protection measures that preserve the existing structure. Thirty-five percent of all the buildings are already elevated above repetitive flood levels and many on slab foundations are on elevated ground along the Lakefront. The rest, however, would benefit from the building protection measures reviewed in Chapter 5.

Recommendations

1. The roadside drainage improvement and Green Infrastructure projects should continue.
2. The Sewerage & Water Board should fund and complete the SELA evaluations to expand drainage capacities in Lakeview and Gentilly.

3. Every owner of a building less than three feet above ground level should review their building protection measure alternatives.
4. Every property owner and renter in every neighborhood should:
    c. Carry a flood insurance policy regardless of their FIRM zone, and
    d. Maintain the catch basins downstream of their property.

5. LAKEVIEW

The Lakeview Repetitive Loss Planning District is in the northwest part of the city. It is bordered on the north by Lake Pontchartrain, on the west by Jefferson Parish, on the east Bayou St. John, and on the south by City Park Avenue and Toulouse Street.

The district has six neighborhoods which are also designated by the City's planning programs and are displayed in Figure 26. Note that the Lakeview Repetitive Loss Planning District has a neighborhood with the same name.

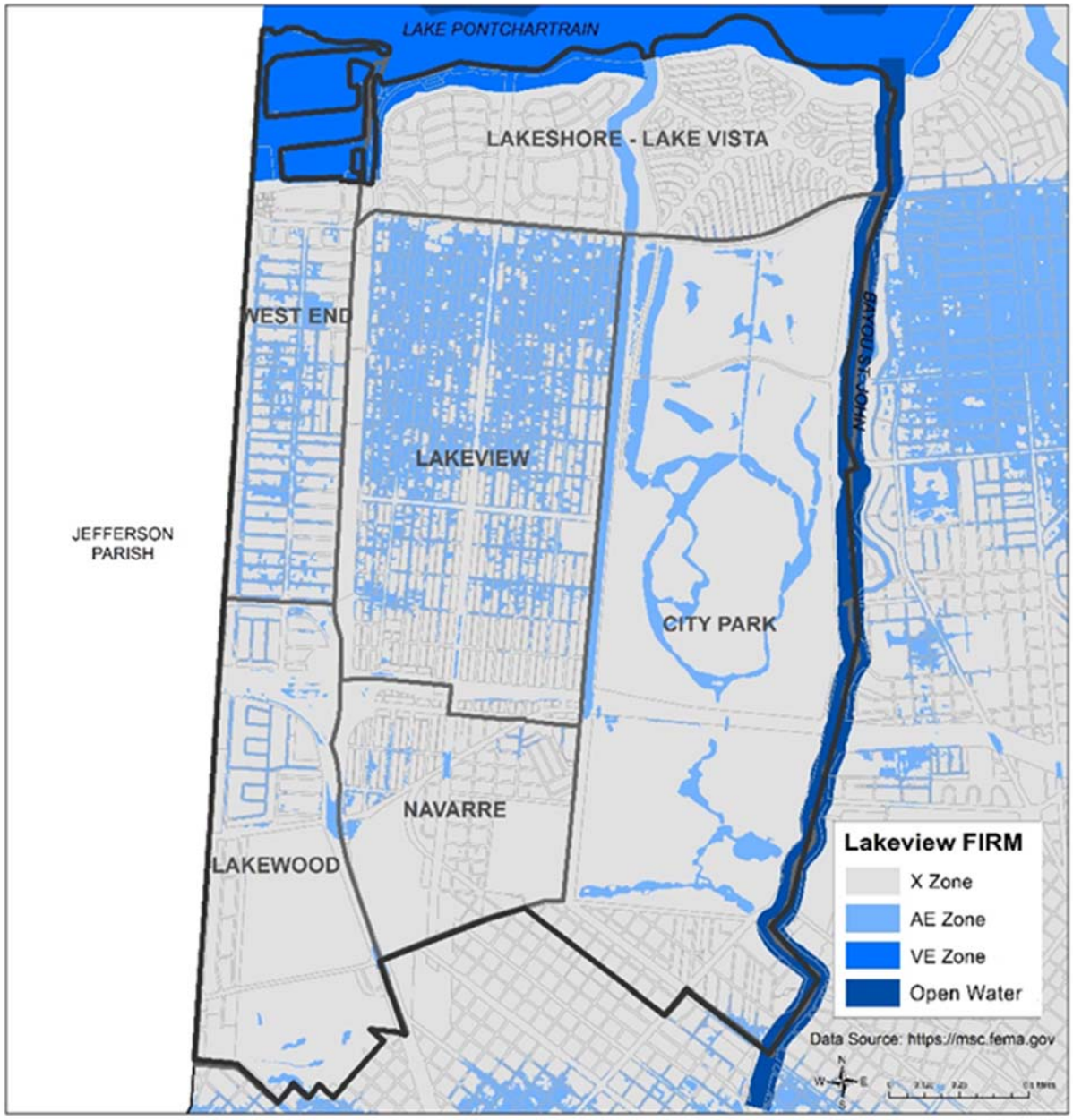


Figure 26 - Lakeview Flood Insurance Rate Map

The Repetitive Flood Problem

The flood zones on the FIRM are explained in the Mitigation Terminology page in Section 5.1. The West End and Lakeview neighborhoods have most of the District's high risk flood zones (AE Zones). These areas are lower than the rest, being close to Lake Pontchartrain. The Lakeshore-Lake Vista neighborhood is even closer, but it was developed on a large, filled area on the lakefront. It is generally higher than the neighborhoods to the south and has almost no identified flood hazard area.

On the other hand, the north part of the West End neighborhood is shown as dark blue, or VE Zone. This area is outside the levee and subject to coastal flood and damage from wave action from storms on Lake Pontchartrain.

Table 16 - FEMA Repetitive Loss Properties in Lakeview

Neighborhood	Buildings	Number of RLs	Percent of RLs	Number Claims	Pct. Of Buildings with Claims
City Park	904	19	2%	572	63%
Lakeshore-Lake Vista	1,396	43	3%	1,383	99%
Lakeview	3,399	219	6%	4,394	129%
Lakewood	747	28	4%	807	108%
Navarre	1,033	37	4%	1,143	111%
West End	1,494	146	10%	2,302	154%
District Total	8,973	492	5%	10,601	118%

Note: the number of claims is the number of claims submitted, including those closed without payment

Table 16 shows numbers and percentages of buildings and claims in Lakeview between 1978 and 2018, the period for available data. Because the number of buildings in the neighborhoods ranges from 747 to 3,399, it is more relevant to compare percentages. Of the 8,973 buildings reviewed in the district, 492 or 5% have been officially listed by FEMA as repetitive loss properties. The largest number of repetitive loss designated properties were in the two neighborhoods with the most mapped flood hazard area, Lakeview and West End.
While only 5% of the buildings in the district have been designated as repetitive loss properties, many more buildings have been flooded, resulting in 10,601 flood insurance claim payments. There were more claims per building in four of the six neighborhoods. Not every building in those areas had a claim but some buildings had two or more claims.

The two neighborhoods noted above, Lakeview and West End, also have the largest number of flood insurance claims and the largest percent of claims per building. Their claims numbers are the highest probably because of the AE Zone floodplains, they tend to have (1) more flooding that causes property damage and (2) more properties covered by flood insurance (which is

mandated under the federal law that requires flood insurance as a condition of a federally-backed mortgage on a property in the AE Zone).

Table 17 - Lakeview Flood Insurance Claims Data

Neighborhood	All Claims			Without Katrina Claims				
	No. Claims	Claim Payments		Claims		Claim Payments		
		Avg.	Total	No.	Pct.	Avg.	Total	Pct.
City Park	572	$74,522	$38,155,321	114	20%	$4,874	$424,053	1%
Lakeshore-Lake Vista	1,383	$146,320	$145,296,092	276	20%	$6,272	$1,160,370	1%
Lakeview	4,394	$142,105	$581,492,404	1,193	27%	$7,934	$7,323,448	1%
Lakewood	807	$198,205	$142,707,757	180	22%	$8,440	$1,114,018	1%
Navarre	1,143	$113,916	$119,270,482	347	30%	$8,999	$2,366,781	2%
West End	2,302	$115,069	$244,176,699	840	36%	$20,966	$14,382,964	6%
District Total	10,601	$139,130	$1,271,098,755	2,950	28%	$11,763	$26,771,634	2%

Note: The number of claims include claims submitted, but not paid.
The average and total payments are based on paid claims only.

Table 17 notes that the National Flood Insurance Program has paid over $1.2 billion in claim payments in the Lakeview Repetitive Loss Planning District between 1978 and 2018. Table 17 also provides data on claims that were paid for floods other than from Hurricane Katrina. These "without Katrina claims" represent the damage caused by repetitive flooding.
Of the 10,601 flood insurance claims in Lakeview, 7,651 were submitted after Hurricane Katrina. The rest are shown as the 2,950 "without Katrina claims" in Table 17. While without Katrina claims represent 28% of the number of claims, they accounted for only $26,771,634 or 2% of the dollars paid. The average non-Katrina claim in Lakeview was $11,763, close to the City-wide average of $11,910.

Despite the difference in floodplain mapping, there is not much difference between the neighborhoods in terms of the percent of non-Katrina claims as they range evenly from 20% to 36%. Similarly, the relative percent of non-Katrina claim payments does not vary much from neighborhood to neighborhood. The most interesting figure is the "without Katrina claims" equal only 2% of all the flood insurance claim payments. That means that damage from Hurricane Katrina accounts for 98% of all the claim payments. Conversely, shallow, repetitive flooding is not as great a hazard as it is in other planning districts.

Flood Control Measures

Drainage System

The City's drainage system is explained in Section 4.1. The Sewerage & Water Board's part of the Lakeview district's drainage system is shown in Figure 27.

Figure 27 - Lakeview Major Drainage System

Figure 27 shows the box canals and pipes that collect surface water and convey it to the four Drainage Pump Stations, DPS 6, 7, 12, and I-10. The three southern pump stations pump the

water over the levees into the 17th Street and Orleans Avenue Canals, which are directly connected to Lake Pontchartrain. DPS 12 pumps into the Lake at West End.

Major Projects

There are no SELA projects in the Lakeview District. However, there is discussion about proposing a SELA project. On March 9, 2021, the City Council passed a proclamation to support the Sewerage & Water Board fully funding the local share of projects, including evaluations to expand drainage capacities in Lakeview and Gentilly.

Roadside Projects

The Department of Public Works received post-Katrina disaster assistance funding to help restore the streets and adjacent drainage facilities. These have been constructed over the years as road work is scheduled; more are planned. Figure 28 shows the location and status for the Lakeview District.

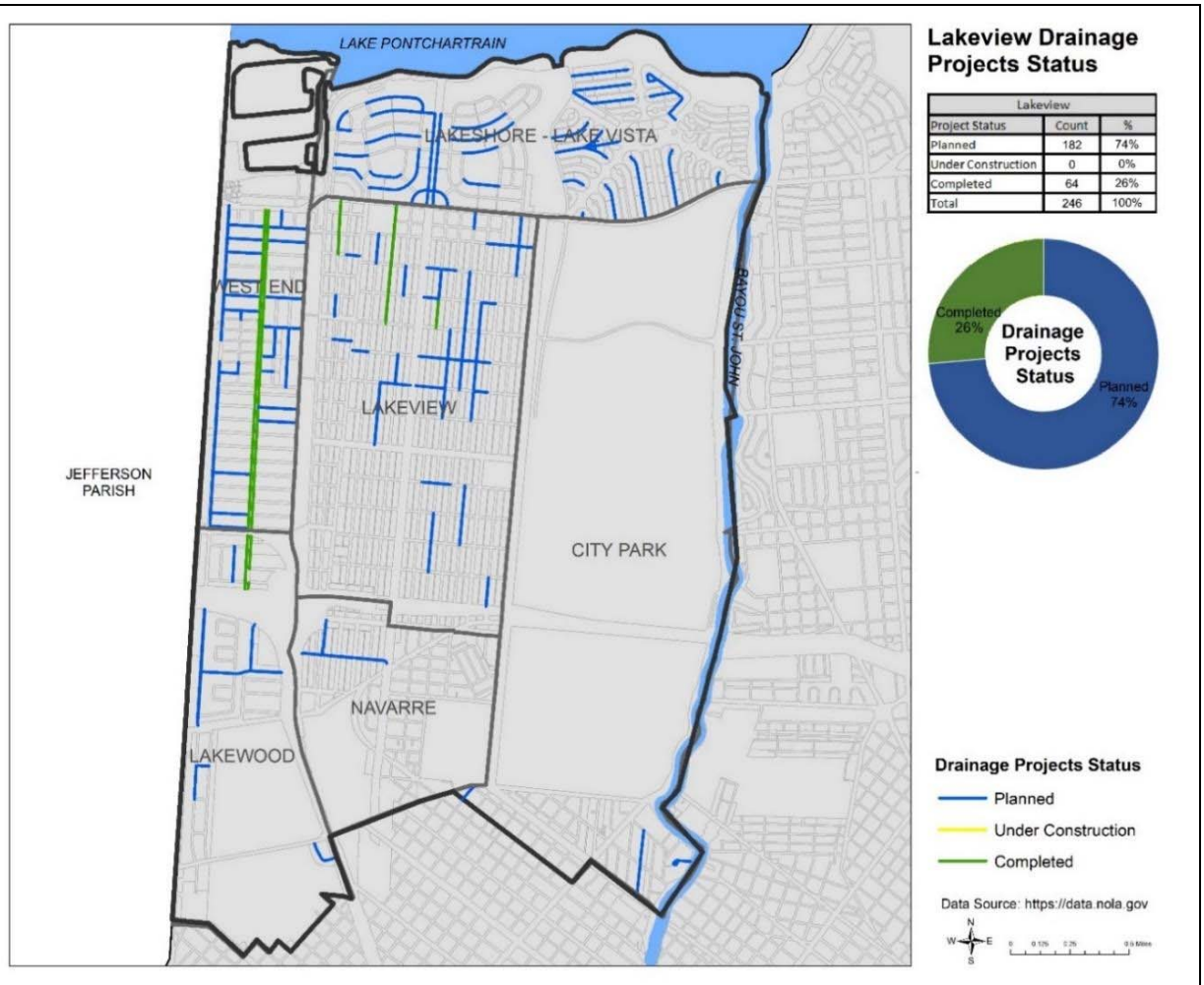


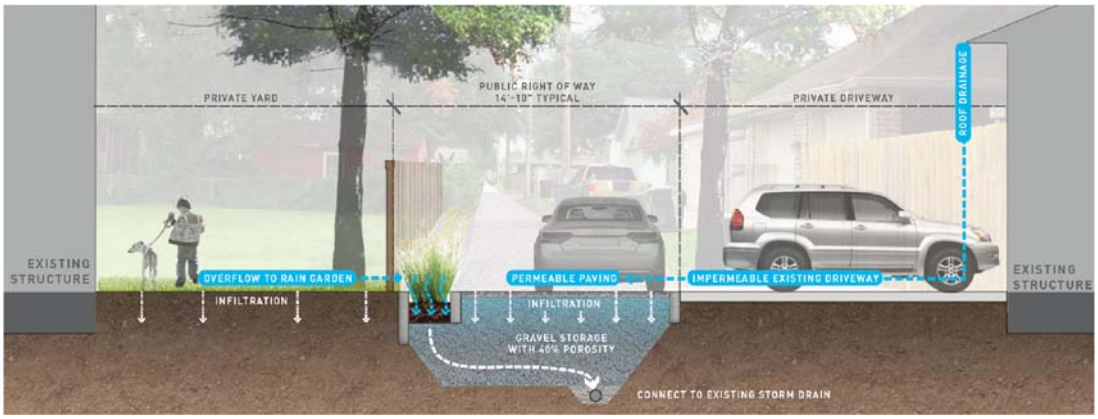
Figure 28 - Roadside Drainage Projects in Lakeview

As of March 2021, 26% of the projects have been completed. Most of the work to date has been the larger collector pipes, such as the one through the middle of the West End neighborhood. When these are complete, the smaller feeder pipes can be improved with the collectors able to handle the increased loads.

When completed, these roadside projects will help drain the streets into the major drainage system's pipes and canals. However, if the major system has blockages or is overloaded, the roadside system may not be able to drain the water from the streets.
One important part of the roadside drainage system is the catch basins that collect surface water and send it into the subsurface pipes. As explained in Section 4.4, the more nearby residents do to keep them clean, the better the system works.

Green Infrastructure
As discussed in Section 4.3, the Green Infrastructure program relies on natural measures to handle drainage, such as letting rainwater soak into the ground in a rain garden. More information on Green Infrastructure can be found at https://ready.nola.gov/green-infrastructure/.

The Green Infrastructure program has received special funding from several different sources. The larger contributors are the Sewage and Water Board (S&WB) and the New Orleans Redevelopment Authority (NORA). Figure 29 shows Sewerage & Water Board stormwater projects to improve drainage and Green Infrastructure projects.
On project in Lakeview is shown in Figure 29 with a red rectangle. The project increases some pipe sizes, adds underground gravel storage in the alleys, and plants trees and grassy rain gardens along one street. This combination captures and stores stormwater for a while and slows the flows to DPS 12, which helpsi properties outside the outlined area. A cross section of the alley concept is seen below.



https://www.nola.gov/resilience-sustainability/resources/fact-sheets/lakeview-factsheet/

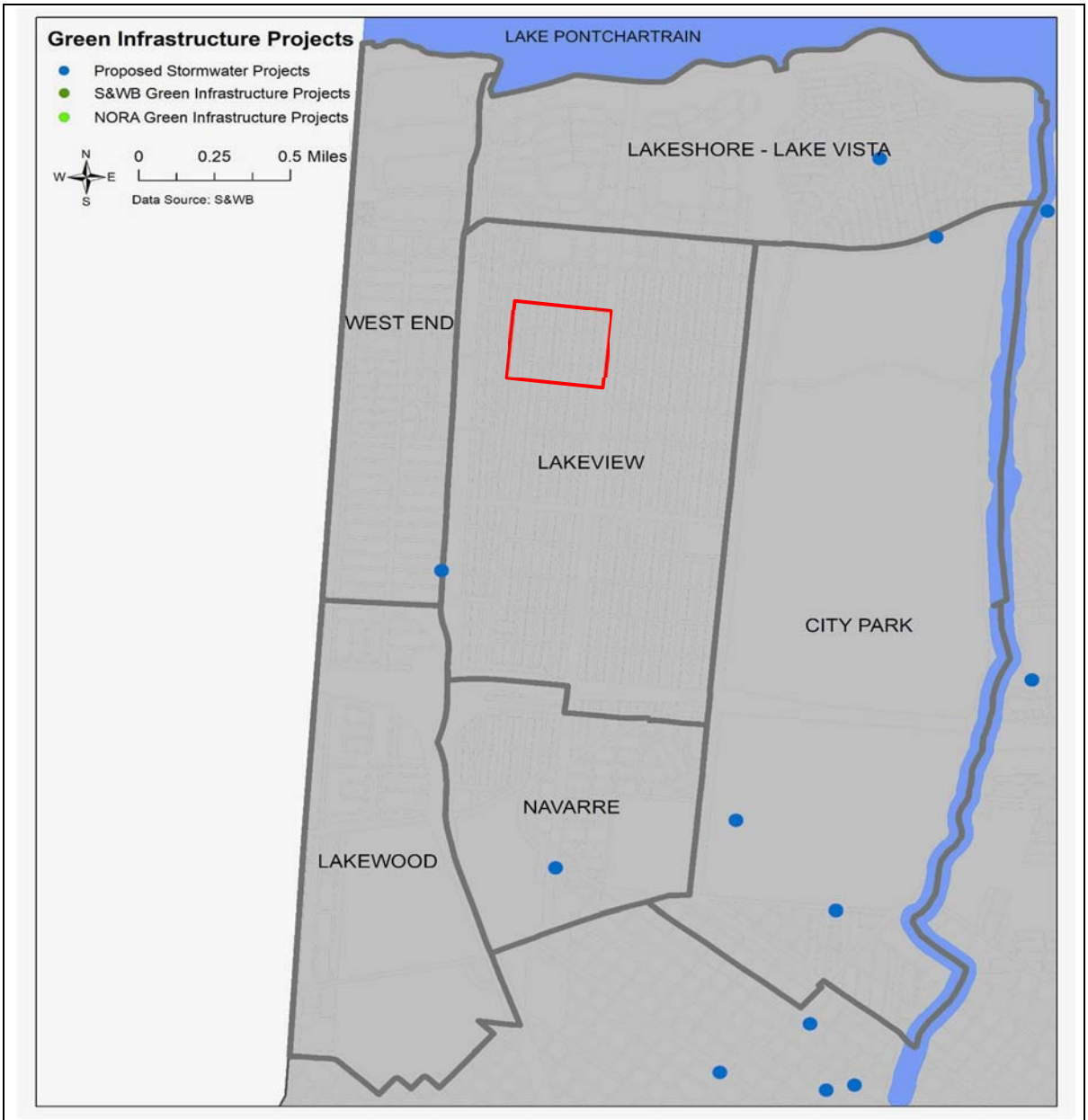


Figure 29 - Green Infrastructure Projects in Lakeview

Flood Control Measures Summary

Lakeview's local drainage system apparently did not need any major projects, but there may be a SELA study to improve the capacity of the major drainage system. Local roadside drainage and Green Infrastructure projects are well underway and will reduce the levels of smaller, more frequent local flooding.

Building Protection Measures

As noted in Section 5.2, building protection measures depend on the type of foundation and the depth of repetitive flooding. Figure 30 shows the types of foundations.

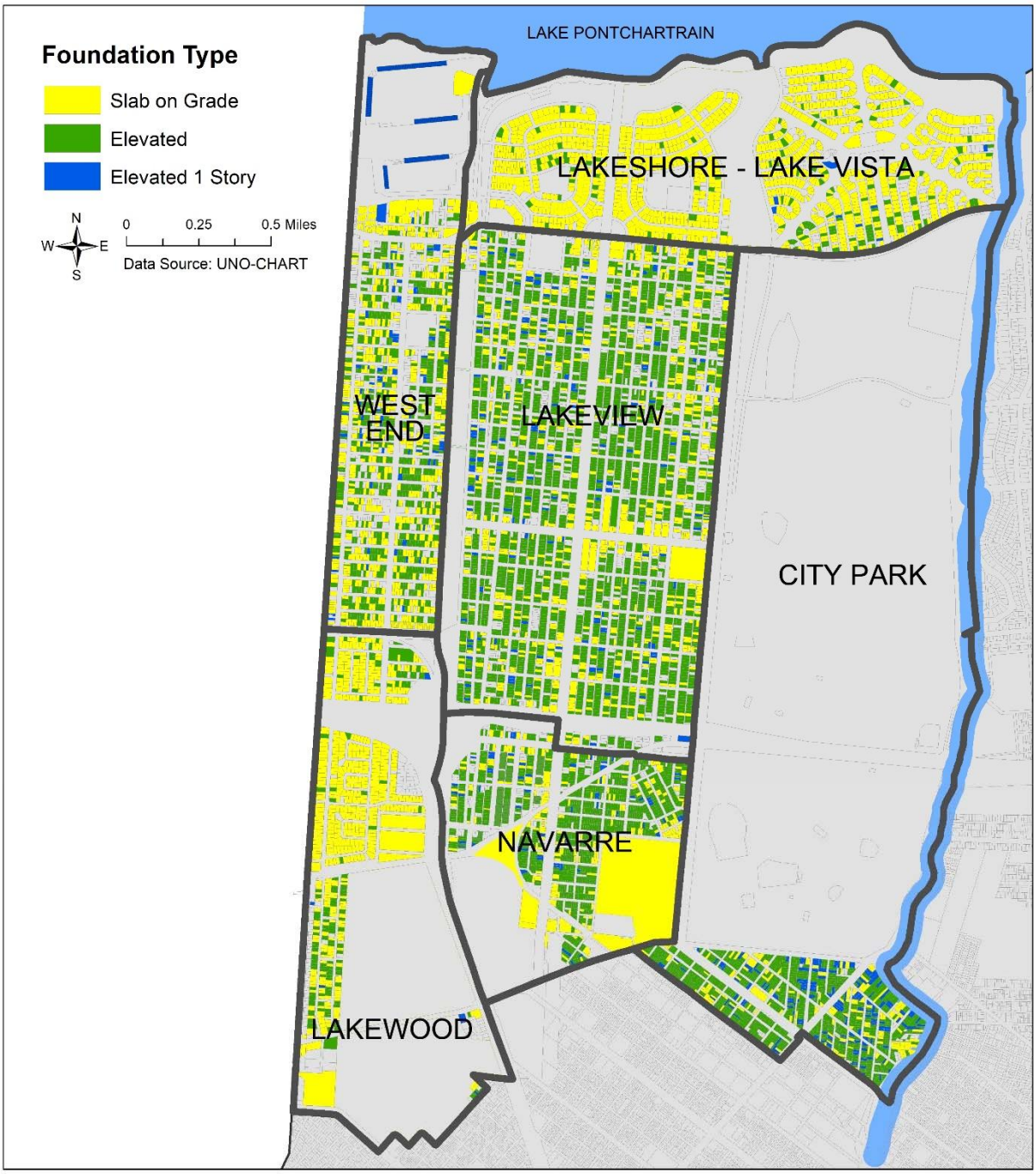


Figure 30 - Foundation Types in Lakeview

Detached garages, park pavilions, and other minor structures are not counted as buildings for the purposes of this report. Some areas were not included by the City's blight survey, so not every building in the district was viewed. In most cases, grey areas are parks or vacant lots. The large grey area in the City Park neighborhood is City Park. In the Lakewood and Navarre neighborhoods, the larger grey areas are cemeteries and a golf course.

Figure 30 shows a relatively even distribution of buildings on slab (yellow) and elevated (green) foundations in the Lakeview, Navarre and City Park neighborhoods. Larger yellow areas in Lakeview and Navarre are school complexes with larger buildings on slab foundations. Lakeshore-Lake Vista has a lot of yellow parcels reflecting the fact that 88% of the buildings are on slab foundations. This is a newer neighborhood built on lakefront fill. The newer developments in the post-1970s did not use the traditional elevated construction techniques. Instead, post-War developers used the less expensive slab foundation approach. [62]
The project team reviewed building types and conditions for 8,973 primary structures in the Lakeview Repetitive Loss Planning District. There may be some that were not included in the survey and there are likely some new buildings that were constructed, elevated, or cleared since the blight program's ArcGIS Photo Survey was conducted beginning in 2010 and updated through 2019. A summary of the findings is in Table 18.[63]

Table 18 - Lakeview District Building Data

Neighborhood	Number of Buildings	Percent Occupied	Percent in Good Condition	Percent >1 Story	Type of Foundation		
					Slab	Elev ≤ 3 ft	Elev > 3 ft
City Park	904	100%	98%	47%	15%	27%	58%
Lakeshore-Lake Vista	1,396	100%	99%	37%	88%	7%	5%
Lakeview	3,399	100%	99%	57%	22%	21%	57%
Lakewood	747	99%	99%	59%	72%	17%	11%
Navarre	1,033	100%	99%	38%	20%	35%	45%
West End	1,494	99%	99%	48%	43%	22%	35%
District Total	8,973	99%	99%	49%	39%	21%	40%

Buildings in good condition are more appropriate for elevation and other building protection measures that preserve the existing structure. There are two measures of whether a building is in good condition that were collected in the building survey: if it is occupied and if it looks in good condition from the street. The building data in Table 18 show a 99% occupancy rate in the district and 99% of the buildings being in good condition, the highest rates in the City.
Buildings with more than one story have a building protection measure not available to single-story structures: the owner can permanently relocate valuable items, such as the furnace and air conditioner, to the upper story, above the flood level. Again, the Lakeview district has the

[62] https://property.nola.gov/
[63] BlightStatus Demolitions - Map | Data.NOLA.gov

highest ratio in the City with 49% of the buildings having two or more stories compared to the City-wide 30%.

The first floors of buildings on slab foundations are closer to the ground than the first floors of the elevated buildings on crawlspaces or piers and therefore apt to flood more often. As seen on the map in Figure 30 and in Table 18, most of the buildings in Lakeshore-Lake Vista and Lakewood are on slab foundations (88% and 72%, respectively). The district's total of 39% is like the neighboring Gentilly district (42%) but higher than the districts to the south which have older construction.

Elevated house on Canal Boulevard in the Lakeview neighborhood

Photo Credit: UNO-CHART

Elevated buildings are the easiest to raise to a higher, flood protected, level. Over half of the buildings in the Lakeview and City Park neighborhoods and almost half in Navarre are elevated more than three feet. Those three neighborhoods have the smallest percentage of slab foundations, making elevation the easiest building protection measure.

Building Protection Measures Summary

Forty percent of the buildings in the Lakeview Repetitive Loss Planning District are considered protected from shallow, repetitive flooding because they are elevated more than three feet above grade. Twenty-one percent of the buildings are elevated less than three feet, but elevation is still a very feasible protection alternative. The remaining 39% of Lakeview's buildings are on slab foundations and can be protected from shallow, repetitive flooding with building protection measures such as barriers and dry floodproofing.

Recommendations

1. The roadside drainage improvement and Green Infrastructure projects should continue.
2. The Sewerage & Water Board should fund and complete the SELA evaluations to expand drainage capacities in Lakeview and Gentilly.
3. Every owner of a building less than three feet above ground level should review their building protection measure alternatives.
4. Every property owner and renter in every neighborhood should:
   a. Carry a flood insurance policy regardless of their FIRM zone, and
   b. Maintain the catch basins downstream of their property.

6. LOWER NINTH WARD

The Lower Ninth Ward Repetitive Loss Planning District is in the eastern part of the city. It is bordered on the north by the Main Outfall Canal, on the west by the Inner Harbor Navigation Canal (also known as the Industrial Canal), on the east by St. Bernard Parish, and on the south by the Mississippi River, as shown in Figure 31.

The district has two neighborhoods which are also designated by the City's planning programs and are displayed in Figure 31. Note that the District has a neighborhood with the same name, the Lower Ninth Ward neighborhood.

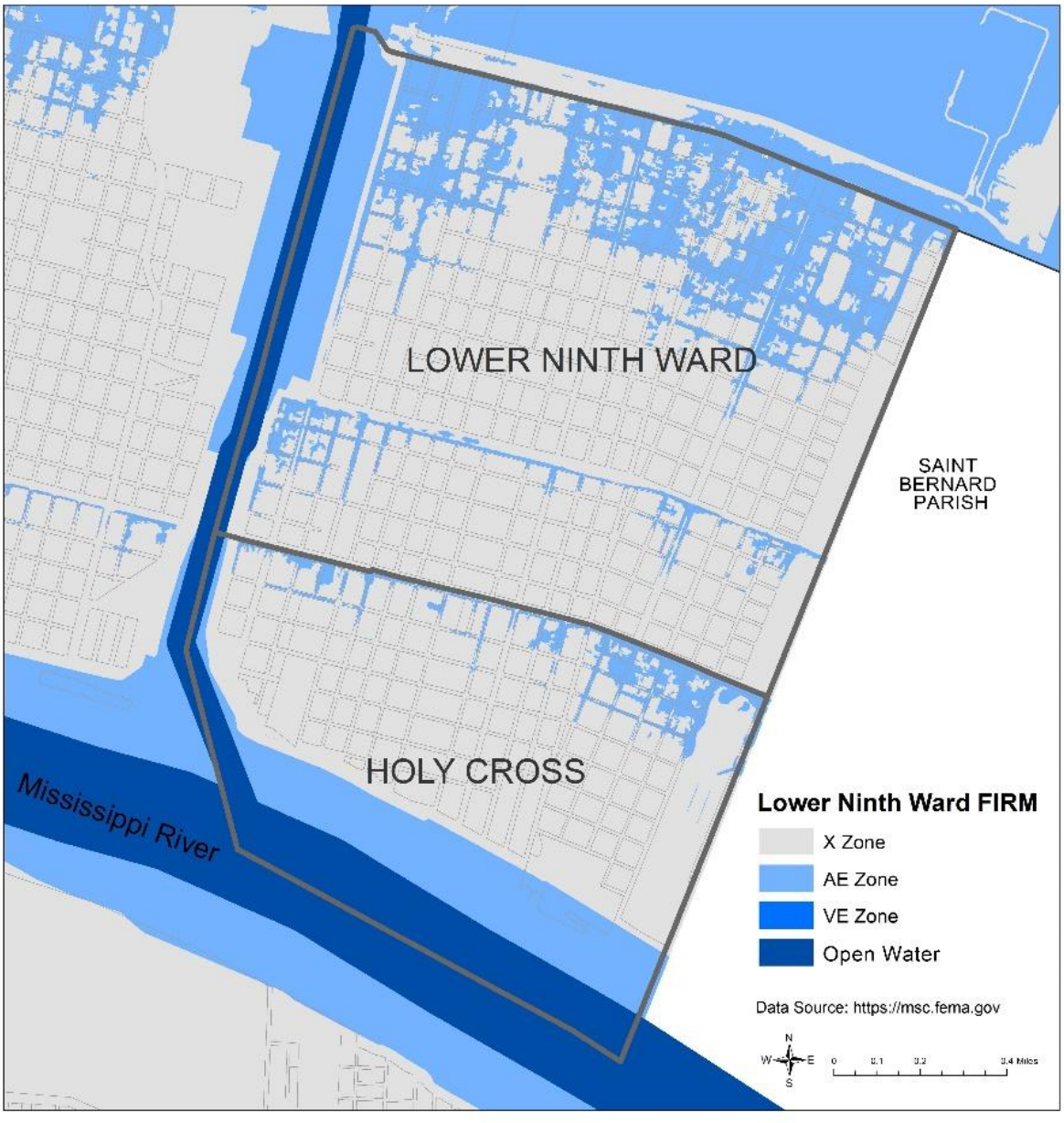


Figure 31 - Lower Ninth Ward Flood Insurance Rate Map

The Repetitive Flood Problem

The flood zones on the FIRM are explained on the Mitigation Terminology page in Section 5.1. The northern neighborhood, the Lower Ninth Ward neighborhood, has most of the District's high-risk flood zones (AE Zones).

Holy Cross is adjacent to the Mississippi River. Much of this neighborhood is on the higher ground formed by the natural levee known as the "sliver near the river." Accordingly, it has less mapped floodplain and is less likely to have repetitive flooding, which is reflected in the percentages in Table 19.

Table 19 - FEMA Repetitive Loss Properties in Lower Ninth Ward

Neighborhood	Buildings	Number of RLs	Percent of RLs	Number Claims	Pct. Of Buildings with Claims
Holy Cross	1,385	43	3%	732	53%
Lower Ninth Ward	2,119	159	8%	2,688	127%
District Total	3,504	202	6%	3,420	98%

Note: the number of claims is the number of claims submitted, including those closed without payment

Table 19 shows numbers and percentages of buildings and claims in the district between 1978 and 2018, the period for available data. Because each neighborhood has a very different number of buildings, it is more relevant to compare percentages. Of the 3,504 buildings reviewed in the district, 202 or 6% have been officially listed by FEMA as repetitive loss properties. Most of them are in the larger Lower Ninth Ward neighborhood.

While 6% of the buildings in the district have been designated as repetitive loss properties, many more buildings have been flooded. There have been 3,420 National Flood Insurance Program claims in the District.

Because of repetitive flooding, there have been almost as many claims (3,420) than there are buildings (3,504). There were more claims than buildings in the Lower Ninth Ward neighborhood. This is probably because the Lower Ninth Ward neighborhood has more mapped floodplain, which means it would tend to have (1) more flooding that causes property damage and (2) more properties covered by flood insurance (which is mandated under the federal law that requires flood insurance as a condition of a federally-backed mortgage on a property in the AE Zone).

Table 20 - Lower Ninth Ward Flood Insurance Claims Data

Neighborhood	All Claims			Without Katrina Claims				
	No. Claims	Claim Payments		Claims		Claim Payments		
		Avg.	Total	No.	Pct.	Avg.	Total	Pct.
Holy Cross	732	$70,481	$42,641,128	314	43%	$4,848	$1,037,557	2%
Lower Ninth Ward	2,688	$54,327	$125,334,344	1,087	40%	$5,663	$4,655,655	4%

District Total	3,420	$57,684	$167,975,472	1,401	41%	$5,495	$5,693,212	3%
Note: The number of claims include claims submitted, but not paid. *The average and total payments are based on paid claims only.*								

Table 20 provides data on all claims paid in the District and those claims that were paid for floods other than from Hurricane Katrina. These "without Katrina claims" represent the damage caused by repetitive flooding. The NFIP has paid over $167 million for claims in the district. While the without Katrina claims were 41% of all claims, they represent only 3% of the total payments. This is because Katrina flooding was much deeper and impacted many more properties than all the other floods since 1978. In some areas of the district affected by the failure of the Canal levee, buildings were completely destroyed.

For the same reasons noted on Table 19, the bulk of the repetitive claims were in the Lower Ninth Ward neighborhood. The average of the non-Katrina flood insurance claims for the district is $5,495. This average non-Katrina claim payment is not much different between the two neighborhoods, but it is well below the City-wide average non-Katrina claims of $11,910.

Flood Control Measures

Drainage System

The City's drainage system is explained in Section 4.1. The Sewerage & Water Board's part of the Lower Ninth Ward district's drainage system is shown in Figure 32.
The map shows that most of the District's major drainage system is located in the Lower Ninth Ward neighborhood. This is because the Holy Cross neighborhood is on higher ground that drains north, into the Lower Ninth Ward neighborhood.

The flatter and lower portion of the Lower Ninth Ward neighborhood needs more pipes to collect and transfer water to Drainage Pumping Station 5 (DPS 5). From there, it is pumped into the Inner Harbor Navigation Canal. The Navigation Canal is part of the drainage system, so it is also shown as a dark blue line in Figure 32. The map makes it appear that DSP 5 is pumping water across the river to the other side of the Canal, but that is due to the GIS representation of the pump station pumping into the Canal (represented by the dark blue line)

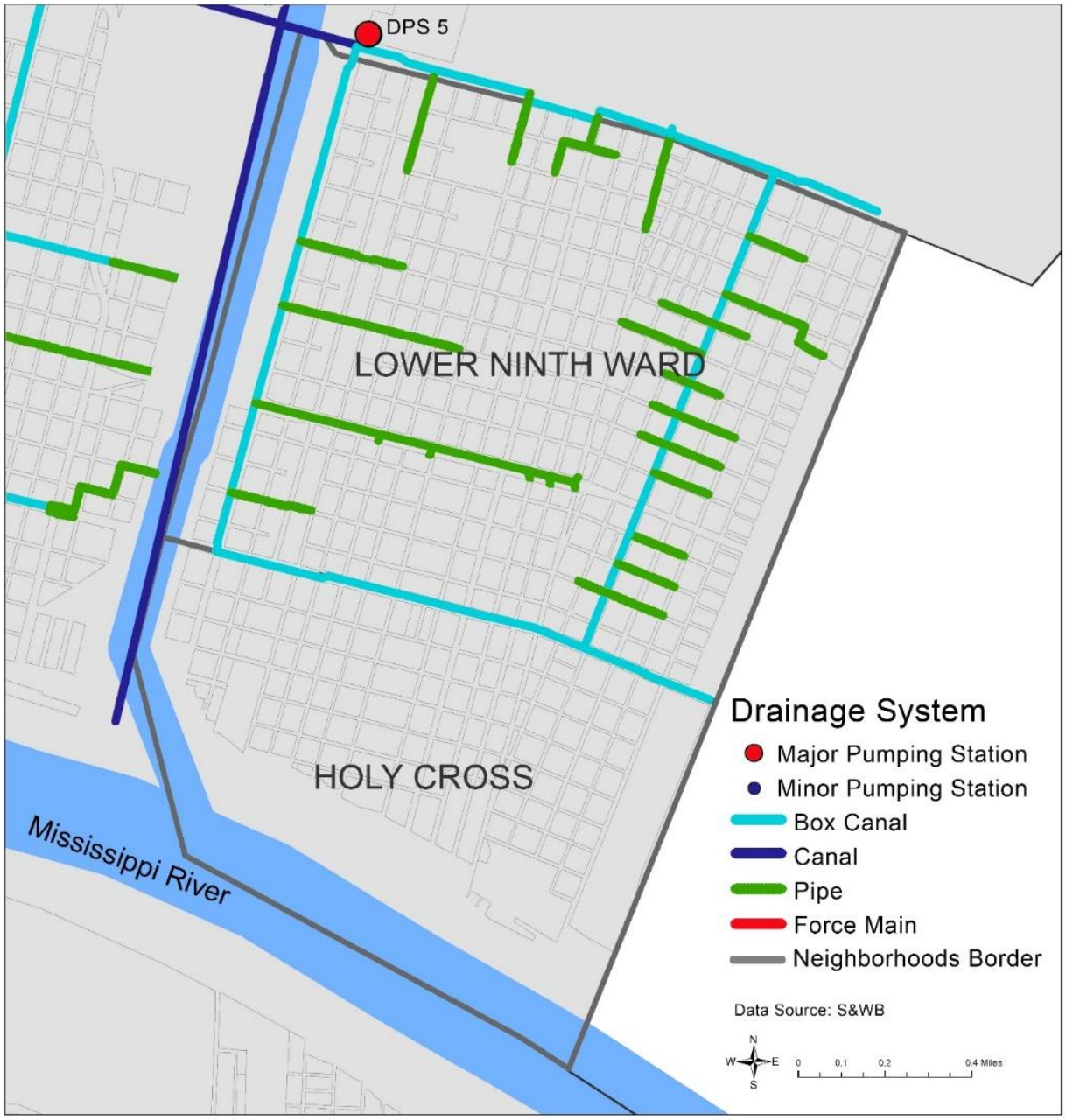


Figure 32 - Lower Ninth Ward Major Drainage System

Major Projects

There are no SELA or other projects underway or planned for the major drainage system in the Lower Ninth Ward.

Roadside Projects

The Department of Public Works received post-Katrina disaster assistance funding to help restore the streets and adjacent drainage facilities, as summarized in Section 4.2. These have been constructed over the years as road work is scheduled; more are planned. **Figure 33** shows the location and status for the District. As with the major drainage system, the Lower Ninth Ward neighborhood needs more attention than the Holy Cross neighborhood.

As of March 2021, 31% of the roadside drainage projects have been completed and only 1% more have been started. These numbers are very close to the City-wide numbers, 32% and 4%. When completed, these roadside projects will help drain the streets into the major drainage system's pipes and canals. However, if the major system has blockages or is overloaded, the roadside system may not be able to drain the water from the streets. One important part of the roadside drainage system is the catch basins that collect surface water and sends it into the subsurface pipes. As explained in Section 4.4, the more nearby residents do to keep them clean, the better the system works.'

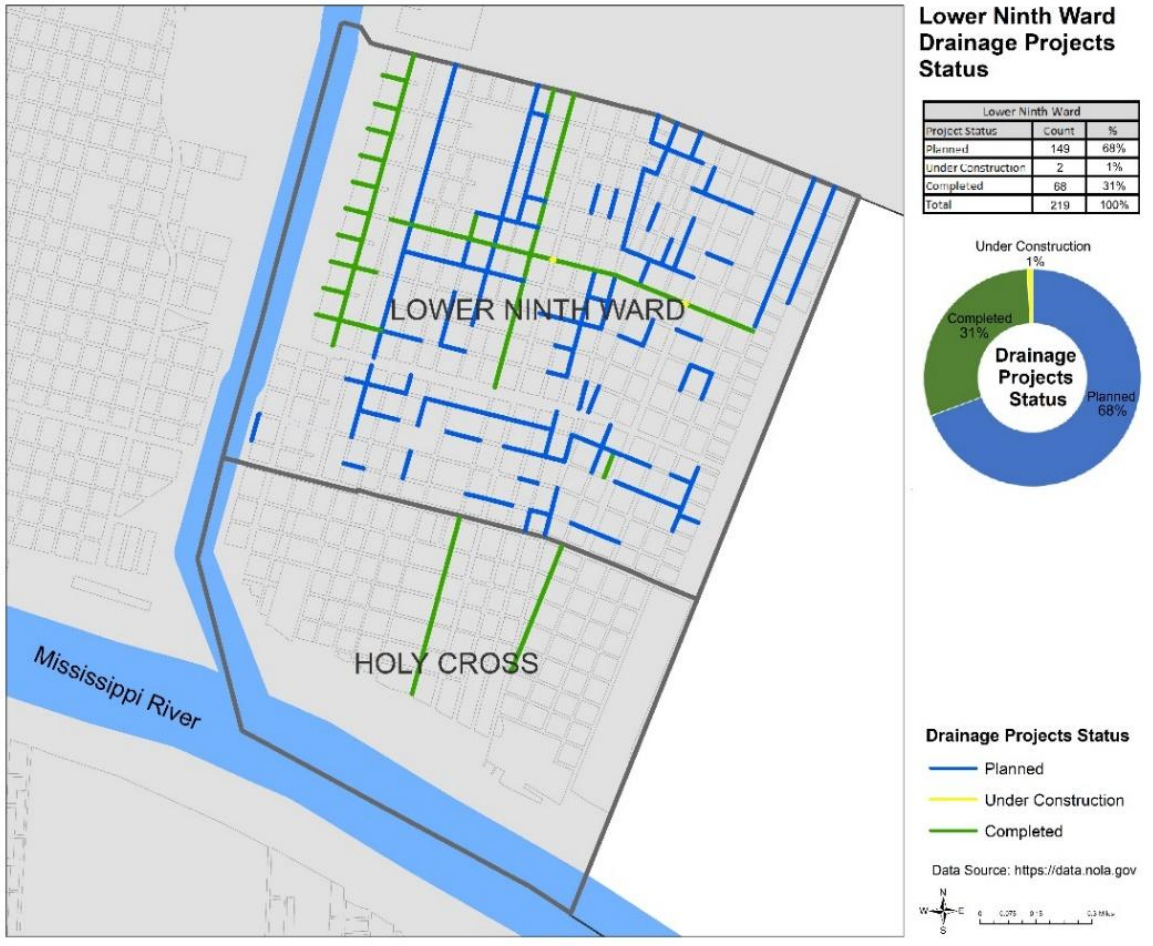


Figure 33 - Roadside Drainage Projects in the Lower Ninth Ward

Green Infrastructure

As discussed in Section 4.3, the Green Infrastructure program relies on natural measures to handle drainage, such as letting rainwater soak into the ground in a rain garden. More information on Green Infrastructure can be found at https://ready.nola.gov/green-infrastructure/.

The Green Infrastructure program has received special funding from several different sources. The larger contributors are the Sewage and Water Board (S&WB) and the New Orleans Redevelopment Authority (NORA). Figure 34 shows Sewerage & Water Board stormwater projects to improve drainage and Green Infrastructure projects. It can be seen that there is only one NORA project in the Lower Ninth Ward neighborhood and one on the district's northern boundary.

An existing Green Infrastructure project in the Lower Ninth Ward, on Deslonde Street

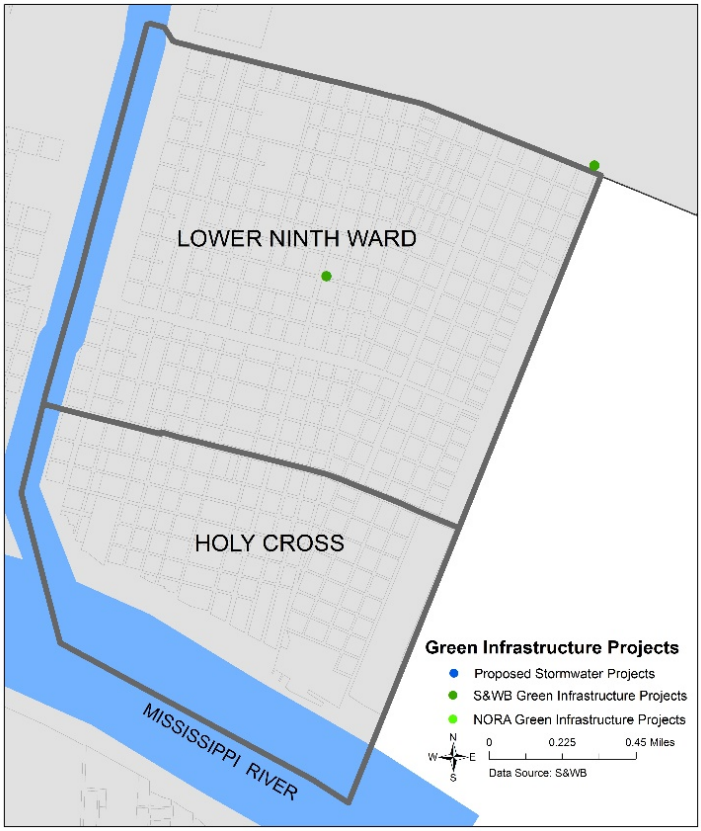


Figure 34 - Green Infrastructure Projects in the Lower Ninth Ward

Flood Control Measures Summary

The Lower Ninth Ward Repetitive Loss Planning District is drained by the same system that drains most of New Orleans: City streets and roadside collector pipes drain to larger pipes and canals maintained by the Sewerage & Water Board. This system is designed to handle the 10-year storm. The roadside pipes are being improved over time and Green Infrastructure projects will help with the smaller, more frequent storms, but they will not increase the total capacity of the system.

Building Protection Measures

As noted in Section 5.2, building protection measures depend on the type of foundation and the depth of repetitive flooding. Figure 35 is a map showing the types of foundations. Detached garages, park pavilions, and other minor structures are not counted as buildings for the purposes of this report. Some areas were not included by the City's blight surveying, so not every building in the district was viewed. In most cases, grey areas are parks or vacant lots.

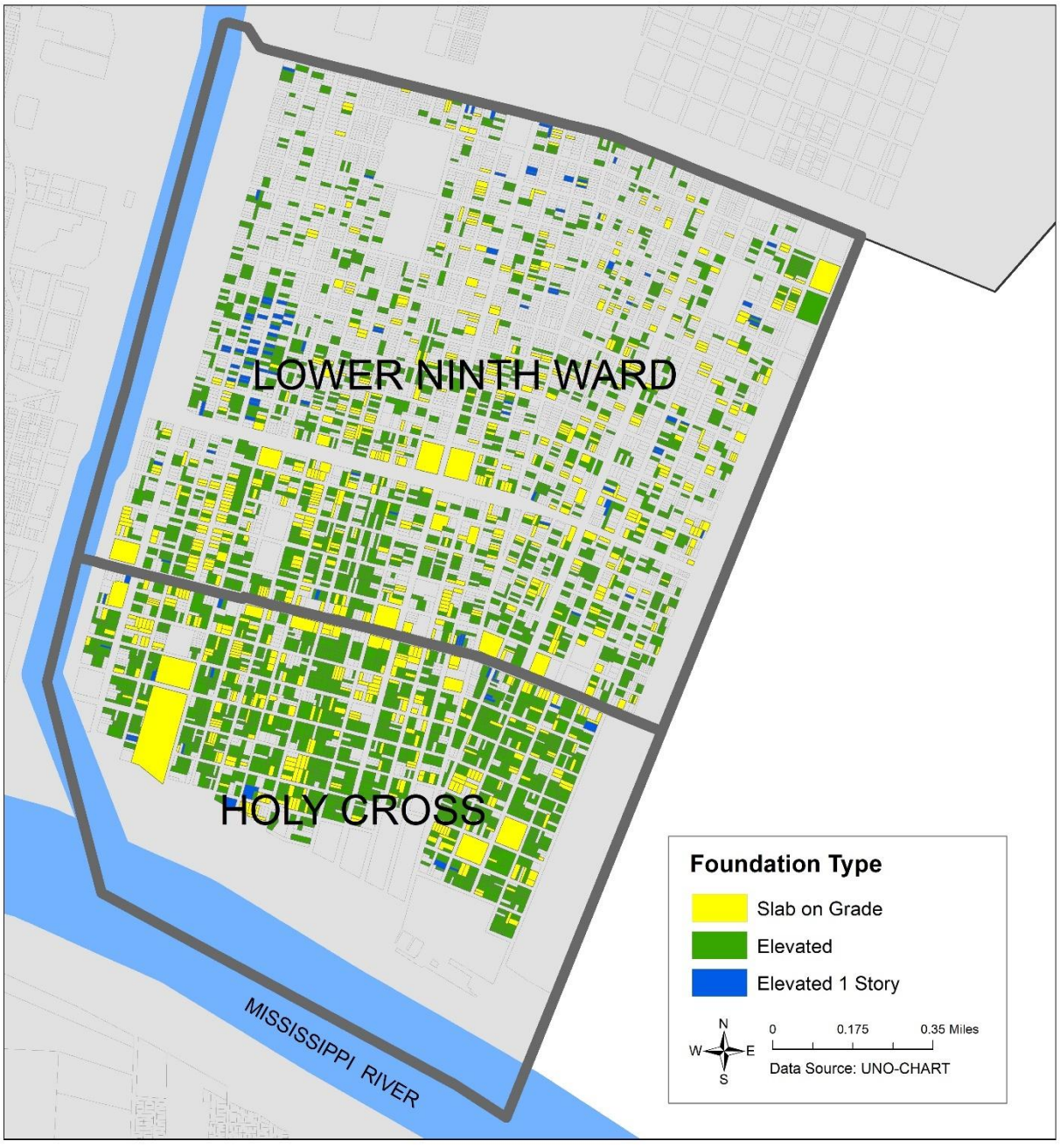


Figure 35 - Foundation Types in the Lower Ninth Ward District

The project team reviewed building types and conditions for 3,504 primary structures in the Lower Ninth Ward district. There may be some that were not picked up in the survey and there are likely some new buildings that were constructed, elevated, or cleared since the blight program's ArcGIS Photo Survey was conducted in 2013. A summary of the findings is in Table 21.

Table 21 - Lower Ninth Ward District Building Data

Neighborhood	Number of Buildings	Percent Occupied	Percent in Good Condition	Percent >1 Story	Type of Foundation		
					Slab	Elev ≤ 3 ft	Elev > 3 ft
Holy Cross	1,385	92%	94%	12%	21%	43%	36%
Lower Ninth Ward	2,119	90%	94%	15%	27%	25%	48%
District Total	3,504	91%	94%	14%	25%	32%	43%

Buildings in good condition are more appropriate for elevation and other building protection measures that preserve the existing structure. There are two measures of whether a building is in good condition that were collected in the building survey: if it is occupied and if it looks in good condition from the street.

Table 21 shows a good occupancy rate (91%) and percentage of buildings in good condition (94%) compared to City-wide data (97% and 95%, respectively). The numbers are very similar for both neighborhoods.

Buildings with more than one story have a building protection measure not available to single-story structures: the owner can permanently relocate valuable items, such as the furnace and air conditioner, to the upper story, above the flood level. This statistic is pretty much the same for each neighborhood and 14% for the district as a whole. This well below the City-wide number of 30%.

The first floors of buildings on slab foundations are closer to the ground than the first floors of the elevated buildings on crawlspaces or piers and therefore apt to flood more often. Twenty-five percent of the buildings in the district are on slab foundations, lower than the 41% for the City as a whole. This is likely due to the fact that housing in the district is either older than, say, areas along Lake Pontchartrain or completely new, flood protected, buildings constructed after Katrina.

As explained in Chapter 5, the building protection options are limited for buildings that are not already elevated. Elevating a slab on grade foundation is more expensive than elevating a building that already has its lowest floor above the ground. Seventy-five percent of the buildings in the Lower Ninth Ward district are elevated and more than half of them are elevated

at least three feet above grade. These are considered elevated above the shallow repetitive flood level.

Note that Table 21 shows two categories of elevated buildings – those elevated up to three feet above grade and those elevated higher. Because of different data sources, Figure 35 shows two different kinds of elevated buildings – those elevated up to eight feet and those elevated one story or more.

Figure 35 shows a concentration of buildings elevated one story or more along Tennessee Street (see the blue parcels near the "L" in "Lower" on the map in Figure 35). Many of these are new elevated homes, built as demonstration projects by Brad Pitt and others.

Photo Credit: UNO-CHART

A new house elevated one story on Tennessee Street

Building Protection Measures Summary

The Lower Ninth Ward Repetitive Loss Planning District has 3,504 insurable buildings, almost all of which are in good condition, making them more appropriate for elevation and other building protection measures that preserve the existing structure. Forty-three percent of all the buildings are already elevated above repetitive flood levels. Another 32% are on elevated foundations that are less expensive to raise to a higher protection level.

Photo Credit: UNO-CHART

Elevated home on Miro Street in the Lower Ninth Ward neighborhood

Recommendations

1. The roadside drainage improvement and Green Infrastructure projects should continue.
2. Every owner of a building less than three feet above ground level should review their building protection measure alternatives.
3. Every property owner and renter in every neighborhood should:
   a. Carry a flood insurance policy regardless of their FIRM zone, and
   b. Maintain the catch basins downstream of their property.

7. MID-CITY

The Mid-City Repetitive Loss District is located in the central part of the City. It is bordered on the north by City Park, on the east by Elysian Fields Avenue, on the southeast by I-10 and Rampart Street, on the southwest by Earhart, and on the west by I-10, as shown in Figure 36. The district has nine neighborhoods which are also designated by the City's planning programs and displayed in Figure 36. Note that the Mid-City Repetitive Loss Planning District has a neighborhood with the same name.

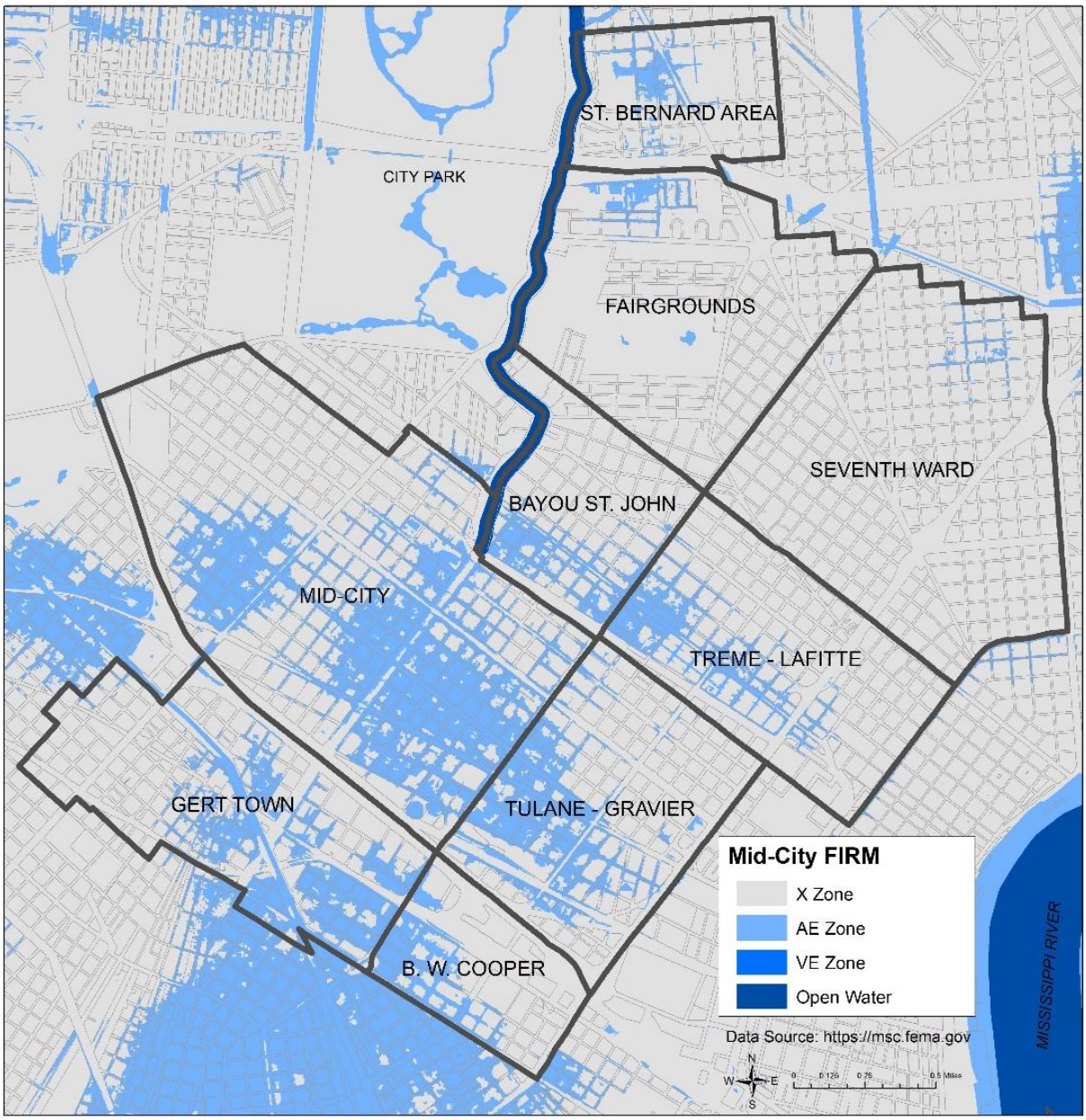


Figure 36 - Mid-City Flood Insurance Rate Map

The Repetitive Flood Problem

The flood zones on the FIRM are explained in the Mitigation Terminology page in Section 5.1. All but two of the nine neighborhoods have substantial amounts of high-risk flood zones (AE Zones). The Fairgrounds and Seventh Ward neighborhoods are mapped as mostly X Zone, i.e., on higher ground than the mapped floodplain.

Table 22 - FEMA Repetitive Loss Properties in Mid-City

Neighborhood	Buildings	Number of RLs	Percent of RLs	Number Claims	Pct. Of Buildings with Claims
B. W. Cooper	102	5	5%	152	149%
Bayou St. John	1,320	65	5%	1,154	87%
Fairgrounds	1,832	93	5%	1,553	85%
Gert Town	881	59	7%	901	102%
Mid-City	3,574	235	7%	3,518	98%
Seventh Ward	4,051	108	3%	2,615	65%
St. Bernard Area	432	23	5%	492	114%
Treme - Lafitte	1,887	76	4%	1,175	62%
Tulane - Gravier	846	28	3%	678	80%
District Total	14,925	692	5%	12,238	82%

Note: the number of claims is the number of claims submitted, including those closed without payment

Table 22 shows numbers and percentages of buildings and claims in the Mid-City district between 1978 and 2018, the period for available data. Because the number of buildings in the neighborhoods range from 102 to 4,051, it is more relevant to compare percentages. Of the 14,925 buildings reviewed in the district, 692 or 5% have been officially listed by FEMA as repetitive loss properties. They are generally spread evenly across the nine neighborhoods, even though two of them have almost no mapped floodplain.

While only 5% of the buildings in the district have been designated as repetitive loss properties, many more buildings have been flooded, resulting in 12,238 flood insurance claim payments. Three of the smaller neighborhoods have had more claims than they have buildings - B.W. Cooper, Gert Town, and St. Bernard Area. The lowest percent of claims to buildings (65%) is in the Seventh Ward, the neighborhood with the least mapped floodplain.

Table 23 - Mid-City Flood Insurance Claims Data								
Neighborhood	All Claims			Without Katrina Claims				
	No. Claims	Claim Payments		Claims		Claim Payments		
		Avg.	Total	No.	Pct.	Avg.	Total	Pct.
B. W. Cooper	152	$41,423	$5,260,693	33	22%	$26,041	$390,620	7%
Bayou St. John	1,154	$45,459	$44,640,784	413	36%	$11,831	$3,537,355	8%
Fairgrounds	1,553	$54,650	$73,722,908	523	34%	$9,047	$3,428,723	5%
Gert Town	901	$76,030	$61,203,914	420	47%	$14,815	$4,962,885	8%
Mid-City	3,518	$82,961	$252,449,393	1,396	40%	$12,315	$11,933,194	5%
Seventh Ward	2,615	$48,465	$109,046,346	786	30%	$7,416	$3,922,861	4%
St. Bernard Area	492	$53,889	$23,980,643	167	34%	$8,968	$1,156,894	5%
Treme - Lafitte	1,175	$38,286	$36,869,435	481	41%	$13,307	$4,737,287	13%
Tulane - Gravier	678	$83,165	$50,897,146	211	31%	$18,512	$2,869,328	6%
District Total	12,238	$62,223	$658,071,262	4,430	36%	$11,667	$36,939,147	6%
Note: The number of claims include claims submitted, but not paid. The average and total payments are based on paid claims only.								

Table 23 notes that the National Flood Insurance Program has paid $658,071,262 in claim payments in Mid-City between 1978 and 2018, the period for available data. Table 23 also provides data on claims that were paid for floods other than from Hurricane Katrina. These "without Katrina claims" represent the damage caused by repetitive flooding.
Of the 12,238 flood insurance claims in the Mid-City district, 7,808 were submitted after Hurricane Katrina. The rest are shown as the 4,430 "without Katrina claims" in Table 23. While the without Katrina claims represent 36% of the number of claims, they were only 6% of the dollars paid.

With one exception, the "without Katrina claim payments" represent 4% - 8% of all claim payments in the various neighborhoods. The exception is Treme-Lafitte, where the non-Katrina claims represent 13%. The District total is 6%, close to the City-wide number, 5%.
The average non-Katrina claim in the Mid-City district was $11,667, close to the City-wide average of $11,910, but this number varied greatly between neighborhoods. They ranged from a low average of $8,968 in the St. Bernard Area to a high of $26,041 in the B.W. Cooper neighborhood.

Flood Control Measures

Drainage System

The City's drainage system is explained in Section 4.1. The Sewerage & Water Board's part of the Mid-City district's drainage system is shown in Figure 37.

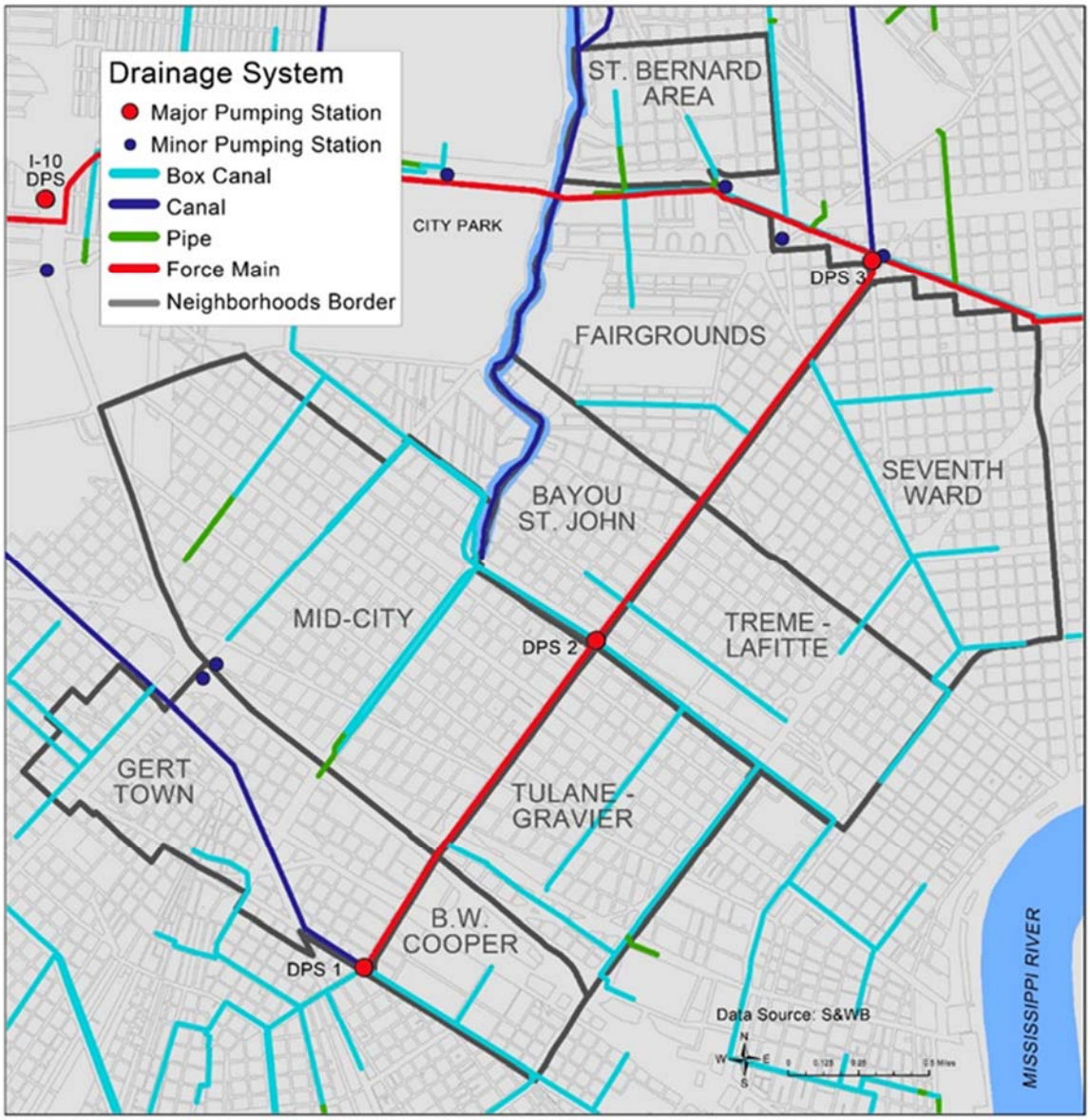


Figure 37 - Mid City Major Drainage System

Figure 37 shows the box canals and larger pipes collecting the runoff from the roadside drainage system and conveying it by gravity to the lower areas in the middle of the district, roughly coinciding with the mapped floodplains in Figure 36. The stormwater is collected by Drainage Pump Stations DPS 1, 2, and 3, which send the water northwest and north to the 17th Street, Orleans Avenue, and London Avenue Canals, respectively.

Major Projects

There are parts of two SELA projects in the Mid-City Repetitive Loss Planning District. The Pritchard Place project includes a corner of Gert Town. Because most of the project is located in the Uptown district, it is discussed in Section 6-10 and shown in Figure 50. DPS 1, which is on the border of the Mid-City and the Garden Districts, was improved as part of the SELA Napoleon Avenue project to the south. It is discussed in Section 6-4 and appears in Figure 16.
Both projects have been completed. There may be new projects in other districts to the north that would improve the flow of stormwater out of the district.

Roadside Projects

The Department of Public Works received post-Katrina disaster assistance funding to help restore the streets and adjacent drainage facilities. These have been constructed over the years as road work is scheduled; more are planned. Figure 38 shows the location and status for the Mid-City Repetitive Loss Planning District.

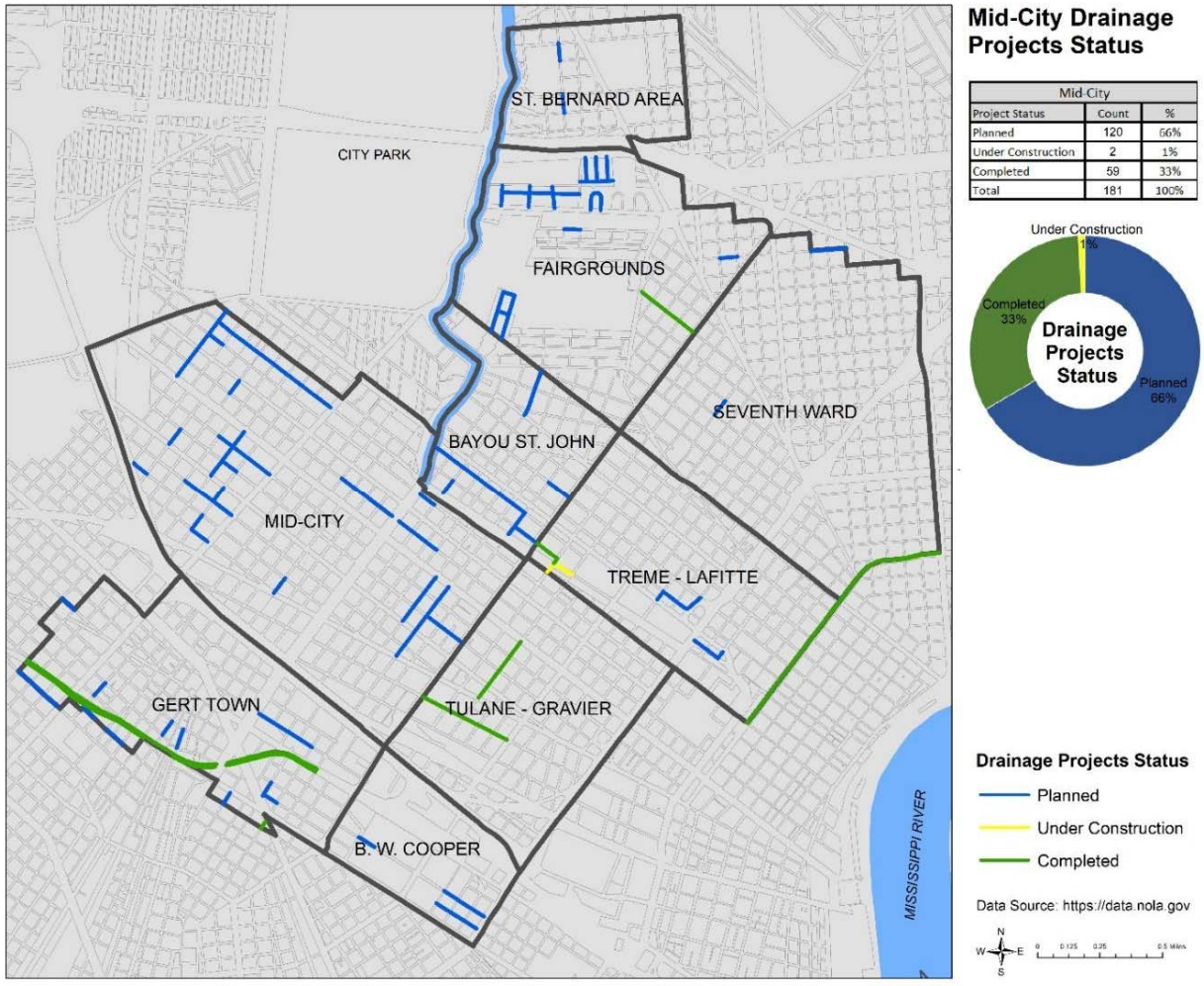


Figure 38 - Roadside Drainage Projects in Mid City

As of March 2021, 33% of the projects have been completed and another 1% was under construction. This status is close to the City-wide numbers of 32% and 4%. When completed, these roadside projects will help drain the streets into the major drainage system's pipes and canals. However, if the major system has blockages or is overloaded, the roadside system may not be able to drain the water from the streets.

One important part of the roadside drainage system is the catch basins that collect surface water and send it into the subsurface pipes. As explained in Section 4.4, the more nearby residents do to keep them clean, the better the system works.

Green Infrastructure

As discussed in Section 4.3, the Green Infrastructure program relies on natural measures to handle drainage, such as letting rainwater soak into the ground in a rain garden. The program has received special funding from several different sources. The larger contributors are the Sewage and Water Board (S&WB) and the New Orleans Redevelopment Authority (NORA). Figure 39 shows Sewerage & Water Board stormwater projects to improve drainage and Green Infrastructure projects.

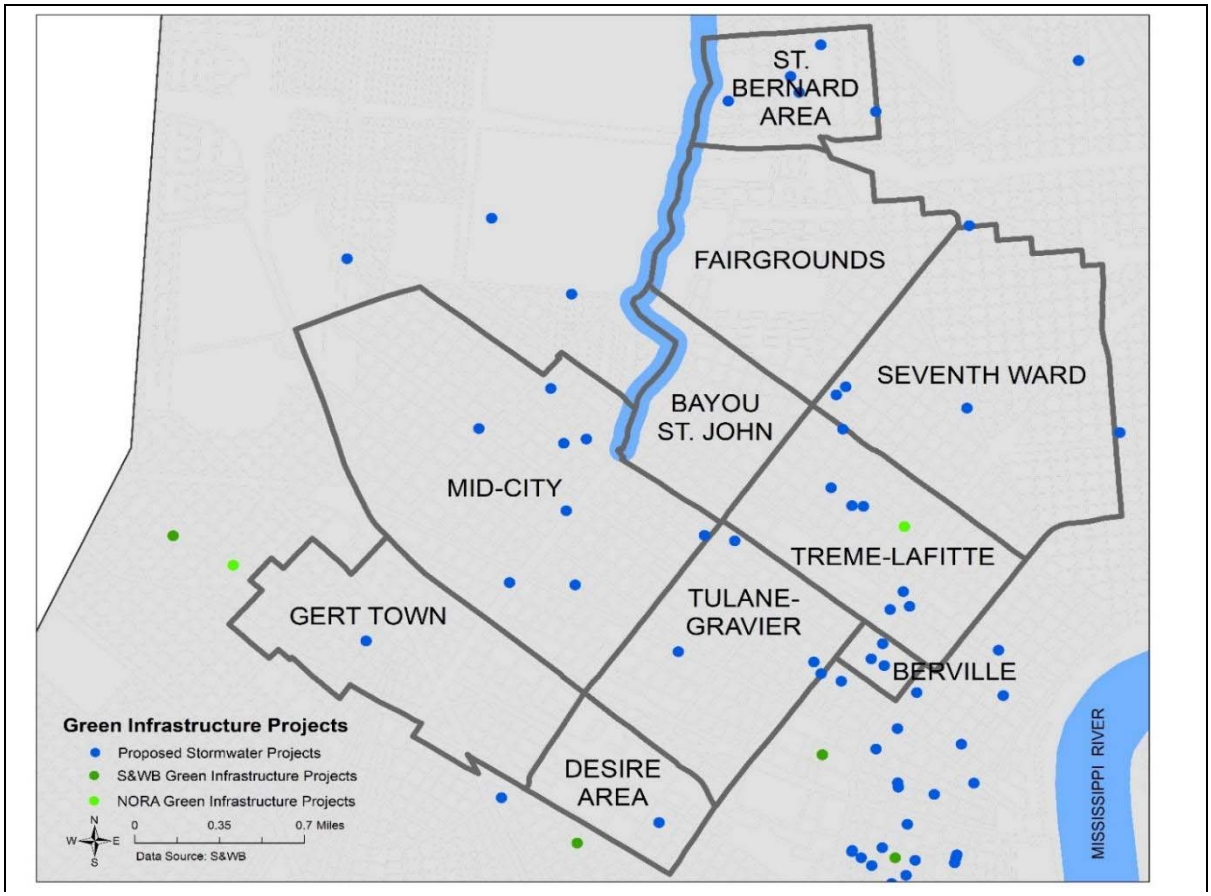


Figure 39 - Green Infrastructure Projects in Mid-City

The Mid-City neighborhood has completed a Green Infrastructure project that includes a million-gallon water storage tank under East Park and modifications to other areas that converted existing impervious surfaces to rain gardens and other areas that absorb stormwater. The Hagan Lafitte project effectively slows down the runoff from 24 blocks along Orleans Avenue into the St. Louis Canal (Figure 40). More information on Green Infrastructure can be found at https://ready.nola.gov/green-infrastructure/.

Rendering of how street corners would be altered to convert impervious surfaces to rain gardens

Source: Hagan Lafitte Fact Sheet

Figure 40 - Hagan Lafitte Project Area

Source: Hagan Lafitte Fact Sheet

Flood Control Measures Summary

The Mid-City district's drainage system appears to be enough to collect stormwater from the surface and streets and send it to Lake Pontchartrain. This system depends on "downstream" canals and pump stations that may be getting improvements under SELA. The district can

always use more projects that reduce or slow down inflow into the roadside system, such as Green Infrastructure projects.

Building Protection Measures

As noted in Section 5.2, building protection measures depend on the type of foundation and the depth of repetitive flooding. Figure 41 is a map showing the types of foundations. Detached garages, park pavilions, and other minor structures are not counted as buildings for the purposes of this report. Some areas were not included by the City's blight surveying, so not every building in the district was viewed. In most cases, grey areas are parks or vacant lots. The large grey area in the Fairgrounds neighborhood is the New Orleans Fair Grounds.
Figure 41 shows that most of the district's buildings are on elevated foundations. Slab foundations are more common in the southern neighborhoods.

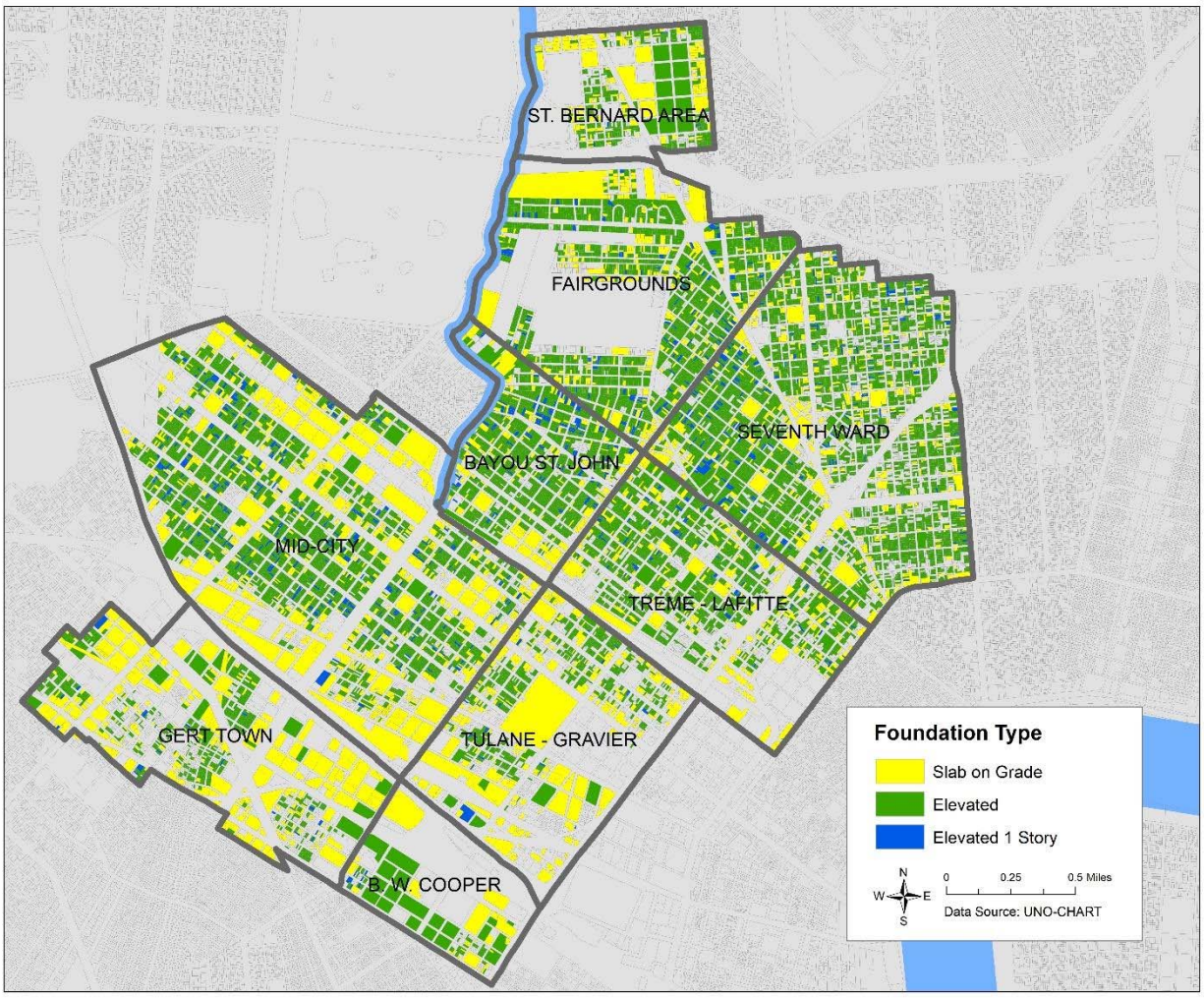


Figure 41 - Foundation Types in Mid-City

The project team reviewed building types and conditions for 14,925 primary structures in the Mid-City Repetitive Loss Planning District. There may be some that were not included in the survey and there are likely some new buildings that were constructed, elevated, or cleared since the blight program's ArcGIS Photo Survey was conducted in 2013. A summary of the findings is in Table 24.

Table 24 - Mid-City District Building Data

Neighborhood	No. Buildings	Percent Occupied	Pct. Good Condition	Pct. >1 Story	Type of Foundation		
					Slab	Elev ≤ 3 ft	Elev > 3 ft
B. W. Cooper	102	92%	87%	39%	31%	8%	61%
Bayou St. John	1,320	98%	95%	29%	13%	25%	62%
Fairgrounds	1,832	98%	93%	20%	18%	32%	50%
Gert Town	881	92%	87%	25%	34%	23%	43%
Mid-City	3,574	98%	94%	36%	19%	21%	60%
Seventh Ward	4,051	93%	88%	20%	14%	33%	53%
St. Bernard Area	432	96%	91%	21%	38%	27%	35%
Treme - Lafitte	1,887	96%	92%	40%	18%	26%	56%
Tulane - Gravier	846	94%	89%	30%	32%	20%	48%
District Total	14,925	96%	91%	28%	19%	27%	54%

Buildings in good condition are more appropriate for elevation and other building protection measures that preserve the existing structure. There are two measures of whether a building is in good condition that were collected in the building survey: if it is occupied and if it looks in good condition from the street.

The building data in Table 24 show a strong healthy area with a high occupancy rate (96%) and a high number of buildings that are in good condition (91%). These figures are close to the City-wide numbers of 97% and 95%. All the neighborhoods have similar conditions as their numbers all within 5% of the district total.

Buildings with more than one story have a building protection measure not available to single-story structures: the owner can permanently relocate valuable items, such as the furnace and air conditioner, to the upper story, above the flood level. The B.W. Cooper, Gert Town, and Treme – Lafitte neighborhoods have the most multi-story buildings with 39%, 36%, and 40% of their building stock being more than one story. The district (28%) is close to the City-wide number of 30%.

The first floors of buildings on slab foundations are closer to the ground than the first floors of the elevated buildings on crawlspaces or piers and therefore more likely to flood. There is an interesting split in the neighborhoods for this factor: five of the neighborhoods have 13% - 19% of their buildings with slab foundations and four have numbers in the 31% - 38% range.

As noted in the discussion on Figure 41, slab foundations are more common in the southern neighborhoods of B.W. Cooper, Gert Town and Tulane-Gravier. They are also found in the St. Bernard Area and the southern portion of the Mid-City neighborhood. These neighborhoods have more commercial and industrial structures than the rest of the district. All the neighborhoods have lower percentages than the City-wide total of 41%.


Elevated home on Bienville in the Mid-City neighborhood of the Mid-City district.

Elevated buildings are the easiest to raise to a higher, flood protected, level. Eighty-one percent of the buildings in the Mid-City Repetitive Loss Planning District are already elevated. Two-thirds of them are already elevated more than three feet. These buildings (and, therefore, 54% of the building stock) are considered elevated above the level of shallow, repetitive flooding.

Building Protection Measures Summary

Just over half the buildings in the Mid-City Repetitive Loss Planning District are elevated at least three feet above grade and therefore counted as elevated above the repetitive flooding level. Of the rest of the buildings 60% are elevated, but less than three feet high. They could be elevated higher relatively easily. Nineteen percent of the district's buildings are on slab-on-grade foundations, which generally need other building protection measures. Many of them are commercial or industrial buildings which have more flood protection options.

Recommendations

1. The Sewerage & Water Board should fund and complete the SELA evaluations to expand drainage capacities in the Lakeview and Gentilly districts to the north.
2. The roadside drainage improvement and Green Infrastructure projects should continue.
3. Every owner of a building less than three feet above ground level should review their building protection measure alternatives.
4. Every property owner and renter in every neighborhood should:
   a. Carry a flood insurance policy regardless of their FIRM zone, and
   b. Maintain the catch basins downstream of their property.

8. New Orleans East

The New Orleans East Repetitive Loss Planning District is in the eastern part of the City. It is bordered on the west by the Inner Harbor Navigation Canal, on the north by Lake Pontchartrain, on the east by the Rigolets Strait and St. Tammany Parish, and on the south by Saint Bernard Parish. The District has nine neighborhoods which are also designated by the City's planning programs and are displayed in Figure 42.

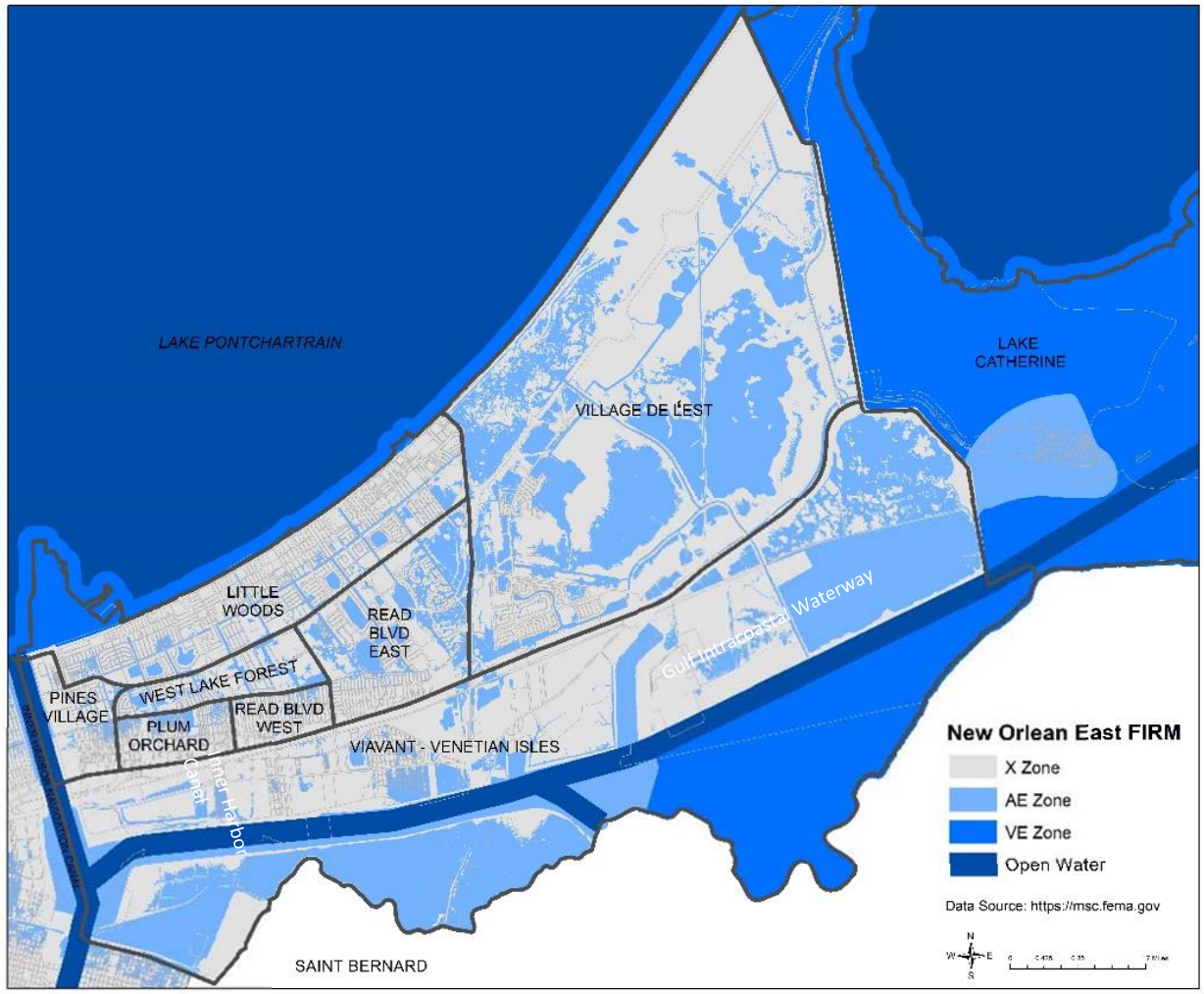


Figure 42 - New Orleans East Flood Insurance Rate Map

The Repetitive Flood Problem

New Orleans East faces two types of flooding. Most of the district is surrounded by levees rated at protecting the area from the base flood caused by coastal flooding. These areas are shown in Figure 42 with the lighter X and AE Zones (the flood zones on the FIRM are explained in the Mitigation Terminology page in Section 5.1). Much of the AE Zones are lakes or undeveloped open space; some of the district includes streets in the higher risk zones.

The areas outside the levees' protection are subject to coastal flooding. Most of those areas are shown in Figure 42 as the darker blue VE Zone. "VE" Zones are threatened with both coastal flooding and damaging wave action. These unleveed areas comprise all the Lake Catherine neighborhood and the part of the Viavant-Venetian Isles neighborhood south of the Gulf Intracoastal Waterway.

Almost all the developed areas in New Orleans East are in leveed neighborhoods. Of the 21,124 buildings in the district, only 512 (2%) are in the Lake Catherine neighborhood. There are no roads or buildings in the area of Viavant-Venetian Isles between the levee on the north side of the Gulf Intracoastal Waterway and the St. Bernard Parish line.

Table 25 - FEMA Repetitive Loss Properties in New Orleans East

Neighborhood	Buildings	Number of RLs	Percent of RLs	Number Claims	Pct. Of Buildings with Claims
Lake Catherine	512	244	48%	929	181%
Little Woods	9,500	301	3%	11,247	118%
Pines Village	1,419	86	6%	1,954	138%
Plum Orchard	1,627	145	9%	2,096	129%
Read Blvd East	2,912	74	3%	2,899	100%
Read Blvd West	1,734	81	5%	2,205	127%
Viavant-Venetian Isles	234	17	7%	240	103%
Village de L'Est	2,098	32	2%	1,766	84%
West Lake Forest	1,088	38	3%	1,350	124%
District Total	21,124	1,018	5%	24,686	117%

Note: the number of claims is the number of claims submitted, including those closed without payment

Table 25 shows numbers and percentages of buildings and claims in New Orleans East between 1978 and 2018, the period for available data. Because the number of buildings in the neighborhoods range from 234 to 9,500, it is more relevant to compare percentages. Of the 21,124 buildings reviewed in the district, 1,018 or 5% have been officially listed by FEMA as repetitive loss properties.

More than 2/3 of the repetitive loss properties are in three neighborhoods: Lake Catherine, Little Woods, and Plum Orchard. Lake Catherine has the highest percentage by far because it is the most exposed to flood damage, being outside the levee system.
While only 3% of the buildings in the district are designated as repetitive loss properties, many more buildings have flooded, resulting in 24,686 flood insurance claim payments. Using the number of claims as a percentage of the number of buildings as a measure of the relative

frequency of flooding, the Lake Catherine neighborhood has the greatest problem. The district has had more claims than buildings (117%).

Village d L'Est stands out as having the least flood insurance claims experience. This may be due to the fact that it is the newest area developed and would have had flood protection standards in the building requirements as much of the development in Village de L'Est is Post-War.[64]

Table 26 - New Orleans East Flood Insurance Claims Data

Neighborhood	All Claims			Without Katrina Claims				
	No. Claims	Claim Payments		Claims		Claim Payments		
		Avg.	Total	No.	Pct.	Avg.	Total	Pct.
Lake Catherine	929	$73,821	$60,828,850	581	63%	$19,625	$9,419,927	15%
Little Woods	11,247	$102,418	$1,020,284,342	2,483	22%	$8,597	$13,247,561	1%
Pines Village	1,954	$66,699	$117,390,679	812	42%	$9,048	$5,763,677	5%
Plum Orchard	2,096	$57,968	$110,720,110	973	46%	$14,335	$11,640,243	11%
Read Blvd East	2,899	$156,535	$403,546,908	496	17%	$4,105	$1,137,265	0%
Read Blvd West	2,205	$83,530	$165,474,806	739	34%	$10,658	$5,734,088	3%
Viavant-Venetian Isles	240	$135,297	$24,624,047	127	53%	$29,249	$2,427,667	10%
Village de L'Est	1,766	$90,191	$134,475,166	253	14%	$8,328	$849,426	1%
West Lake Forest	1,350	$109,681	$130,301,189	289	21%	$5,260	$836,401	1%
District Total	24,686	$99,088	$2,167,646,097	6,753	27%	$11,030	$51,056,255	2%

Note: The number of claims include claims submitted, but not paid.
The average and total payments are based on paid claims only.

Table 26 notes that the National Flood Insurance Program has paid over two billion dollars in claim payments in New Orleans East. between 1978 and 2018, the period for available data. Table 26 also provides data on claims that were paid for floods other than from Hurricane Katrina. These "without Katrina claims" represent the damage caused by repetitive flooding. Of the 24,686 flood insurance claims in New Orleans East, 17,933 were submitted after Hurricane Katrina. The rest are shown as the 6,753 "without Katrina claims" in Table 26. While "without Katrina claims" represent 27% of the number of claims, they were only 2% of the dollars paid.

While 98% of all the claims dollars paid were caused by Hurricane Katrina, repetitive flooding is still a chronic problem. It is costing over 50 million dollars in flood insurance claims, which measure only part of the total cost. The average non-Katrina claim in the New Orleans East Repetitive Loss Planning District was $11,030, a little lower than the City-wide average of $11,910.

[64] https://property.nola.gov/

Based on the percentage of non-Katrina claims and the average non-Katrina claim payments, the neighborhoods with the greatest repetitive flooding problems are Lake Catherine, Plum Orchard, and Viavant-Venetian Isles. The very high average payment in Viavant-Venetian Isles may be related to the relatively large number of more expensive commercial and industrial buildings in that neighborhood.

Flood Control Measures

Drainage System

The City's drainage system is explained in Section 4.1. The Sewerage & Water Board's part of the New Orleans East district's drainage system is shown in Figure 43.

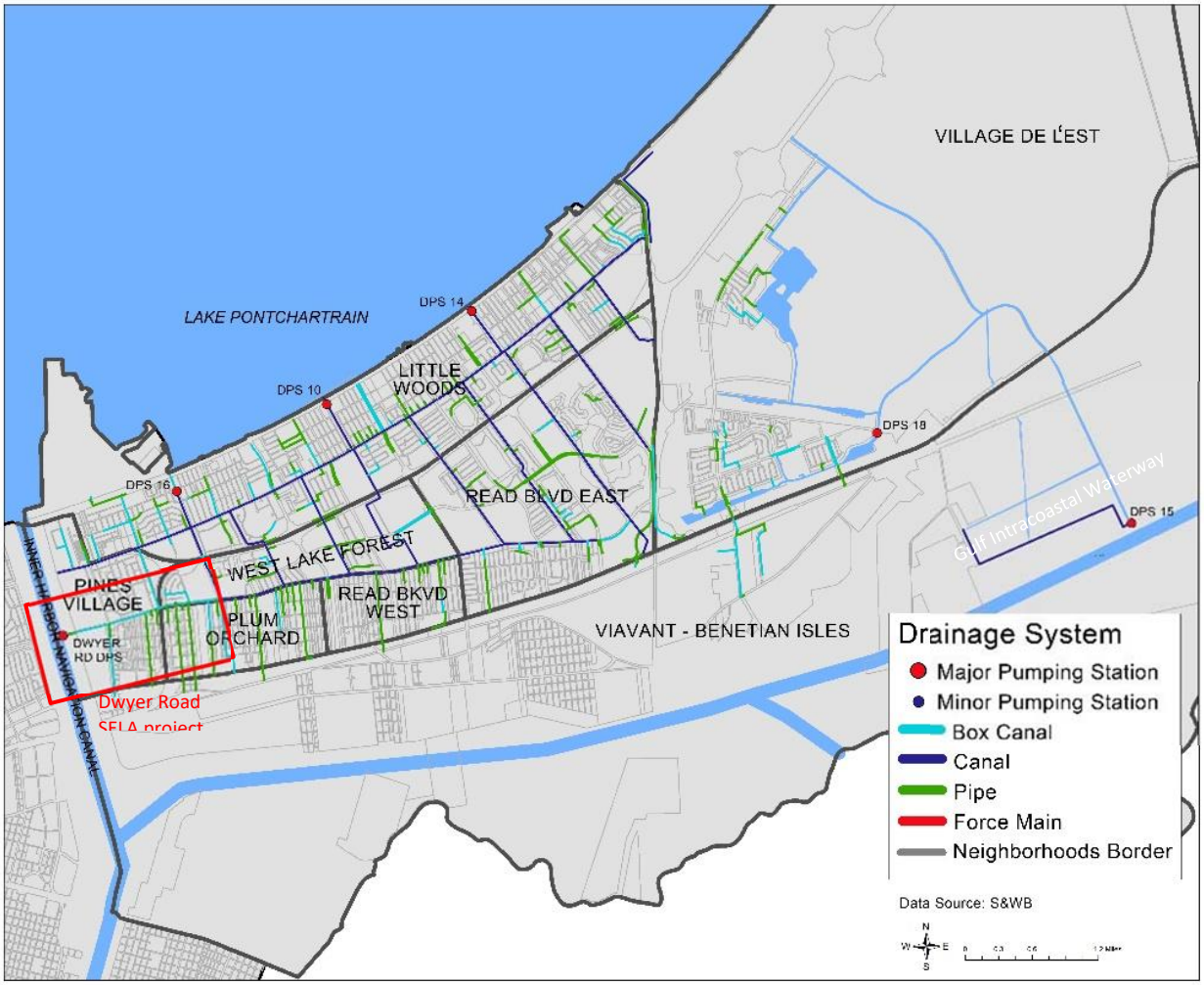


Figure 43 - New Orleans East Major Drainage System

The developed leveed areas shown above have a drainage system like the rest of the City's. Stormwater carried by the roadside drains is collected by the pipes and box canals managed by the Sewerage & Water Board (S&WB). These drain to Drainage Pump Stations (DPS) that pump

the water over the levees and into the Inner Harbor Navigation Canal, Lake Pontchartrain, or the Intracoastal Waterway.

The **Lake Catherine** neighborhood outside the levees is not shown in Figure 43. In most cases, the 512 buildings do not have a constructed drainage system as most of them are adjacent to a canal, lake, or other water body.

Most of the buildings in the neighborhood are elevated above the shallow, repetitive flood level and many are elevated above the coastal base flood elevation, as seen in the photo of Venetian Isles at the end of this summary. Accordingly, the Lake Catherine neighborhood is not included in the rest of this discussion on flood control measures.

Aerial view of the Venetian Isles development (not to be confused with the Viavant-Venetian Isles neighborhood) where every house is on a canal.
Photo Source: Google Earth.

Major Projects

There has been one completed SELA project in the New Orleans East District known as the Dwyer Road drainage improvements. It is in the red box in Figure 43.

The project provides flood risk reduction for a 10-year rain event which can handle three inches of rain in the first hour or 9 inches of rain over a 24-hour period. The total construction cost of the project was $91.7 million.

Construction of the intake canal
Photo: U.S. Army Corps of Engineers

The Dwyer Sub-basin area drainage improvements consisted of three components:

- → Drainage Pump Station, completed in 2004
- → Intake Canal (right), completed in 2011
- → Pump Station Outfall Canal, completed in 2013
- →

The Dwyer Road drainage improvements project increased the pump station's capacity from 120 cubic feet per second to nearly 1,000 cfs. The project should particularly help drain stormwater from the Plum Orchard neighborhood, which has one of the district's largest

percentages of non-Katrina claims and claim payments and the third highest average non-Katrina claim payment. (Table 26).

Roadside Projects

The Department of Public Works received post-Katrina disaster assistance funding to help restore the streets and adjacent drainage facilities. These have been constructed over the years as road work is scheduled; more are planned. Figure 44 shows the location and status for New Orleans East.

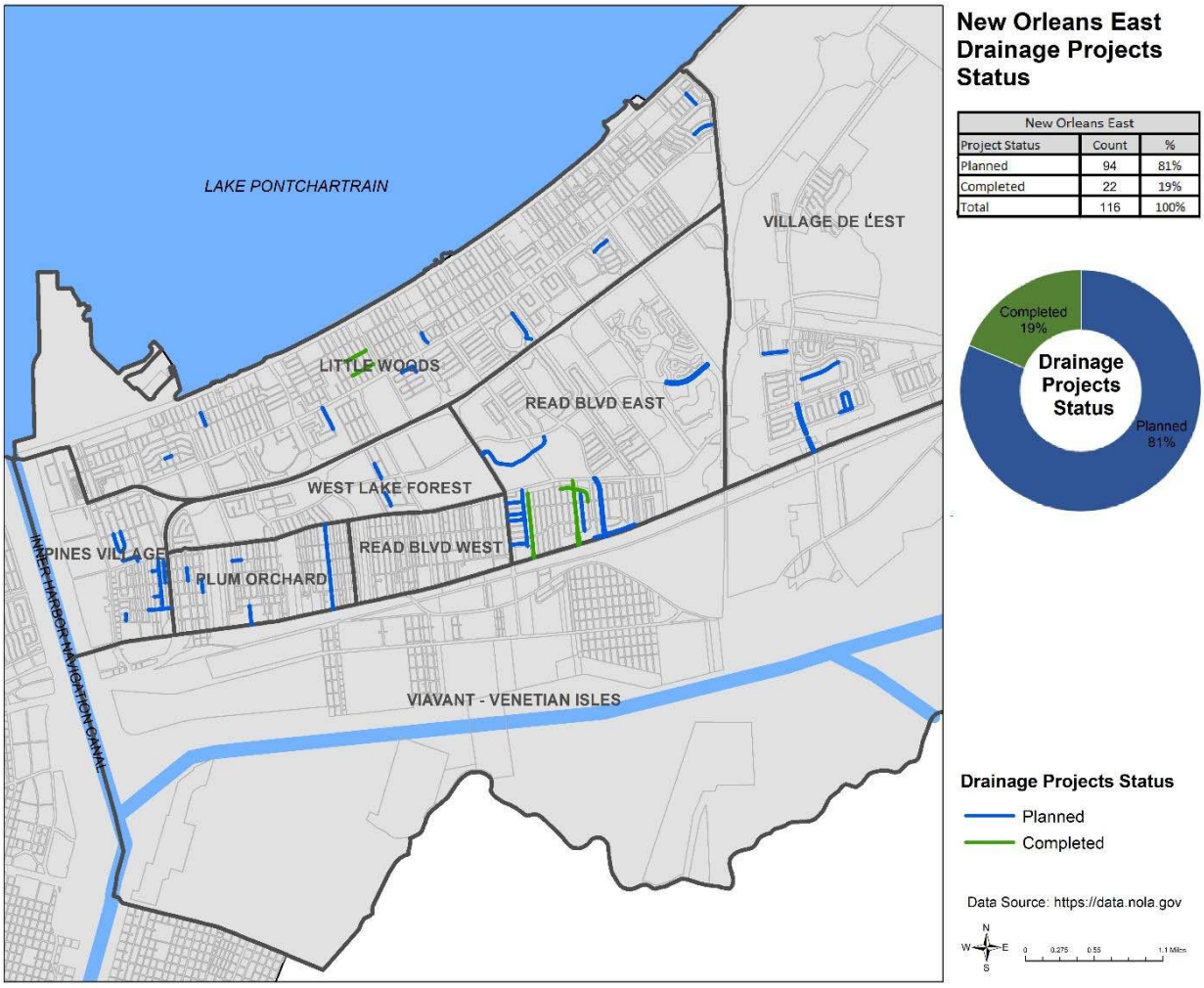


Figure 44 - Roadside Drainage Projects in New Orleans East

As of March 2021, 19% of the projects have been completed (shown in green in Figure 44). These roadside projects will help drain the streets into the major drainage system's pipes and canals. However, if the major system has blockages or is overloaded, the roadside system may not be able to drain the water from the streets.

One important part of the roadside drainage system is the catch basins that collect surface water and sends it into the subsurface pipes. As explained in Section 4.4, the more nearby residents do to keep them clean, the better the system works.

Green Infrastructure

As discussed in Section 4.3, the Green Infrastructure program relies on natural measures to handle drainage, such as letting rainwater soak into the ground in a rain garden. More information on Green Infrastructure is at https://ready.nola.gov/green-infrastructure/.

The Green Infrastructure program has received special funding from several different sources. The larger contributors are the Sewage and Water Board (S&WB) and the New Orleans Redevelopment Authority (NORA). Figure 45 shows Sewerage & Water Board stormwater projects to improve drainage and Green Infrastructure projects.

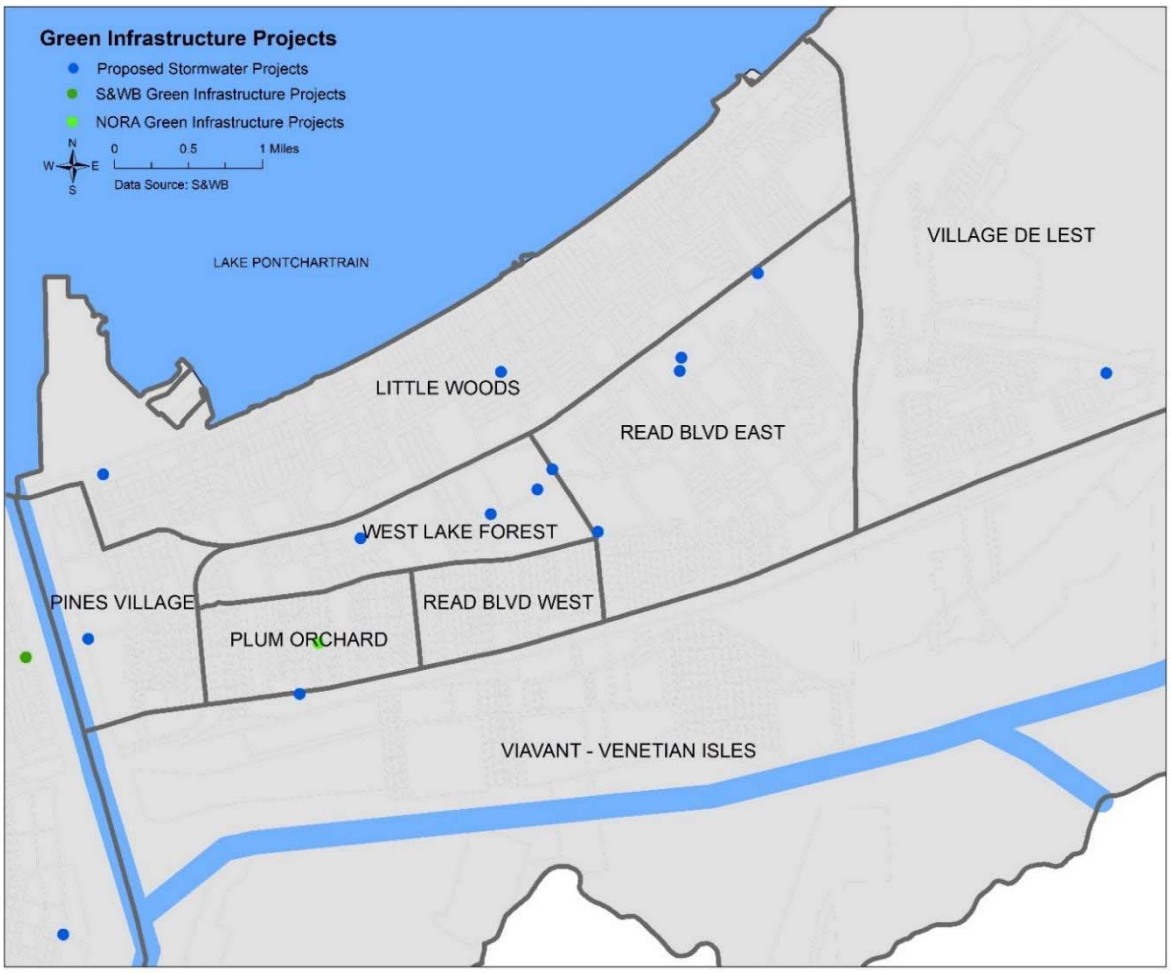


Figure 45 - Green Infrastructure Projects in New Orleans East

Flood Control Measures Summary

Flood control measures for the areas protected by levees focus on collecting and conveying stormwater to a body of water outside the levees. The one SELA project planned for the major drainage system has been completed. Roadside drainage improvements to carry stormwater to the major system are underway. A variety of Green Infrastructure projects are planned to reduce the peak flows of stormwater runoff.

Building Protection Measures

As noted in Section 5.2, building protection measures depend on the type of foundation and the depth of repetitive flooding. Figure 46 is a map showing the types of foundations.

Figure 46 shows large areas of the New Orleans East district colored grey. These are areas without buildings, such as the Lakefront Airport. To the south and east, the grey areas are undeveloped areas, mostly marsh land.

Only in the Plum Orchard neighborhood is there a relatively even distribution of buildings on slab and elevated foundations. Everywhere else has a preponderance of yellow, i.e., slab-on-grade foundations, the more common foundation in post-War construction, when most of the New Orleans East residential areas were developed.

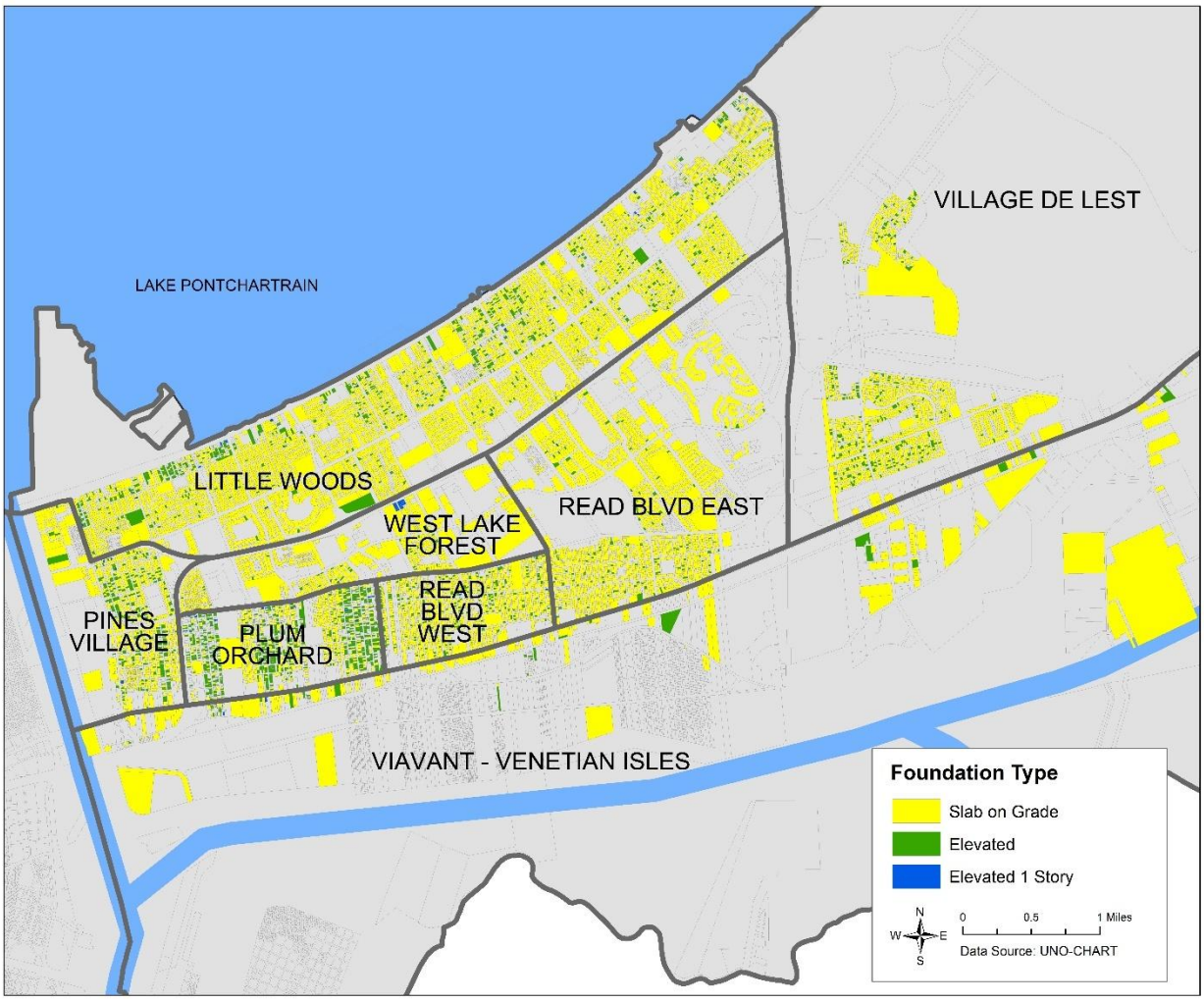


Figure 46 - Foundation Types in New Orleans East

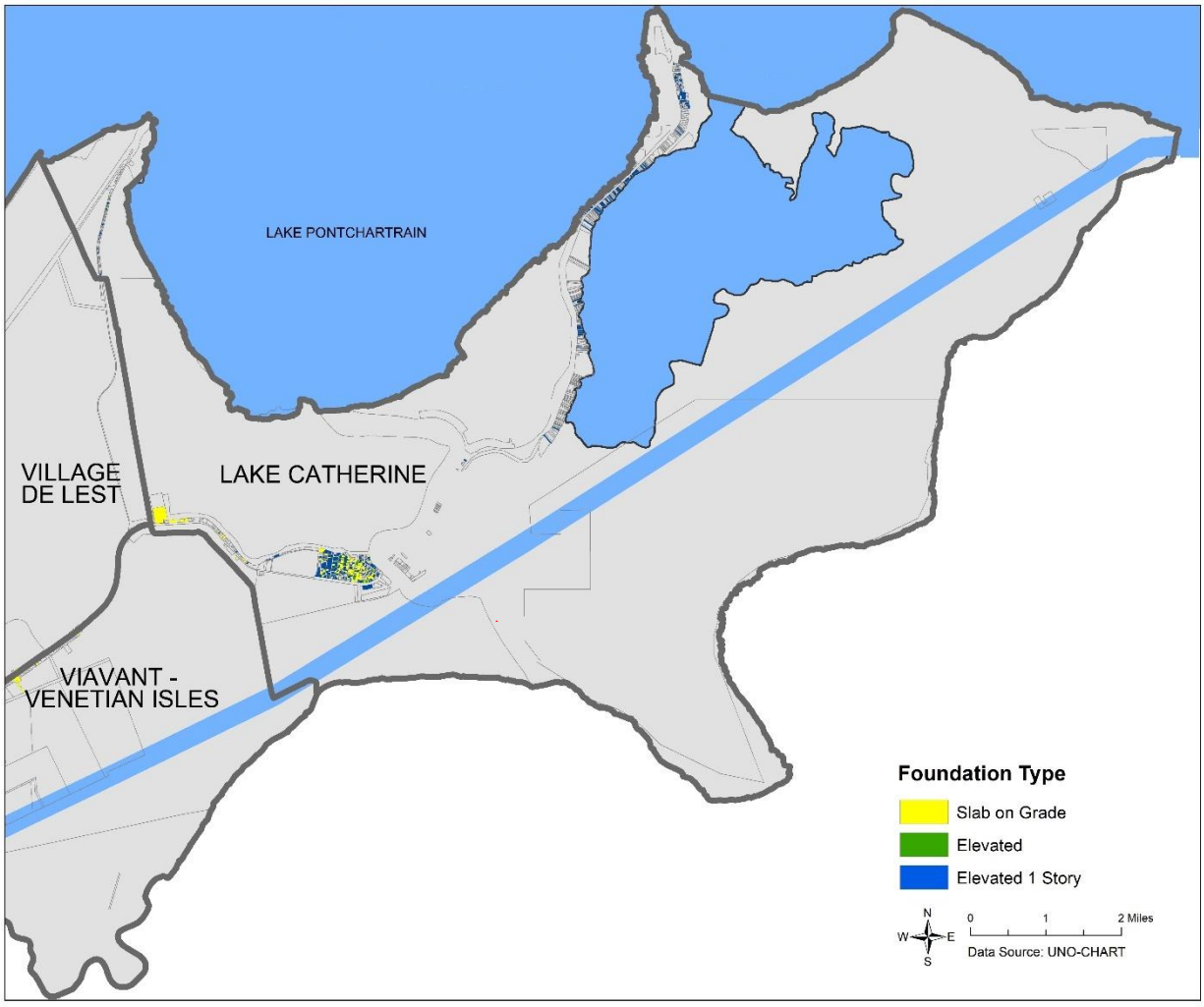


Figure 47 - Foundation Types in the Lake Catherine neighborhood

Figure 47 shows how much of the Lake Catherine neighborhood and the eastern parts of Village de L'Est and Viavant-Venetian Isles are undeveloped (the grey areas). Except for the Venetian Isles development in the Lake Catherine neighborhood, the only buildings are those along the few roads in this area.

Table 27 has the numbers for the various types of foundations. Seventy-six percent of the buildings in the Lake Catherine neighborhood have their lowest floor elevated three feet or more above grade. This is by far the highest ratio in the City. While these buildings are still subject to damage by large floods and coastal storms, they are considered protected from the shallow repetitive floods.

The project team reviewed building types and conditions for 21,124 primary structures in the New Orleans East Repetitive Loss Planning District. There may be some that were not included in the survey and there are likely some new buildings that were constructed, elevated, or cleared since the blight program's ArcGIS Photo Survey was conducted in 2013. A summary of the findings is in Table 27.

Table 27 - New Orleans East District Building Data

Neighborhood	No. Buildings	Percent Occupied	Pct. Good Condition	Pct. >1 Story	Type of Foundation		
					Slab	Elev ≤ 3 ft	Elev > 3 ft
Lake Catherine	512	99%	97%	29%	23%	1%	76%
Little Woods	9,500	99%	97%	19%	90%	4%	6%
Pines Village	1,419	97%	97%	23%	80%	6%	14%
Plum Orchard	1,627	96%	96%	11%	52%	20%	28%
Read Blvd East	2,912	98%	99%	20%	95%	1%	4%
Read Blvd West	1,734	97%	99%	7%	86%	3%	11%
Viavant-Venetian Isles	234	85%	88%	24%	79%	17%	4%
Village de L 'Est	2,098	99%	99%	20%	88%	3%	9%
West Lake Forest	1,088	96%	98%	51%	95%	1%	4%
District Total	21,124	95%	96%	20%	83%	7%	10%

Buildings in good condition are more appropriate for elevation and other building protection measures that preserve the existing structure. There are two measures of whether a building is in good condition that were collected in the building survey: if it is occupied and if it looks in good condition from the street.

The building data in Table 27 show a strong healthy area with a high occupancy rate (95%) and a high number of buildings that are in good condition (96%). These figures are close to the City-wide numbers of 97% and 95%. The only neighborhood that varies from these numbers is Viavant-Venetian Isles with 85% of its buildings occupied and 88% in good condition. Over 40% of the residential properties in Viavant-Venetian Isles / Lake Catherine were deemed substantially damaged according to post-Katrina assessment data from the City of New Orleans. Homes damaged over 50% were required to meet the 1984 BFE or be elevated to Advisory Base Flood Elevation (ABFE) as adopted by the New Orleans City Council. This may explain the low occupancy percentage in the Viavant-Venetian Isles Neighborhood among other factors contributing to the decline in occupancy rates.[65]

Buildings with more than one story have a building protection measure not available to single-story structures - the owner can permanently relocate valuable items, such as the furnace and air conditioner, to the upper story, above the flood level. The percentages of buildings with

[65] https://nolaplans.com/plans/Lambert%20Final/District_11_Final_Viavant&Venetian%20Isles.pdf

more than one story varies widely from 7% in Read Boulevard West to 51% in West Lake Forest, so this option is more available in some neighborhoods than in others. The district total (20%) is less than the City-wide number of 30%.

The first floors of buildings on slab foundations are closer to the ground than the first floors of the elevated buildings on crawlspaces or piers and therefore apt to flood more often. As noted earlier, most of the buildings (83%) in New Orleans East are on slab-on-grade foundations. There are two exceptions to this: Lake Catherine with only 23% on slab foundations and Plum Orchard with 52%.

Elevated buildings are the easiest to raise to a higher, flood protected, level. Outside of the Lake Catherine neighborhood, the New Orleans East has the lowest percentage of buildings elevated more than three feet of any repetitive loss planning district.

Elevated houses in the Venetian Isles development in the Lake Catherine neighborhood.

Photo Source: Google Earth.

Building Protection Measures Summary

The high number of slab foundations throughout the New Orleans East district presents some challenges for building protection measures. Efforts should focus on the buildings in the leveed areas with slab foundations.

Recommendations

1. The roadside drainage improvement and Green Infrastructure projects should continue.
2. Every owner of a building less than three feet above ground level should review their building protection measure alternatives.
3. Every property owner and renter in every neighborhood should:
   a. Carry a flood insurance policy regardless of their FIRM zone, and
   b. Maintain the catch basins downstream of their property.

9. UPTOWN

The Uptown Repetitive Loss district is in the southeast part of the city. It is roughly bordered on the north by Airline Highway, on the west by Jefferson Parish, on the east by Washington and Napoleon Avenues, and on the south by the Mississippi River, as shown in Figure 48.

The District has eleven neighborhoods which are also designated by the City's planning programs and are displayed in Figure 48. Note that the Uptown Repetitive Loss Planning District has a neighborhood with the same name.

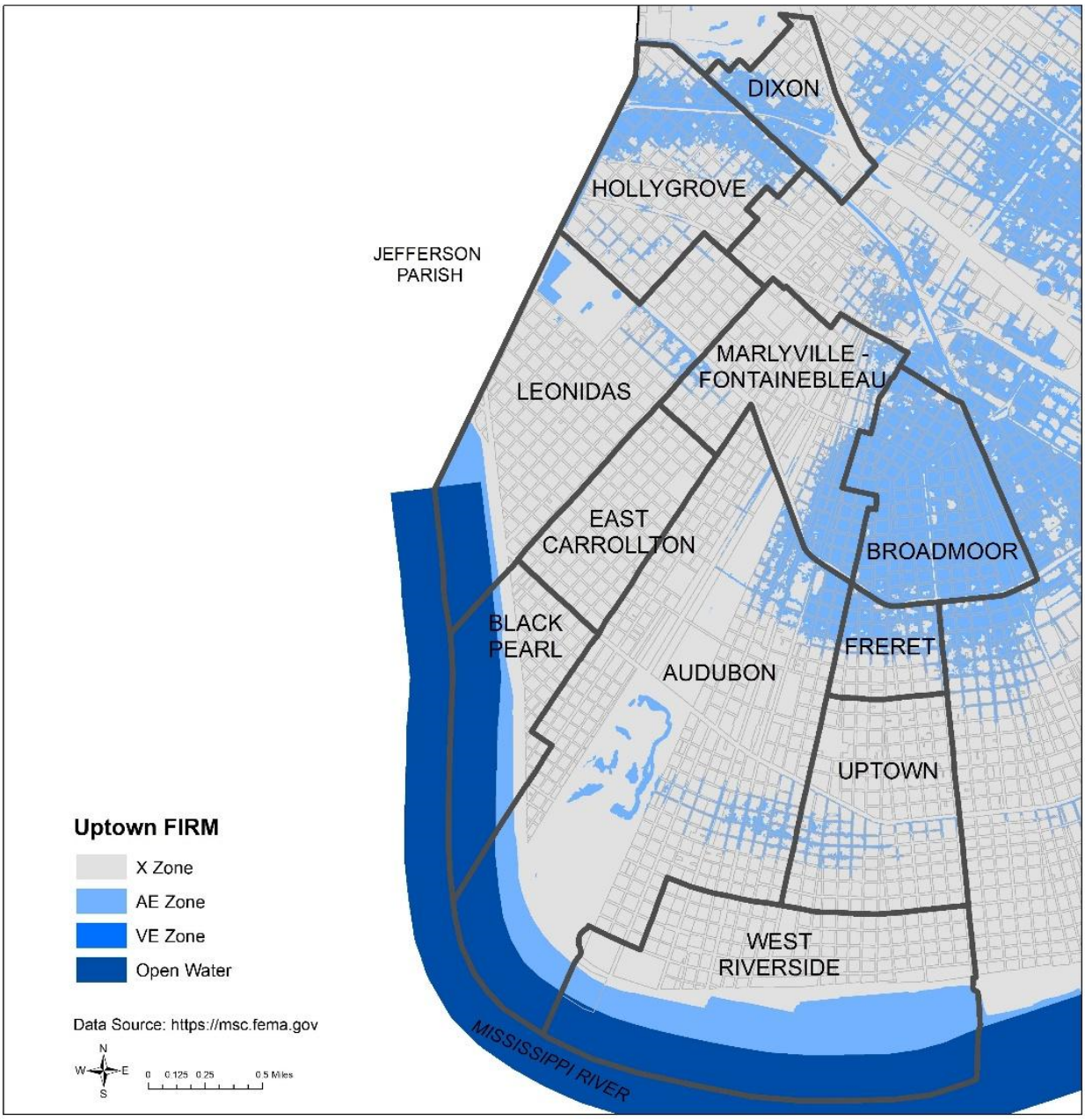


Figure 48 - Uptown Flood Insurance Rate Map

The Repetitive Flood Problem

The flood zones in the FIRM are explained in the Mitigation Terminology page in Section 5.1. The highest part of Uptown is the bank of the Mississippi River. A natural levee was formed over the centuries where the flooding river dropped sediment on its banks, known as the "sliver near the river." Surface water drains away from the river and flows north to the lower ground. Most of the district's high flood risk area (AE Zones) is located on this lower ground in the northern parts of the district, especially the Broadmoor neighborhood.

The AE Zone along the river is outside the levee and is mostly public open space and port facilities. The few structures in this area fall into the "large building" category that need individual attention by an architect or engineer.

Table 28 - FEMA Repetitive Loss Properties in Uptown

Neighborhood	Buildings	Number of RLs	Percent of RLs	Number Claims	Pct. Of Buildings With Claims
Audubon	3,853	465	12%	5,380	140%
Black Pearl	497	7	1%	197	40%
Broadmoor	1,878	594	32%	5,318	283%
Dixon	390	37	9%	505	129%
East Carrollton	1,290	26	2%	576	45%
Freret	596	80	13%	917	154%
Hollygrove	1,777	197	11%	2,469	139%
Leonidas	2,488	80	3%	1,539	62%
Marlyville - Fontainebleau	1,969	252	13%	3,154	160%
Uptown	1,958	91	5%	1,416	72%
West Riverside	1,744	11	1%	354	20%
District Total	18,440	1,840	10%	21,825	118%

Table 28 shows numbers and percentages of buildings and claims. Because the number of buildings in the neighborhoods range from 497 to 3,853, it is more relevant to compare percentages. Of the 18,440 buildings reviewed in the district, 1,840 or 10% have been officially listed by FEMA as repetitive loss properties. This is the highest percentage of any district in the City.

The neighborhoods with more than 10% of their buildings being designated repetitive loss properties are Audubon, Broadmoor, Freret, Hollygrove, and Marlyville-Fontainebleau. These are the neighborhoods with most of the high-risk zones.

While 10% of the buildings in the district have been designated as repetitive loss properties, many more buildings have been flooded, resulting in 21,825 flood insurance claim payments between 1978 and 2018, the period for available data. Six of the eleven neighborhoods have had more claims than they have buildings (shown in the "Pct of Buildings" column as greater than 100%). These are the same five neighborhoods with more than 10% repetitive loss properties plus Dixon (which also has a relatively large area mapped as AE Zone). Broadmoor,

the neighborhood with the most mapped floodplain, has had almost three floods for every building.

High claim counts are likely related to having mapped AE Zone floodplains. Mapped floodplains tend to have (1) more flooding that causes property damage and (2) more properties covered by flood insurance (which is mandated under the Federal law that requires flood insurance as a condition of a Federally-backed mortgage on a property in the AE Zone).

Table 29 - Uptown Flood Insurance Claims Data

Neighborhood	All Claims			Without Katrina Claims				
	No. Claims	Claim Payments		Claims		Claim Payments		
		Avg.	Total	No.	Pct.	Avg.	Total	Pct.
Audubon	5,380	$37,469	$160,330,154	3,429	64%	$8,174	$23,771,089	15%
Black Pearl	197	$7,290	$605,113	49	25%	$5,175	$201,822	33%
Broadmoor	5,318	$38,920	$186,193,020	3,918	74%	$8,830	$30,011,654	16%
Dixon	505	$52,037	$22,375,766	243	48%	$8,489	$1,578,982	7%
East Carrollton	576	$18,976	$6,546,586	191	33%	$6,095	$932,474	14%
Freret	917	$41,885	$33,968,398	574	63%	$10,151	$4,852,043	14%
Hollygrove	2,469	$37,643	$81,948,714	1,430	58%	$7,807	$9,047,920	11%
Leonidas	1,539	$42,446	$51,444,476	599	39%	$6,087	$2,666,239	5%
Marlyville - Fontainebleau	3,154	$64,401	$184,896,399	1,723	55%	$9,266	$13,778,677	7%
Uptown	1,416	$19,296	$18,099,484	685	48%	$7,507	$4,196,402	23%
West Riverside	354	$6,320	$834,219	87	25%	$5,810	$389,244	47%
District Total	21,825	$41,371	$747,242,329	12,928	59%	$8,409	$91,426,546	12%

Note: The number of claims include claims submitted, but not paid.
The average and total payments are based on paid claims only.

Table 29 notes that the National Flood Insurance Program has paid $747,242,329 in claim payments in Uptown between 1978 and 2018, the period for available data. Table 29 also provides data on claims that were paid for floods other than from Hurricane Katrina. These "without Katrina claims" represent the damage caused by repetitive flooding.
Of the 21,825 flood insurance claims in Uptown, 8,897 were submitted after Hurricane Katrina. The rest are shown as the 12,928 "without Katrina claims" in Table 29. While without Katrina claims represent 59% of the number of claims, they were only 12% of the dollars paid. The average non-Katrina claim in Uptown was $8,409, quite a bit lower than the City-wide average of $11,910.

Only three of the eleven neighborhoods had without Katrina claims worth more than 16% of their total claims: Black Pearl (33%), Uptown (23%), and West Riverside (47%). The two with the largest percentages, Black Pearl and West Riverside, have relatively small numbers of buildings and are on the "sliver near the river" with no mapped floodplain inside the levee. Because they

are on higher ground, they did not get hit as hard by Katrina as the other neighborhoods so their Katrina claims where relatively lower and their non-Katrina payments were higher.

Flood Control Measures

Drainage System

The City's drainage system is explained in Section 4.1. The Sewerage & Water Board's part of the Uptown district's drainage system is shown in Figure 49.

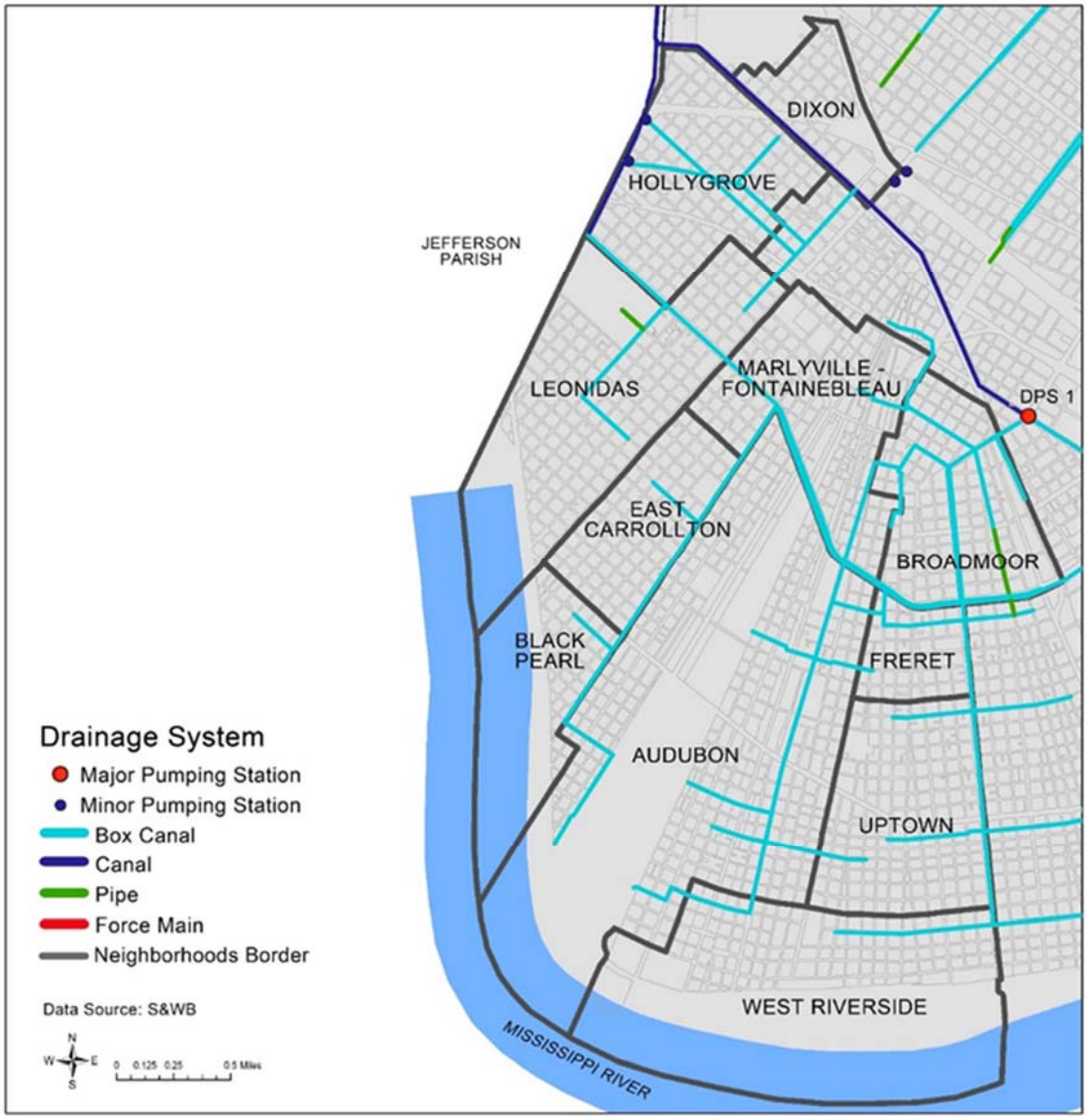


Figure 49 - Uptown Major Drainage System

Figure 49 shows the canals and larger pipes collecting the runoff from the roadside drainage system and conveying it by gravity to the lower areas to the north. It is collected at Drainage

Pump Station DPS 1 or the minor pump stations in Hollygrove. From there it is pumped to or over the levee into the 17th Street Canal.

Major Projects:

The Southeast Louisiana Urban Flood Control Program (SELA) has completed two projects that most help Uptown. In the Hollygrove and Leonida neighborhoods, the S. Claiborne Avenue Canal project modified the canals along the streets noted in green in Figure 50 to carry more water. There were improvements to the Pritchard Place Pump Station, too.

The Napoleon Avenue Canal project is half in the Uptown district and half in the Garden District. It is described in Section 6-4, the Garden District summary. Both projects were funded through a 65/35% (Federal/Local) cost share and were completed in May 2017.

Figure 50 - SELA projects in the Uptown and Garden District Repetitive Loss Planning Districts

Roadside Projects:

The Department of Public Works received post-Katrina disaster assistance funding to help restore the streets and adjacent drainage facilities. These have been constructed over the years

as road work is scheduled; more are planned. Figure 51 shows the location and status for Uptown.

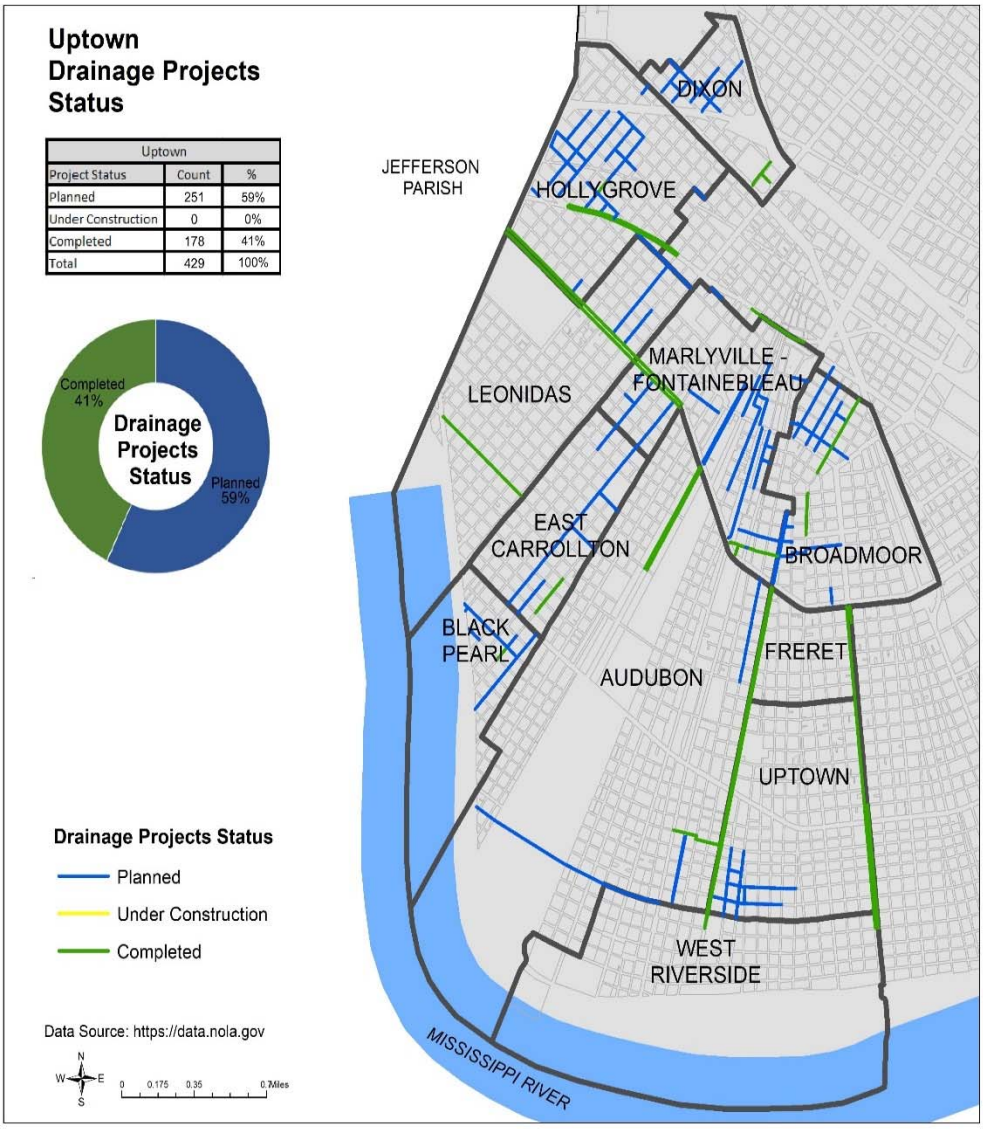


Figure 51 - Roadside Drainage Projects in Uptown

As of March 2021, 33% of the projects have been completed and 1% more have been started. This schedule is about the same as for the City as a whole: 32% and 4%, respectively. The completed work is mostly on the western side, where the drainage system feeds into the recently completed SELA projects on Louisiana and Napoleon Avenues.

When completed, these roadside projects will help drain the streets into the major drainage system's pipes and canals. However, if the major system has blockages or is overloaded, the roadside system may not be able to drain the water from the streets.

One important part of the roadside drainage system is the catch basins that collect surface water and sends it into the subsurface pipes. As explained in Section 4.4, the more nearby residents do to keep them clean, the better the system works.

Green Infrastructure

As discussed in Section 4.3, the Green Infrastructure program relies on natural measures to handle drainage, such as letting rainwater soak into the ground in a rain garden. More information on Green Infrastructure can be found at https://ready.nola.gov/green-infrastructure/.

The Green Infrastructure program has received special funding from several different sources. The larger contributors are the Sewage and Water Board (S&WB) and the New Orleans Redevelopment Authority (NORA). Figure 52 shows Sewerage & Water Board stormwater projects to improve drainage and Green Infrastructure projects.

The S&WB and the Land Trust for Louisiana cooperated on a demonstration project, located at 3601 General Tayler in Broadmoor. Here is from a description in a brochure available at *https://www2.swbno.org/documents/Environmental/GreenInfrastructure/WEB_Brochure.pdf*

> "Sponsored by the Sewerage & Water Board of New Orleans, the WEB Project at 3601 Gen. Taylor will convert a vacant lot to a green infrastructure demonstration site for the Broadmoor community.
>
> "The installation will capture rainwater that falls on the site plus additional street runoff to help reduce localized flooding and improve water quality.
>
> "The WEB Project will serve as a life-science educational outpost for the nearby Andrew H. Wilson Charter School. A corps of neighborhood volunteers will be organized to assist with monitoring water quality and infiltration."

The demonstration project. *Photo credit: Google Earth*

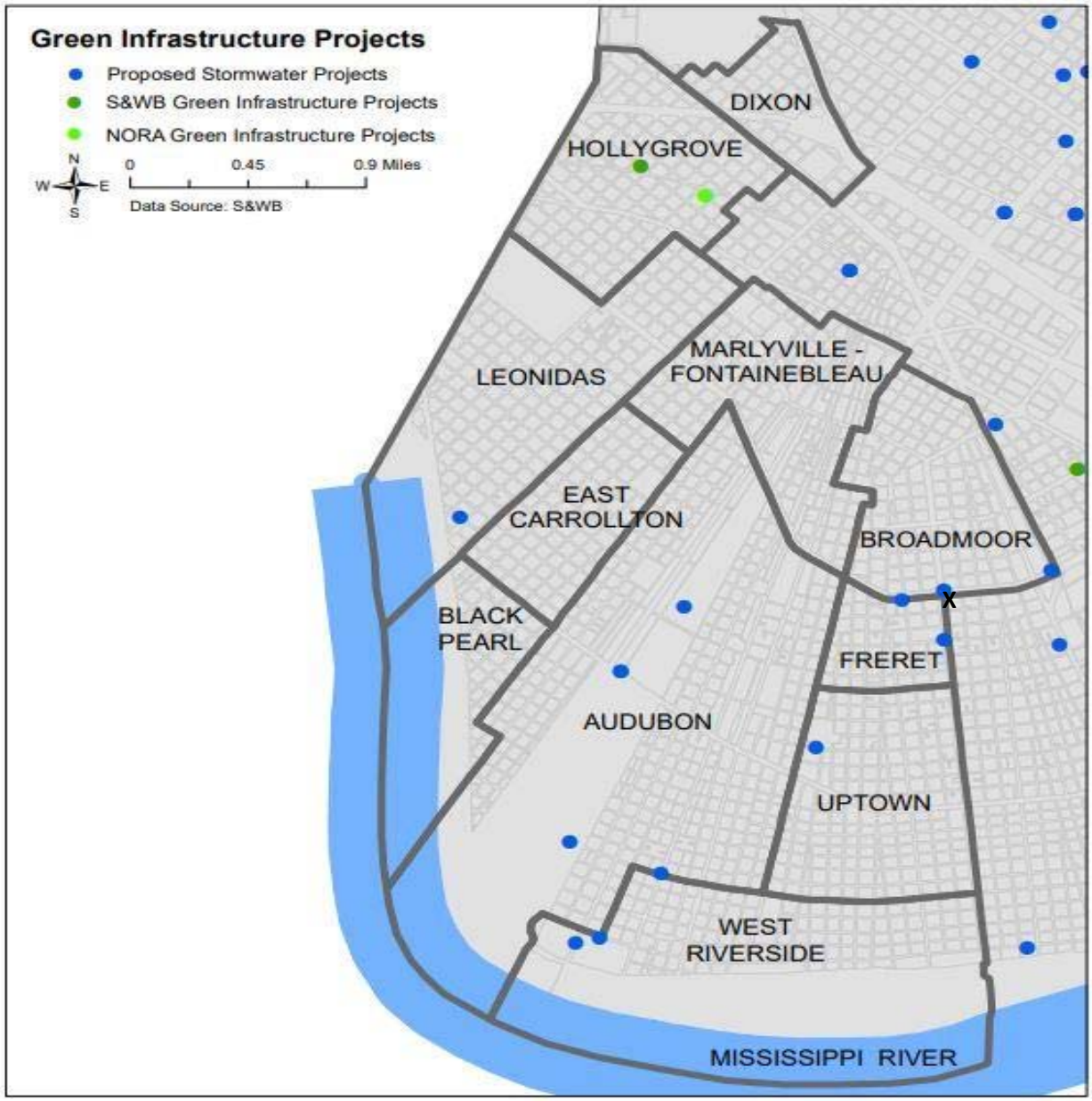


Figure 52 - Green Infrastructure Projects in Uptown

"X" = the site of the Broadmoor demonstration project described on the previous page

Flood Control Measures Summary:

The major drainage projects have been completed and the roadside drainage projects are well underway. A variety of Green Infrastructure projects throughout the district will help reduce inflow into the system. Together, these efforts should lower the frequency of localized, shallow repetitive flooding, but may not have an impact on the larger, less frequent floods.

Building Protection Measures

As noted in Section 5.2, building protection measures depend on the type of foundation and the depth of repetitive flooding. Figure 53 is a map showing the types of foundations. Detached garages, park pavilions, and other minor structures are not counted as buildings for the purposes of this report. Some areas were not included by the City's blight surveying, so not every building in the district was viewed. In most cases, grey areas are parks or vacant lots. Larger grey areas include - Audubon neighborhood: Audubon Park and Audubon Riverview Park, Leonidas: the S&WB wastewater treatment complex, and West Riverside: non-building port facilities.

Figure 53 shows a relatively even distribution of buildings on slab and elevated foundations throughout the district. The West Riverside neighborhood has more industrial and commercial properties where slab construction (yellow) is more common. Most of the larger yellow squares on the map are large public buildings or campuses, such hospitals and schools.
The project team reviewed building types and conditions for 18,440 primary structures in the Uptown Repetitive Loss Planning District. There may be some that were not included in the survey and there are likely some new buildings that were constructed, elevated, or cleared since the blight program's ArcGIS Photo Survey was conducted beginning in 2010 and updated through 2019. A summary of the findings is in Table 30.[66]

Table 30 - Uptown District Building Data

Neighborhood	No. Buildings	Percent Occupied	Pct. Good Condition	Pct. >1 Story	Type of Foundation		
					Slab	Elev ≤ 3 ft	Elev > 3 ft
Audubon	3,853	99%	99%	62%	13%	23%	64%
Black Pearl	497	99%	100%	35%	15%	35%	50%
Broadmoor	1,878	98%	98%	44%	13%	21%	66%
Dixon	390	94%	93%	19%	15%	34%	51%
East Carrollton	1,290	99%	99%	43%	14%	29%	57%
Freret	596	96%	97%	41%	15%	27%	58%
Hollygrove	1,777	94%	94%	16%	21%	34%	45%
Leonidas	2,488	98%	97%	25%	14%	32%	54%
Marlyville/Fontainebleau	1,969	99%	99%	51%	16%	26%	58%
Uptown	1,958	99%	99%	54%	12%	24%	64%
West Riverside	1,744	99%	99%	27%	13%	30%	57%
District Total	18,440	98%	98%	42%	14%	28%	58%

[66] BlightStatus Demolitions - Map | Data.NOLA.gov

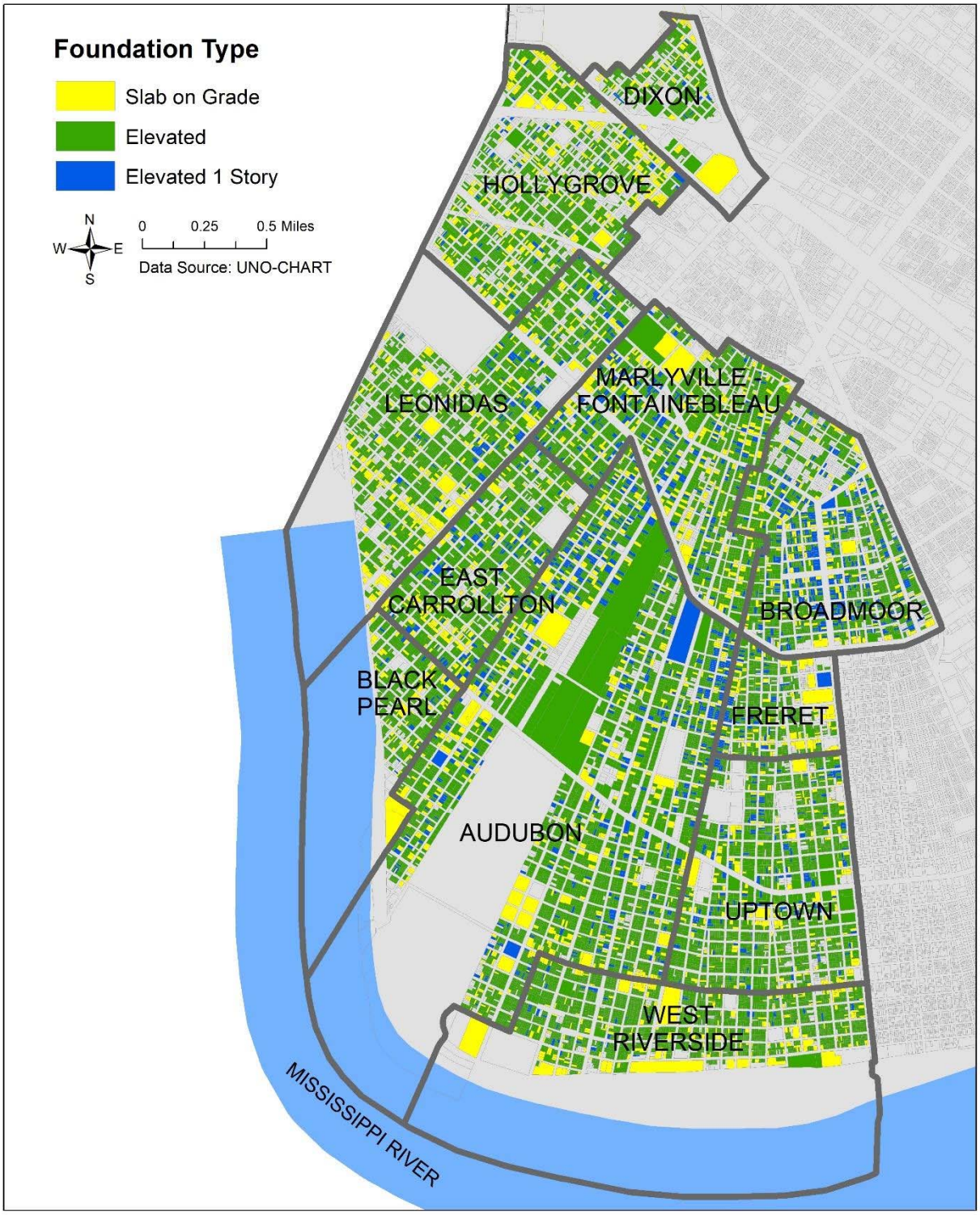


Figure 53 - Foundation Types in Uptown

Buildings in good condition are more appropriate for elevation and other building protection measures that preserve the existing structure. There are two measures of whether a building is

in good condition that were collected in the building survey: if it is occupied and if it looks in good condition from the street.

The building data in Table 30 show a strong healthy area with a very high occupancy rate (98%) and a very high number of buildings that are in good condition (also 98%). These figures are slightly higher than the City-wide numbers of 97% and 95%. The numbers are similar for all the neighborhoods.

Buildings with more than one story have a building protection measure not available to single-story structures: the owner can permanently relocate valuable items, such as the furnace and air conditioner, to the upper story, above the flood level. There is some variance here, from 16% of the building stock in Hollygrove to 62% in Audubon. The district (42%) is above the City-wide number of 30%.

The first floors of buildings on slab foundations are closer to the ground than the first floors of the elevated buildings on crawlspaces or piers and therefore apt to flood more often. Other than Hollygrove at 21%, the other ten neighborhoods range from 12% to 16%. The district total is only 14%, very low compared to the City-wide figure of 41%.

Elevated home in the Uptown district.
Photo Credit: UNO-CHART

Elevated buildings are the easiest to raise to a higher, flood protected, level. The Uptown Repetitive Loss Planning district has one of the highest percentages of elevated buildings – 58% of the buildings in the district are elevated more than three feet.

Building Protection Measures Summary

Over half of the buildings in the Uptown Repetitive Loss Planning District are considered protected from shallow, repetitive flooding because they are elevated more than three feet above grade. Two-thirds of the rest of the buildings could be protected by being elevated higher. The remaining buildings on slab foundations are likely in good shape, making building protection measures for them more viable, especially for the commercial and industrial buildings.

Recommendations

1. The roadside drainage improvement, and Green Infrastructure projects should continue.
2. Every owner of a building less than three feet above ground level should review their building protection measure alternatives.
3. Every property owner and renter in every neighborhood should:
   a. Carry a flood insurance policy regardless of their FIRM zone, and
   b. Maintain the catch basins downstream of their property.

CHAPTER 7 FINDINGS AND RECOMMENDATIONS

This repetitive loss area analysis (RLAA) reviewed the City's repetitive flood problem, relying primarily on flood insurance claims data to identify and measure the scope of the problem. Chapters 1 – 3 provide background information and explains why the analysis uses the City's existing planning districts as a framework to review the problem and mitigation measures to address the repetitive flooding. Chapters 4 and 5 provide a summary of mitigation measures available to reduce flooding across the City while Chapter 6 includes an overview of the data collected and related analysis for each of the repetitive loss planning districts. Based on previous chapters, Chapter 7 reviews the findings of this RLAA and related recommendations.

7-1 FINDINGS

The Repetitive Flood Problem

Chapter 1 reviews the flood insurance claims data. It notes that New Orleans has been flooded severely enough for flood insurance claims to be paid in every year since 1978 (when the data started being reported). A total of 124,041 claims were submitted from 1978 to 2018. In response, the National Flood Insurance Program (NFIP) paid over $7 billion for repairing and rebuilding flooded New Orleans properties. While this is a very large number, over half the claims and 94% of the $7 billion in claim payments were for damage from Hurricanes Katrina and Rita in 2005. In recent history, hurricanes that caused levee breaks have only occurred in 1964 and 2005. Therefore, they are not considered causes of repetitive flooding that would flood properties at least twice every ten years.

The floods over the last 43 years were caused by four things: levee failure, storm surge, rain, and pump failure. Levee overtopping caused by storm surge higher than the design protection level is considered storm surge and not a failure of the levee. For the areas inside the levees, almost all of the non-Katrina flooding was caused by rain.

Photo Credit: nola.com

Accordingly, this analysis focuses on the non-Katrina floods that were caused by rain. There have been 52,544 flood insurance claims for damage from these floods, totaling almost a half a billion dollars. With an average payment of $11,910 these floods are not as devastating as Katrina and Rita, but repetitive floods have significant impacts. There have been more insurance claims and payments when one considers that these figures do not include payments by private insurance policies. These figures also do not include those properties that were uninsured or those properties for which the owner chose not to file an insurance claim.

As iterated in Section 3-3, repetitive flooding causes more than damage to buildings that can be repaired with insurance claim payments. Flood events close streets (including access for commerce and emergency vehicles), threaten lives, and cause health problems. This repetitive loss area analysis focused on flooding, property damage, and property protection measures. It did not consider socio-economic factors and potential connections to level of flood protection, number of flood claims, etc. For example, is there a connection between the level of flood protection provided and the number of people living in the district?

Flood Control Measures

As noted, almost all the non-Katrina (i.e., repetitive) flooding was caused by rain falling within the leveed areas. To control such flooding requires a fully operational drainage system built to handle such heavy storms. As explained in Section 4-1, the City's drainage system has been developed over the last century. It relies on a system of storm drain inlets (catch basins), roadside pipes, and canals to collect the rainfall runoff and pump stations to convey the water over the levees and into Lake Pontchartrain or canals that lead to the Lake.

This system was originally built to carry a two-year flood or a similarly small and frequent storm. Building construction adapted to inadequate drainage in lower areas of the City (mostly in the central areas, away from the Lake and the Mississippi River). Buildings were elevated, many as much as seven or eight feet above the ground. But over the years, the drainage system improved, and new buildings were built closer to the ground, many on slab foundations. The lower levels of elevated buildings were converted to improved, livable spaces, sometimes as separate apartments.

As people's desires for less flooding increased and climate change increased storm frequency and intensity, the drainage system has had to play catch up. The SELA program, supported by the Sewerage and Water Board and the US Army Corps of Engineers, is substantially complete, resulting in increased capacity for key major canals and pump stations.

The Department of Public Works has replaced roadside pipes under a long-term program (right). Two new programs have helped the roadside system: Green Infrastructure projects are reducing the amount of water that runs into the system and the Adopt-a-Catch-Basin program improves the efficiency of the inlets and roadside pipes by reducing or eliminating blockages.

Photo Credit: https://roadwork.nola.gov/types-of-repairs

These improvements are well underway, but other than SELA, have more years of funding

and work needed before they are all fully operational. Further, they are only increasing the capacity of a two-year storm system to a ten-year system. Many of the repetitive, damage-causing floods have resulted from larger storms or concentrations of heavier rain in some locales. In other words, taken alone, the drainage system improvements will do a lot to reduce property damage, traffic obstacles, and safety and health hazards, but will not prevent flooding from larger storms.

Building Protection Measures

There is an alternative to controlling flood waters with an improved drainage system - modifying the buildings that will get flooded so they will have little or no damage. Chapter 5 reviews seven ways a building or property could incorporate flood protection, ranging from removing the building from harm's way, to elevating it above flood levels, to barriers and dry floodproofing that keep the water out, to letting the water in without causing damage, and to improving the drainage in the yard.

Photo Credit: UNO-CHART

Each measure has advantages and disadvantages. Different measures work for different kinds of buildings; Section 5-2 reviews which ones work best for different foundation types and Section 5-3 provides a simple technique to select the most appropriate measures for different buildings and flood levels. As explained in Section 5-5, some of those measures may be prohibited or otherwise impacted by regulations designed to protect new buildings from flood damage and neighboring buildings from an increased flood hazard caused by new construction.

No building protection measure is 100% guaranteed, so every property should have a flood insurance policy to pay for repairing the damage that was not prevented.

Repetitive Loss Planning Districts

As noted in Chapter 2, this analysis uses the City's existing planning districts as a framework to review the repetitive flooding problem and related mitigation alternatives. While the City has eleven such districts, the building data needed were not available for two of them, the Central Business District and the French Quarter. These districts are the two smallest, with the fewest number of repetitive loss properties, and some building types that are unique to the district. While the City is not 100% covered, the nine remaining districts account for 95% of the parcels in the City. It was concluded that given the cost of data collection, this is enough coverage to guide the City's repetitive loss policies and programs.

Five of the districts have SELA major drainage system projects that have been completed, one (Bywater) has a project underway, and three districts have no SELA projects (Lakeview, Gentilly,

and Lower Ninth Ward). However, there is a movement to have the SELA program review the capacity of the system in the Lakeview and Gentilly districts.
Every district has roadside drainage improvements planned. These are funded substantially with disaster assistance funds after Katrina. Algiers had the fewest projects (and had the least damage from Katrina flooding); these are complete. The other districts have from 14% of their roadside projects completed to 57%.

The below table is Table 3 from Section 6-1. It shows a very high occupancy rate for the City and most (95%) of the buildings are in good condition. These numbers mean that most of the buildings in the City are worth protecting using one or more of the suggested building protection measures. This applies to all nine districts.

Table 3 - Building Data by District

District	No. Buildings	Percent Occupied	Percent Good Condition	Percent >1 Story	Type of Foundation		
					Slab	Elev ≤ 3 ft	Elev > 3 ft
Algiers	14,423	99%	95%	32%	70%	15%	15%
Bywater	10,471	96%	90%	20%	19%	37%	44%
Garden District	10,040	96%	97%	43%	19%	30%	51%
Gentilly	12,836	98%	94%	21%	42%	23%	35%
Lakeview	8,973	99%	99%	49%	39%	21%	40%
Lower Ninth Ward	3,504	91%	94%	14%	25%	32%	43%
Mid-City	14,925	96%	91%	28%	19%	27%	54%
New Orleans East	21,124	95%	96%	20%	83%	7%	10%
Uptown	18,440	98%	98%	42%	14%	28%	58%
City-wide total	114,736	97%	95%	30%	41%	22%	37%

Note: The number of claims include claims submitted, but not paid.
The average and total payments are based on paid claims only.

The most important factors to determine appropriate building protection measures are the type of foundation and the depth of flooding. The foundation types are summarized in Table 3. Most buildings are slab on grade foundations in two districts: Algiers and New Orleans East. Just over half of the buildings are already elevated three feet or more above ground level in three districts - the Garden District, Mid-City, and Uptown and 37% of the buildings in the City as a whole. These are considered already protected from shallow repetitive flooding.
The depth of repetitive flooding on each building could not be collected without interviewing every property owner. Only the owner has all the information needed about the building's condition, flood depth, and desired protection level (e.g., protection to the repetitive flood level, the base flood level, or a Katrina repeat level).

7-2 RECOMMENDATIONS

In Chapter 6, the summaries for the districts without completed SELA projects recommend that they be finished. All the district summaries, except Algiers, recommend completing the roadside drainage improvements and all of the summaries recommend completing the Green Infrastructure projects.

Given the lack of complete data on every building, each of the district summaries recommends that "Every owner of a building less than three feet above ground level should review their building protection measure alternatives." It is also recommended that "Every property owner and renter in every neighborhood should: (1) Carry a flood insurance policy regardless of their FIRM zone, and (2) Maintain the catch basins downstream of their property."
These general recommendations are converted to specific action items in this section. Each action item has an office responsible for its implementation, a timetable, and the source of any needed funding.

Property Owners

One of the key findings is that the flood control measures are done or well underway, but these measures can only do so much. The real protection will come when individual owners take steps to protect their buildings – they are the ones dealing with the damage and paying insurance premiums, so they have a stake in reducing repetitive flood losses.
Based on the information found in this analysis, here are recommendations for property owners across the City of New Orleans.

1. Every owner of a building less than three feet above ground level should review the alternative building protection measures. They should start with the steps outlined in Section 5.3. Technical assistance is available from the Office of Safety and Permits at (504) 658-7100.
   Timetable: This should be done as soon as possible, but the longer one waits, the more likely there will be another flood.
   Funding: There is no cost to review the alternatives or for the technical assistance. The Office of Safety and Permits' staff are also familiar with the funding sources described in Section 7.6.

2. Every owner of a building should carry a flood insurance policy regardless of the FIRM zone. Every tenant should carry a flood insurance policy with contents coverage. Those with a policy should review it to ensure there is adequate coverage for both the structure and the contents. More information on National Flood Insurance Program policies can be found at https://www.floodsmart.gov. Local insurance agents have information and can sell both NFIP and private flood insurance coverage.

Timetable: This should be done as soon as possible, but the longer one waits, the more likely there will be another flood. There is also a 30 day waiting period for most NFIP policies to take effect.
Funding: There are no grant programs to pay for a flood insurance policy. However, a property owner can shop around for the best prices among NFIP and private policies. An NFIP policy will also be less expensive if the building is elevated.

Residents and Businesses

3. Every resident and business in the City should maintain the catch basin(s) that drains their property. It is recommended that people commit to this work by registering to Adopt-a-Catch Basin. The latest information can be found at https://catchbasin.nola.gov.
   Timetable: This should be done as soon as possible, but the longer one waits, the more likely there will be another flood.
   Funding: Funding should not be needed as this is volunteer work for residents and business owners.

Office of Homeland Security and Emergency Preparedness/ Office of Mitigation

4. Establish a building protection website. Help property owners by providing a website with the building data from CHART's survey work and the process to determine the best building protection measure(s) for a property. Ideally, property owners would be able to access data collected on their properties, update or correct the data, and be led through the step by step process described in Section 5.3. Examples of each type of measure could be included along with links to technical assistance and sites with information on financial assistance.
   Timetable: Have the site up and running within six months of adoption of this plan.
   Funding: The work would be done as a staff assignment, so no special funding would be needed.

5. Conduct an annual evaluation of the progress of implementing these recommendations. Include progress updates in the Hazard Mitigation Annual Report and future Hazard Mitigation Plan Updates. Include recommendations for action items that are behind schedule.
   Timetable: Prepare the annual evaluation by July 1 each year. The CRS recertification package is due by August 1 each year. Prepare an update of this repetitive loss area analysis in accordance with CRS criteria (which is expected to change with the next *CRS Coordinator's Manual*).
   Funding: The work would be done as a staff assignment, so no special funding would be needed.

6. Share findings of this analysis with the Mayor's Office of Human Rights and Equity (OHRE) and include OHRE staff in the evaluation process. This analysis mentions but does not investigate the possibility of socio-economic disparities among the districts. OHRE could

provide input that would make implementation of these recommendations more equitable and effective.

Timetable: Share findings within six months of final draft and review annually.

Funding: The work would be done as a staff assignment; no additional funding would be needed.

Office of Safety and Permits

7. Continue to provide property protection technical assistance to property owners, residents, and businesses. Respond to inquiries as needed. Ensure that this service continues to meet the credit criteria for CRS Activity 360 (Flood Protection Assistance).
   Timetable: Ongoing
   Funding: The work is being done as a staff assignment, so no special funding is needed.

8. Partner with the Office of Neighborhood Engagement to share information with residents on technical assistance available.
   Timetable: Ongoing
   Funding: The work is being done as a staff assignment, so no special funding is needed.

9. Maintain the database with FEMA's repetitive loss list and update it as information becomes available that a building has been mitigated.
   Timetable: Ongoing. Submit update information with each annual CRS recertification package.
   Funding: The work would be done as a staff assignment, so no special funding would be needed.

Department of Public Works

10. Continue the roadside drainage improvements.
    Timetable: Ongoing
    Funding: The work is funded with grant money as explained in Section 6-2 and through the City's annual budgeting process.

11. Continue the Adopt-a-Catch Basin program. Assist neighborhood associations with informational materials and training sessions for their residents (see Recommendation 14).
    Timetable: Ongoing
    Funding: The work is done as a staff assignment, funded through the City's annual budgeting process.

Sewerage and Water Board

12. Complete the remaining SELA projects. The General De Gaulle, Donner, and Nolan Canals, feeder canals, and Drainage Pump Station #13 needs to be completed in Algiers and the Florida Avenue Canal should be completed in Bywater. These are the last two projects in the original list of SELA projects and both have been started.
    Timetable: Underway
    Funding: The work is funded with Corps of Engineers funds with the City's share budgeted each year.

13. Evaluate the drainage capacities in Lakeview and Gentilly. This work would not only help properties in these two districts, but they will also help properties in the districts to the south that depend on the Lakeview and Gentilly pump stations to drain their stormwater. An evaluation would identify any projects that would be needed in the future.
    Timetable: Determine the feasibility of such an evaluation within one year. Then pursue funding as needed.
    Funding: Hopefully, most of the work would qualify as a SELA project that could be funded with Corps of Engineers funds. The City's share would need to be budgeted each year.

Mayor's Neighborhood Engagement Office / Neighborhood Associations

14. Help property owners by promoting the services provided by the City, especially the technical assistance on selecting property protection measures. The Office of Safety and Permits could provide public information materials that could be used in association newsletters, websites, flyers, etc.
    Timetable: Share information with residents within 12 months and thereafter, on an annual basis.
    Funding: The work would be done by the Mayor's Neighborhood Engagement Office in coordination with each association's office or volunteers.

15. Promote or coordinate the Adopt-a-Catch Basin program in the neighborhood. Options can range from publicizing the program in the neighborhood newsletter or website to assigning catch basins to particular property owners to organizing teams to inspect and clean the catch basins in an area. The Department of Public Works can schedule a training session or a drain cleaning event in the association's area.

16. Send the project(s) with the Offices of Safety and Permits and Neighborhood Engagement to share with other associations.
    Timetable: Do the first project within 12 months.
    Funding: The work would be done by each association's office or volunteers, so no special funding is needed.

APPENDIX

I. FLOOD FLYER (FRONT AND BACK)

Protect yourself from Flooding

The reality in New Orleans is that everyone is at risk and a Katrina could happen again. The City, the U.S. Army Corps of Engineers, and others are working to reduce this risk, but you can take actions to protect yourself. Here are some ideas:

1. Know your flood risk. We have two kinds of flooding. The more common is caused by heavy rain that falls within the levee. Sometimes the storm is so heavy, we cannot collect the stormwater and pump it out fast enough, so streets and lower lying areas are flooded. The areas most affected are shown on the Flood Insurance Rate Maps.

   For info on historic flood levels, high water marks, or to schedule a site visit please contact: Safety & Permits at (504) 658-7130. To view the Flood Insurance Rate Maps, see http://maps.lsuagcenter.com/floodmaps/

   The other kind of flooding is caused by deep flooding on the Mississippi River, the Gulf of Mexico, or Lake Pontchartrain. This will flood areas outside the levee. It is also possible that the flooding will overtop or cause the levee to fail, as it did in 2005. This kind of flooding affects everyone, especially those who do not evacuate when a hurricane or flood watch or warning is issued.

2. Know when a flood is coming. You can stay posted on flooding conditions by tuning to local radio stations 870 AM and 105.3 FM. In the event of an emergency, City officials also may interrupt Local Television News Stations and Cox Cable services to disseminate important information.

   A better way to learn of possible flooding and other hazards is to receive emergency alerts directly from the City through its alert notification system at ready nola.gov. This free service allows you to receive information about emergencies in your zip code, by email or text message. You can also register by texting your Zip Code to 888777. Message and data rates may apply.

3. Know what to do when it floods. Put together a plan for what your family will do when there is a flood, tropical storm, or hurricane warning. If the threat is severe enough, emergency officials may advise you to evacuate the City. You can get ideas for an emergency plan and information on evacuation routes at http://ready.nola.gov/home/.

   No matter what kind of flooding you face, remember "Turn around, don't drown." Do not drive through flooded areas – more people are killed by floods in their vehicles than anywhere else.

4. Protect your property. There are several different ways to protect a building from flood damage. They range from very inexpensive measures, such as re-grading your yard to drain away from the building to elevating the entire house. See how you can retrofit your property at the University of New Orleans' Flood Help website, http://floodhelp.uno.edu.

5. Insure your property. Contact your property insurance agent and ask about flood insurance. In New Orleans, even properties located outside of the Special Flood Hazard on the Flood Insurance Rate Map should be insured for flood. Flood insurance can be a good investment because most homeowner's insurance policies do not cover damage caused by flooding. Do not wait – there is a 30 day wait for a flood policy to become effective.

6. Follow the construction rules. Check with the Department of Safety and Permits before you build on, alter, regrade or fill on your property. We are at (504) 658-7130 or 1300 Perdido St., Room 7E05. You may need a permit to ensure that a project is compliant with all regulations. These regulations are designed to protect your property from flood damage and to make sure you do not cause a water problem for your neighbors.

7. Keep our canals clear. Per City ordinances, it is illegal to dump debris in canals. Debris blocks the flow of water and can damage our pumps. Please contact the Sewage and Water Board (504) 529-2837 or (504) 52-WATER whenever you see debris or someone dumping into a drain or drainage canal.

Building Flood Protection Analysis

The City has asked the University of New Orleans' Center for Hazards Assessment, Response and Technology (UNO-CHART) to conduct a study that looks at all of the buildings in the City. The purpose of this study is to get a better understanding of how well the buildings may be protected from flooding.

The study will review photographs of homes and businesses taken from the street. In some cases, such as where the view is blocked, there will be some field checks. No one will enter on private property as part of this work. Therefore, the information collected will not be detailed, but it will present summary data for over 90,000 buildings and will help the city set policies and programs to help owners protect their properties.

The information will be available online when the study is completed. You will be able to look up your property and gain some ideas of what could be done.

To improve the study data, we are asking for your help. If you can, please go to www.nola.gov/floodstudy and provide the requested information for your property.

After the study is completed, a preliminary report will be posted on the same website and explained at a series of public meetings. The meeting time and location will be announced once the team's analysis is near completion. We will also ask for comments on the report and its recommendations.

If you have any questions about this project, please feel free to call the *Office of Homeland Security and Emergency Preparedness/Hazard Mitigation Administrator*, at (504) 658-8740, or if you want to speak to a member of the research team, call UNO-CHART at (504) 280-5760.

This insert is being mailed courtesy of the Sewerage & Water Board of New Orleans

II. SURVEY QUESTIONS

City of New Orleans Repetitive Loss Area Analysis

The City of New Orleans has partnered with the University of New Orleans' Center for Hazards Assessment, Response and Technology (UNO-CHART) to conduct a study that looks at all the buildings in the City. The purpose of this study is to get a better understanding of how well they may be protected from flooding.

To improve the study and provide better data, please complete the data sheet below. Any information you can provide would be greatly appreciated.

If you have any questions about the study, please email chart@uno.edu.

1. Please share your address so we can add to or correct the data on your property.
2. In what year did you move to this address?
3. What type of building is located at this address?
4. What type of foundation does your house have?
5. If your house has blocks, crawlspace or post/piles foundation, please estimate roughly how high from the ground your lowest floor of living space is.
6. Has the property ever flooded?
7. If your property flooded, what was the longest time that the water stayed over the first floor?
8. What do you think caused your property to flood? Check all that apply.
9. Have you taken any flood protection measures on your property? Check all that apply.
10. Did any of the above measures work?
11. If so, which ones?
12. Do you currently have flood insurance?
13. Please include any comments you may have about flooding in your area or your interests in flood protection for your property:
14. Are you interested in pursuing measures to protect the property from flooding? Please refer to floodhelp.uno.edu or email chart@uno.edu, or share your contact information below:

A link to the survey can be found at https://nola.gov/hazard-mitigation/flood-risk-analysis/.

III. INDIVIDUAL PROPERTY DATA

Discussion of flood decision matrix.

Table 7 - Building Protection Selection Matrix

Building Type and Walls	Flood Depth[1]	Recommendation[2]						
		Reconstruction	Elevation	Barriers	Dry floodproofing	Wet floodproofing[3]	Flood insurance	Yard improvements
Dilapidated building	N/A	1					✓	✓
Slab-on-grade, stucco, block, or masonry walls	> 2'	2	1				✓	✓
	≤ 2'	4	3	1	2		✓	✓
Slab-on-grade, other types of walls	> 2'	2	1				✓	✓
	≤ 2'	3	2	1			✓	✓
Elevated foundation, lowest habitable floor more than three feet above ground level	N/A					1	✓	✓
Elevated foundation or crawlspace with vents, lowest habitable floor higher than past repetitive flood levels	N/A					1	✓	✓
Elevated foundation or crawlspace with vents, lowest habitable floor below past repetitive flood levels	N/A	3	1			2	✓	✓
Raised basement, stucco, block, or masonry walls	> 2'	3	2			1	✓	✓
	≤ 2'	5	4	1	2	3	✓	✓
Raised basement, other types of walls	> 2'	3	2			1	✓	✓
	≤ 2'	4	3	1		2	✓	✓
Large building	N/A	Requires individual on-site evaluation					✓	✓
Lowest floor below grade	N/A						✓	✓

4. "Flood depth" is the depth of past repetitive floods above the lowest habitable floor. ">2'" means that highest flood (other than Hurricane Katrina) was more than 2 feet over the lowest habitable floor (see Table 7 on locating that floor). Owners interested in protecting their buildings from a deep flood, such as Katrina, should elevate their building one or more feet above the Katrina level at the site.
5. Numbers under "Recommendation" are 1st choice, 2nd choice, etc.
6. Wet floodproofing measures are recommended for crawlspaces and other enclosed areas below an elevated floor. They include removing all damageable items and installing openings to allow flood waters into the enclosed area to equalize water pressures.

IV. TRAINING PROCESS & QUESTIONS

CHART trained 20 UNO students to grade properties on the Repetitive Loss Area Analysis project. The preliminary training sections generally include 1-hour slide deck presentation covering the 13 questions asked on the grading application. Afterward, there was a 30 minute exercise section for the students to practice grading the properties on the test grading application. Additional training sections were conducted to address QC/QA issues that arise during the grading of different Repetitive Loss Planning districts.

Grading Questions:

- Is there a structure on the property (yes, no or maybe)? Structures are building that have enclosed walls with a roof and has the foundation connected to the ground.
- Is the structure occupied (yes, no or maybe)? An occupied structure is being used for residential, commercial, industrial, and institutional proposes.
- How many stories (1 and higher)? Raised basement and attic does not count as a story.
- What is the foundation type (below grade, slab on grade, crawlspace, or raised?
- What is the EC Diagram Number (1A, 1B, 2A, 2B, 3, 4, 5, 6, 7, or 8/9)?
- What is the foundation condition (Poor, Fair, Good, NA)? Poor condition is when the foundation is damage to the point of being unsafe. Good is the default condition due to the limited images of the building.
- How many steps to the front door (1-15)? A step is 7 inches or higher. Only count steps of the structure and not site steps.
- What is the building walls construction materials (stucco, wood/vinyl, cinderblock/masonry/brick, brick faced, or other)?
- What is the ground elevation (minimum or maximum)? Minimum elevation site is relatively flat. Maximum elevation site has the building siting on raised site. Look for site steps that lead to the building.
- Is the HVAC visible (yes or no)?
- If so, how high is it (at grade, at or above 1st floor, in window, or other)?
- Comment? This is where the data collectors can add important relevant information.

- Need Follow up (yes or no)? If any of the questions cannot be answered, a yes answer will be mark for the property to be regraded again in the QC/QA process.

V. QUALITY CONTROL/ASSESSMENT PROCESS

The quality control and assessment process included technical activities performed weekly, not just to minimize grading errors, but also to measure the effectiveness of the grading procedures. Additionally, the quality control and assessment data are used to take appropriate corrective actions, which can minimize future grading errors. The quality control and assessment process established techniques to determine if the grading procedure produced acceptable data and identified proactive actions to correct unacceptable grading performance. These techniques resulted in the reliability and validity of the data collection conducted as part of the Repetitive Loss Area Analysis.

Quality Control: The internal quality control process involved collecting property data and also evaluated the data in order to take corrective action. The process included the following:

- The progress reports of the graded properties from the previous week were downloaded from emails sent by James B. Raash of the Information Technology & Innovation Office at the City of New Orleans.
- The grading progress reports were not organized by chronological grading order or by district location. Therefore, the grading data first needed to be reorganized by the data collector, district, and time of data collection.
- By using Excel formulas, the grading data were sorted and matched to see if cells were unfilled, and if the foundation type, EC diagram number, and steps to the front door all accurately correlated with each other.
- The formulas are pasted on a separate cell column at the end of each property cell roll.

  Formula examples:

  {=VLOOKUP(B2,'chart_answers (Dec 10-16).csv'!$B:$P,15,FALSE)}

  {=MATCH(TRUE,IF(Left(F2:G2) <> "N",TRUE)}
- The errors were highlighted in yellow.

Quality Assessment: The blind quality assessment process evaluated every 50 entries in order to sample the accuracy of the data collection. The assessor examined all of the data collected on the individual properties. This objective assessment helped to identify errors that might not have been noticed in the quality control process. The assessment included the following:

- The parcel GEOPIN was used to find the property address from the City of New Orleans Property Viewer website by referencing the GEOPIN in the URL address bar (e.g., http://property.nola.gov/?geopin=41091229). The site address was displayed under property information.
- The address was searched on multiple websites to find property images and information.
  - Websites:
  - Google Maps (www.google.com/maps)
  - City of New Orleans Property Viewer (www.property.nola.gov)
  - Orleans Parish Assessor's Office (www.qpublic.net/la/orleans)
  - Bing Maps (www.bing.com/maps)
- The data were evaluated to see if they are correct.
- The errors were highlighted in blue.

- The assessor then sent the data spreadsheets to the project manager, who examined every 10 of the 50 sample entries for errors. The project manager then communicated any issues found with the assessor.

Error Data Management: The quality control and assessment error entries were compiled in a separate spreadsheet and emailed to James B. Raash. These error entries were blanked out and regraded periodically.

Corrective Action: The quality control and assessment processes found repetitive errors which led to corrective actions. This ensured that future grading was performed more consistently and without previous errors.

- The error data management procedure helped to distinguish technical/mechanical errors, random errors and systematic errors. Technical/mechanical errors were made when the online data collection application showed images of properties that did not match the indicated GEOPIN property on the map. Random errors were made accidentally by the data collectors and have no pattern. Examples of random errors were designating the wrong building walls construction materials or the number of steps due to the low quality of property images. Systematic errors were consistent mistakes made by the collector's inaccurate understanding of the grading criteria. Examples of systematic errors included when the collector did not understand the difference between EC diagram numbers 5 and 6.
- The assessor worked with the data collectors to find the sources of these errors and reduce the errors in future grading.
- The assessor provided further training, including guide sheets and graphic diagrams for the data collectors to use. Examples of these diagrams are found below.

VI. FOUNDATION TYPE EC DIAGRAM