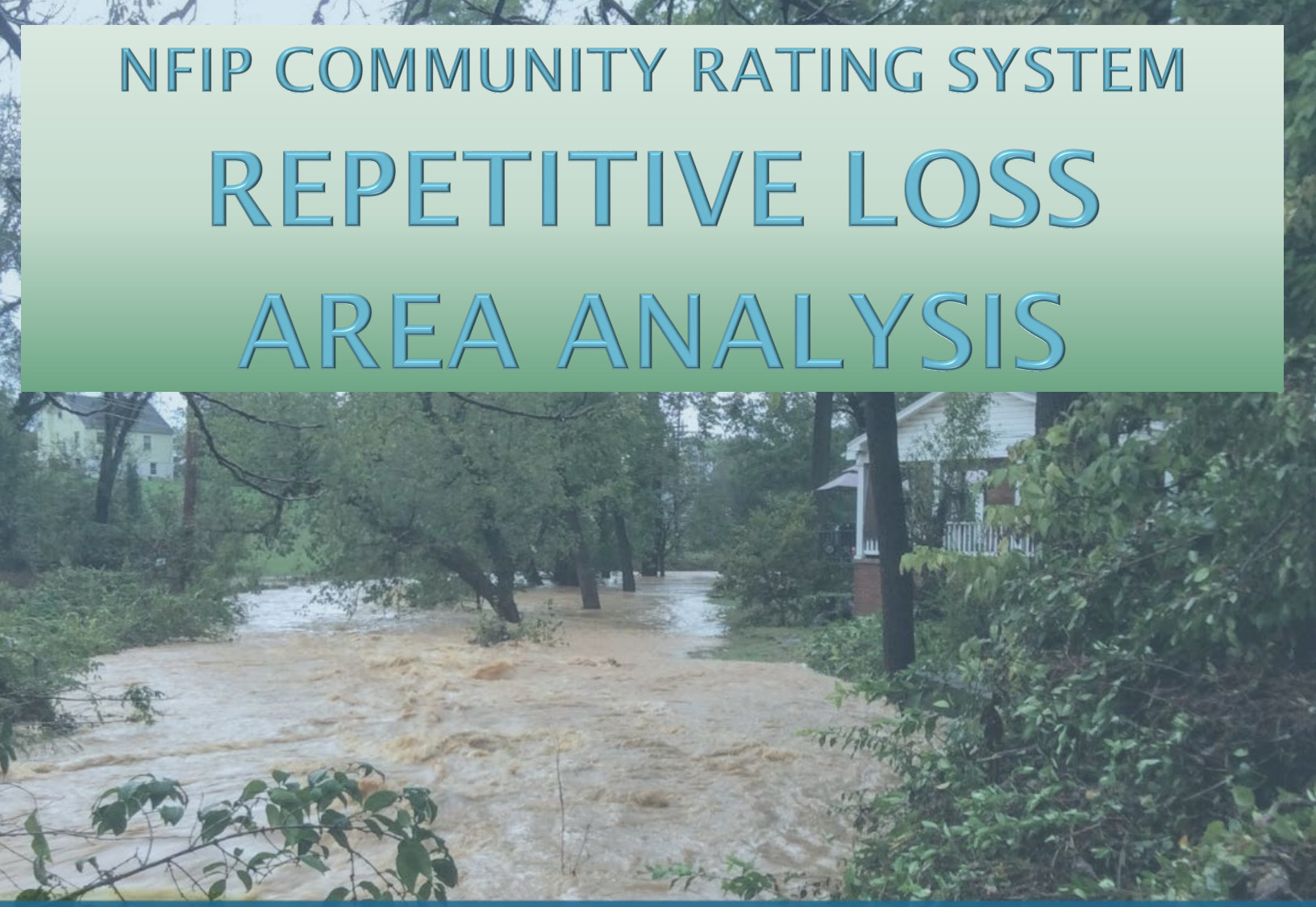
NFIP COMMUNITY RATING SYSTEM

REPETITIVE LOSS AREA ANALYSIS



Protect the life you've built.

2021

City of Roanoke
Stormwater Division
1802 Courtland Road, NE
Roanoke, VA 24012

ROANOKE
STORMWATER

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What is a Repetitive Loss Area Analysis?

Background

The City of Roanoke participates in the National Flood Insurance Program (NFIP). The NFIP is a Federal program to mitigate flood losses through sound, community-based building and zoning ordinances and to provide access to affordable, federally backed flood insurance protection for property owners.

Flooding is the most common natural hazard in the United States and causes more damage and deaths than most other natural hazards combined. This is also the most common natural disaster in the Roanoke Valley. The Flood of 1985 is the flood of record and what many flooding events are measured against.

However, smaller floods also contribute to the nation's and to localities' repetitive flood problems. Often called "nuisance flooding," these low-level floods can be the result of inadequate drainage or localized stormwater problems such as ponding of water, poor drainage, clogged culverts or drains, obstructed drainage ways, sewer backup, overbank flow from a ditch or small stream, or even from a homeowner's filling in a drainage swale. For many repetitively flooded properties, these smaller floods represent most or all of the flood insurance claims paid on a building.

The City is committed to protecting citizens and their property from floods, as well as taking actions that reduce flood insurance rates for citizens. As such, the City participates in the voluntary Community Rating System (CRS) Program. Participation in this additional NFIP Program gives citizens discounts on flood insurance premiums. The City of Roanoke is currently a class 7 in the CRS Program, which provides a 15% discount on flood insurance premiums for properties in Special Flood Hazard Area (SFHA) and a 5% premium reduction in Non-SFHA for City residents. This discount should be itemized on your flood insurance invoice if you have purchased flood insurance.

Purpose

A Repetitive Loss Area Analysis (RLAA) is a mitigation plan for areas that have or are expected to experience repeated losses from flooding. During this analysis, detailed building information is collected through desktop analysis and field visits to develop an understanding of the exact causes of repetitive flood damage at those sites.

The repetitive loss analysis will evaluate the following property level data elements:

- Property Card Report from the City's Office of Real Estate Valuation
- Building permit records for mitigation projects
- Structure and site elevation information (elevation certificates if available)

- City construction and maintenance projects related to storm drainage and flooding
- Potential projects identified in City Watershed Master Plans
- Building code / floodplain development regulations when suggesting mitigation projects
- Historical flood event information (when events occurred, amount of damage to property, etc.)

The goal of this effort is to provide options for mitigation tailored to each repetitive loss area that could include small projects to be undertaken by homeowners or larger projects that the City could apply for grant funding to implement; as sometimes mitigation projects require a collective effort from local, state, and federal agencies to implement. The results of the repetitive loss analysis will include a review of potential approaches for property protection measures and drainage improvements where feasible.

How is Repetitive Loss defined?

Under the National Flood Insurance Program's Community Rating System, a repetitive loss property is any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period since 1978 (the year at which consistent claims data collection began).

For example, a building with paid NFIP claims of more than $1,000 in 1979 and again in 1980 is considered a repetitive loss property until that building's flood problem is mitigated. However, a building with paid NFIP claims of more than $1,000 in 1994 and again in 2013 would not be a repetitive loss property since more than 10 years elapsed between the first and second losses.

Severe repetitive loss (SRL) properties are another class of repetitive loss. These properties, defined under the 2004 Flood Insurance Reform Act, are those buildings that either have four or more claims of $5,000 or more, or have at least two claims that cumulatively exceed the building's value.

FEMA is required by the Act to define SRL properties for multi-family buildings. This subset of SRL properties also includes non-residential buildings that meet the same criteria as for 1–4 family properties. The flood insurance on these properties is serviced by FEMA through a Special Direct Facility and not by individual Write Your Own insurance companies.

A repetitive loss designation runs with a building even if ownership of the building changes. The repetitive loss designation for a building will remain on a community's list even after the insurance policy has lapsed, has been terminated, or the building's risk has been mitigated.

The City of Roanoke's Repetitive Loss List

The City of Roanoke maintains and updates its repetitive loss data annually. Maintaining this data helps our community accurately identify the repetitive flooding problems and appropriate mitigation measures. At a minimum, data includes the property address, dates of claims, amount of each claim, and the current insured and/or previous owner's name.

The Repetitive Loss list is protected by the Privacy Act of 1974. All information on the Repetitive Loss list is kept confidential. For this reason, this report will cover *Repetitive Loss Areas,* which consist of multiple properties and there are no Privacy Act restrictions on publishing aggregate data. A property owner may be included in a Repetitive Loss Area but has never experienced flooding.

Although most repetitive loss properties are in the Special Flood Hazard Area (SFHA) or floodplain, a property can be susceptible to localized flooding or drainage issues that cause water damage and result in flood claims.

The Required Steps to Conducting, Adopting, and Evaluating a Repetitive Loss Area Analysis

The RLLA is a five step planning process. The following steps outline the requirements for the RLLA.

Step One: Contact property owners.
Notify all properties in the identified repetitive loss area(s) that a project is beginning that will investigate flood damage and recommend mitigation solutions. Property owner's participation in analyzing hazards and recommending solutions is essential. For this reason, a survey was included in the letter mailed to all owners and/or residents included in the Repetitive Loss Areas.

Letters were mailed on 5.25.21 to all property owners as well as the physical address of those properties that appear to be rental properties. A survey was included for residents and/or owners to fill out with specific information that may be helpful to the Floodplain Manager. Twenty nine completed surveys were received by the 6.30.21 deadline. Samples of the letter and the survey are enclosed in Appendix A.

Step 2. Contact other agencies.
Agencies and organizations that have plans, studies, or reports that may discuss the causes of flooding must be contacted during the planning process, whether they are outside the community or within it. Each agency, organization, or department must be cited in the analysis along with the type of information utilized.

The following federal, state, and local agencies and organizations were used to collect data for the RLAA. This list includes the data that was used in this RLLA from each agency.

- FEMA - FIRM Floodplain Maps and Flood Insurance Study
- FEMA - Repetitive Loss Data
- CDC - Vulnerability Index Score Website and associated shapefile data
- Virginia Department of Housing and Community Development (DHCD) - Opportunity Zones
- United States Census Bureau – Census Block Data
- Roanoke Alleghany Regional Commission - Hazard Mitigation Plan
- Community Rating System - Repetitive Loss Area Analysis Resources
- Stormwater Utility - Capital Improvement Projects
- Stormwater Utility - Watershed Master Plan Proposed Projects
- Stormwater Utility - Floodway Buildings Mapping layer
- City of Roanoke - Real Estate GIS Map and Data layers
- ESP Associates, Inc. – Roanoke River LOMR – Floodplain Depths, Inundation Mapping Tools
- DCR - Virginia Community Flood Preparedness Fund Grant Program

Step 3. Collect data.

Each building in the repetitive loss area must be visited to collect data and make a preliminary determination of repetitive flooding and appropriate mitigation measures. At the building site, numerous factors should be investigated, including but not limited to drainage patterns around the building, location and elevation of the HVAC unit, and the condition of the structure, the foundation, the gutters and downspouts, and nearby drainage ditches and storm drains.

Desktop analysis includes looking at elevation and topography, capital improvement projects, base flood elevations & flood depths, floodway buildings, and vulnerability index scores, etc.

Step 4. Consider mitigation alternatives.

This step requires matching the correct mitigation measure with the flooding problem, based on the data collected and the field visits. Many mitigation measures are available, and multiple options should be considered.

There are six FEMA Mitigation Categories:

1. **Preventative** activities keep things from getting worse. Planning, land acquisition or regulations put in place to reduce development in flood-prone areas. Examples of non-structural preventative projects may include:
    - More accurate floodplain mapping using LiDAR and including development of depth grids

- Increased floodplain regulations that manage what can and cannot be done in the SFHA
- More stringent building code requirements to protect buildings
- Creating open space areas within areas subject to flood damage to reduce potential for additional damage
- Changes to the planning and zoning requirements which could include low density zoning requirements in the floodplain
- Maintaining the drainage system to ensure there are no obstructions to the flow
- Implementing stormwater management regulations to reduce post-development runoff from building sites
- Develop setback requirements

2. **Property Protection** activities are most often undertaken by property owners on a particular building or can be led by a community on behalf of a property owner(s). Examples of non-structural property protection projects include:
    - Promotion of flood insurance across the community to make sure those in repetitively flooded buildings in B, C and X-Zones also carry insurance.
    - Encourage acquisition and/or relocation of a building to eliminate damage from flooding.
    - Elevate pre-FIRM buildings to at or above the base flood elevation plus any freeboard.
    - Combined storm and sanitary sewers may require that sewer backup protection measures be implemented.
    - Retrofitting a building can eliminate low level repetitive flooding.
    - Elevate damage-prone components, such as the furnace or air conditioning unit.
    - Dry flood proof the building so water cannot get into it.
    - Wet flood proof portions of the building so water won't cause damage.
    - Construct a berm or redirect drainage away from the building.
    - Maintain nearby streams, ditches, and storm drains so debris does not obstruct them.
    - Correct sewer backup problems.

3. **Natural Resource Protection** activities may not directly affect a building that is subject to repetitive flooding, but these measures can help areas by protecting lands from development and keeping property in a natural state. Examples of non-structural natural resource protection projects include:
    - Preserving natural areas, open space, or restoring areas to a natural state can benefit the quality of a community or local neighborhood.
    - Protecting wetlands will allow additional storage of floodwaters and provide a recharge of the aquifer system.

- Protecting streams and the Roanoke River by preserving and restoring riparian buffer and enforce the River and Creek Corridor Overlay and modify as applicable for new and redeveloped areas to protect from stream bank erosion, provide for natural resource function, and protect biological habitat.

4. **Structural Projects** keep floodwaters away from buildings or an area through a variety of large-scale mitigation projects. These projects are usually undertaken by the local, state, or federal governments or a combination of government entities and not by property owners. Examples of structural projects include:
    - Building a levee or floodwall between a water course and the area to be protected.
    - Modifications to channels can bring about reduced flood damage.
    - Reservoirs hold water back for a period of time. Floodwaters are stored behind a dam or in a storage or detention basin. Floodwaters can be stored for some time, then released slowly so that the stream or river can handle the flow.
    - A diversion is a new channel or pipe that moves flood waters away from an existing problem to a new area where there is less of an impact.
    - Drainage improvements often are described in a local capital improvement program.

5. **Public Information** activities will not fix the flood problem, but will help to educate property owners about the causes of repetitive flooding and ways they can protect their buildings from damage. These activities are usually undertaken by the local government, but can also be implemented by a regional planning agency, water management district, or other entity. Examples of public information activities include:
    - Conducting outreach projects including mailings to all properties in the repetitive loss area encouraging the purchase of flood insurance and discussing property protection measures along with sources of financial assistance and where to go to get help.
    - Enhancing a community's website to provide departmental assistance for property protection advice and assistance.
    - Working with the real estate community to develop a disclosure program for flooding either by encouraging the use of a local GIS system (which identifies if a building is in the SFHA or is in an area that is subject to flooding) or by working with the Multiple Listing Service (MLS) to promote disclosure of the flood hazard on MLS forms.

6. **Emergency Services** measures are more for response and recovery than for mitigation; however, having a fully operational flood threat recognition system and warning system can protect residents and prepare them to make modifications to their building or to encourage action to move their belongings to a higher level or safer location.

Step 5. Document the findings.

The findings of the analyses must be documented and a report must be developed for each repetitive loss area. This report is made available to the public. Each report must include:

- A summary of the planning process that was followed, including how the property owners were involved
- A problem statement of the flood problem with a map of the affected area. The map may show individual properties or parcels, but cannot show which ones are on FEMA's repetitive loss list.
- A list or table showing information for each building without property identifiers.
- A description of the alternative mitigation measures that were considered for the repetitive loss area. A comprehensive review must include evaluating the flood protection measures in the sources listed above.
- An action plan for the selected mitigation measures that indicates
    - Who or what agency is responsible for implementation
    - When the project will be implemented (date, duration, after the next flood, etc.)
    - How the project will be funded (operating budget, after grant funding is received, etc.)

The RLAA draft should be made available to affected property owners for review and comment. After comments are received and revisions are incorporated, the RLAA must be adopted by the local governing body.

Step 6. Approval by City Council

A resolution is the appropriate method of adoption.

Step 7. Annual Evaluation

The repetitive loss list should be retrieved from FEMA to provide necessary updates to repetitive loss areas. The evaluation report must review each action item or project by indicating whether a project has been implemented and if there are any recommended changes.

- The report must review each action item (project) by indicating whether the project has been implemented and recommend changes to action item as appropriate.
- Only one report is required to cover some or all of the area analyses that were prepared.
- The report must be made available to the media, the public, and to all properties (owners and residents) of the repetitive loss areas.
- The report must be submitted with the community's annual recertification.
    - The update will review the flooding and building conditions as well as any changes to FEMA's repetitive loss list or any other circumstances that have changed. This may require that the repetitive loss mapping and projects are updated or revised accordingly.

- The update will be an addendum to the existing report unless significantly new information is available that necessitates a new report.
- An annual evaluation report that reviews and updates the five planning steps may qualify as the area analysis update.
- The update can qualify as the annual evaluation report for the year in which it was prepared.
- The update must be made available to the media and the public, especially to all properties (owners and residents) in all of the repetitive loss areas.

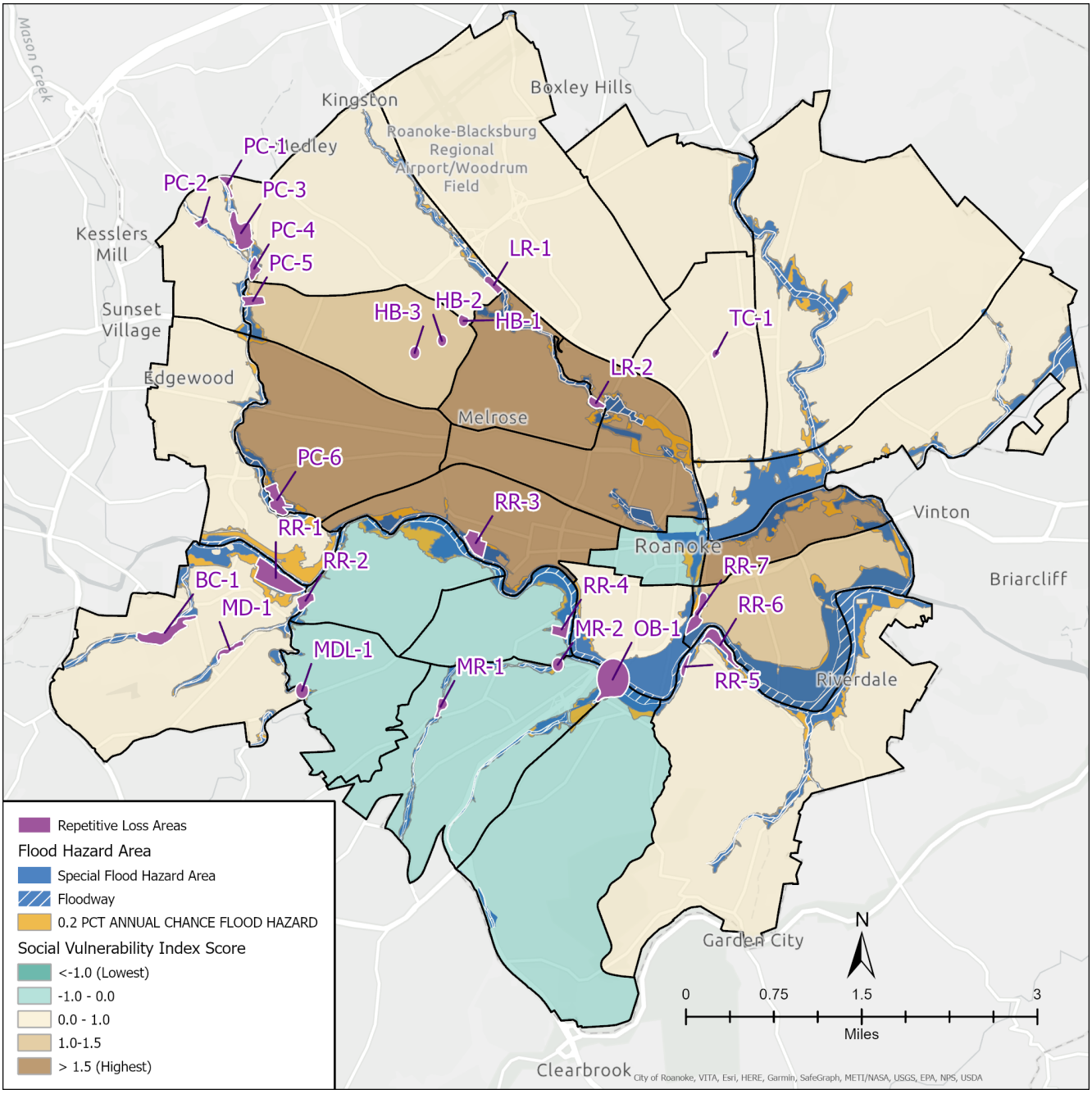
Other Study Considerations

Equity

The City of Roanoke's Comprehensive Plan places an emphasis on equity and evaluating city programs and policies for equitable treatment of citizens and removal of barriers that may inhibit the ability of our citizens to be successful in life. The City's annual budgeting process places further emphasis on how city programs can help communities of color, low income individuals, and neighborhoods. For the purpose of this RLAA, the Center for Disease Control and Preventions' (CDC's) Social Vulnerability Index was used to identify communities that may face challenges when it comes to resilience and the ability to overcome and thrive when confronted with stresses that can be caused by natural or human-made disasters. Taking measures to reduce a community's vulnerability can decrease both human suffering and economic losses.

The CDC Social Vulnerability Index is based on US Census Data and uses 15 different criteria to create a community's score. The factors used include elements of socioeconomic status, household composition, disability status, minority status, primary language spoken, housing type, and access to private & public transportation. The City as a whole is identified by the CDC as a vulnerable community. The scores can also be assessed by Census Tract, which shows some communities in the City as highly socially vulnerable and others as not vulnerable. These scores are being used by the City of Roanoke as an initial metric to assess the socioeconomic vulnerability of populations in repetitive loss areas and as a potential assessment tool to help prioritize efforts to reduce overall flood risk.

The following map includes all the individual Repetitive Loss Areas, a map of the SFHA (or floodplain), and the CDC's Social Vulnerability Index. Neighborhoods that are less socially vulnerable are depicted in blue-green with scores of a negative one. Areas increasing in vulnerability are listed in tan to brown with the most vulnerable communities having scores of greater than 1.5.



More information can be found online at:
https://www.atsdr.cdc.gov/placeandhealth/svi/fact_sheet/fact_sheet.html

Identifying and Evaluating Capital Projects at the Watershed Level

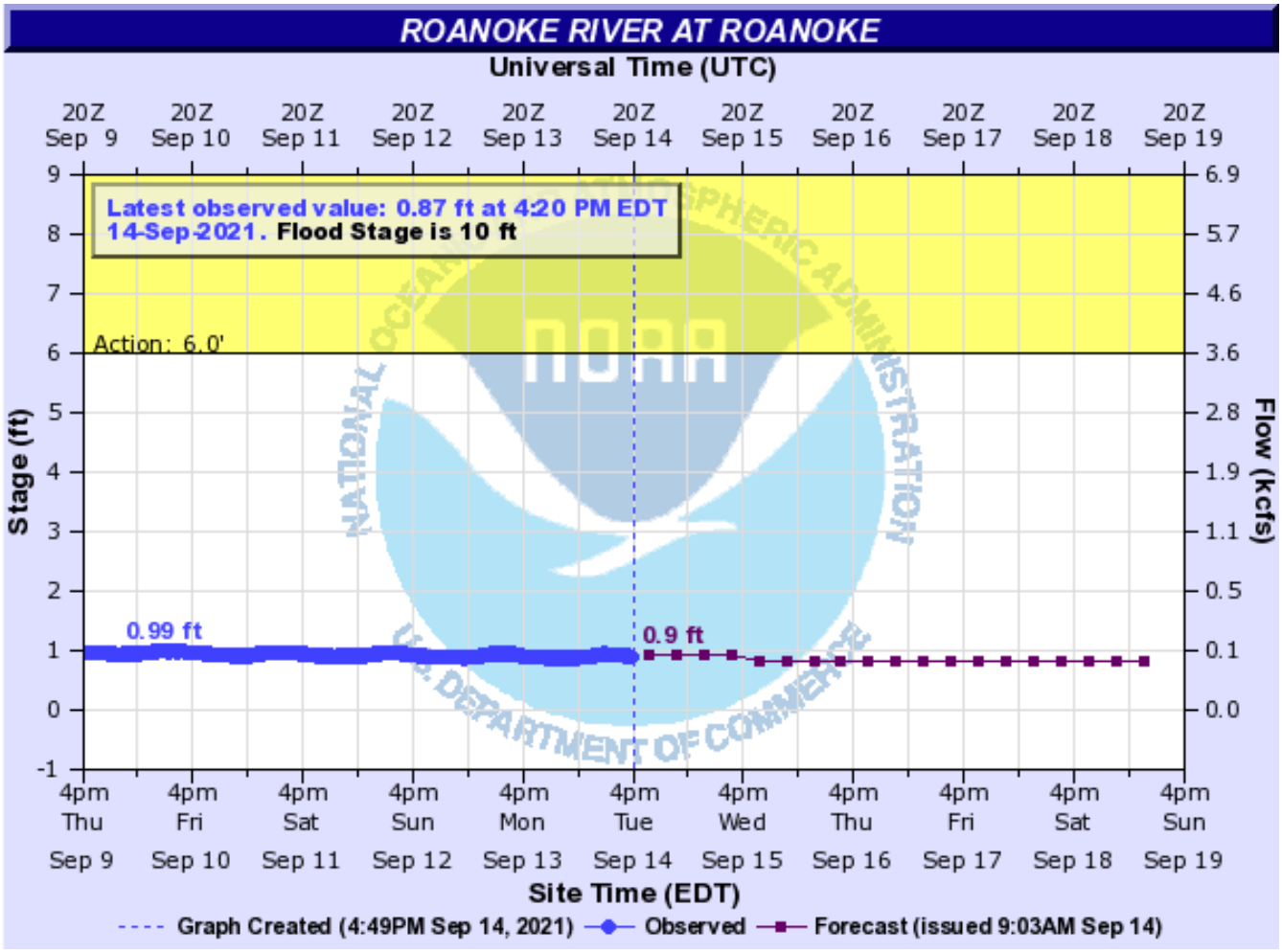
The Stormwater Division is in the process of developing Watershed master plans for the Roanoke River and its tributaries. As part of this effort, the City is using more advanced modeling approaches to assess flood potential and how various projects can mitigate or reduce the impacts of flooding. As these master plans are completed, current capital projects may be replaced with new projects that are more holistic in nature and address broader drainage, flooding, and water quality issues. As such, capital projects that are identified in this study may change over time.

As part of this watershed planning process, Repetitive Loss Areas can be specifically assessed and the ranking system should be evaluated to consider weighting projects that help address flooding issues in identified repetitive loss areas.

Walnut Street Gauge

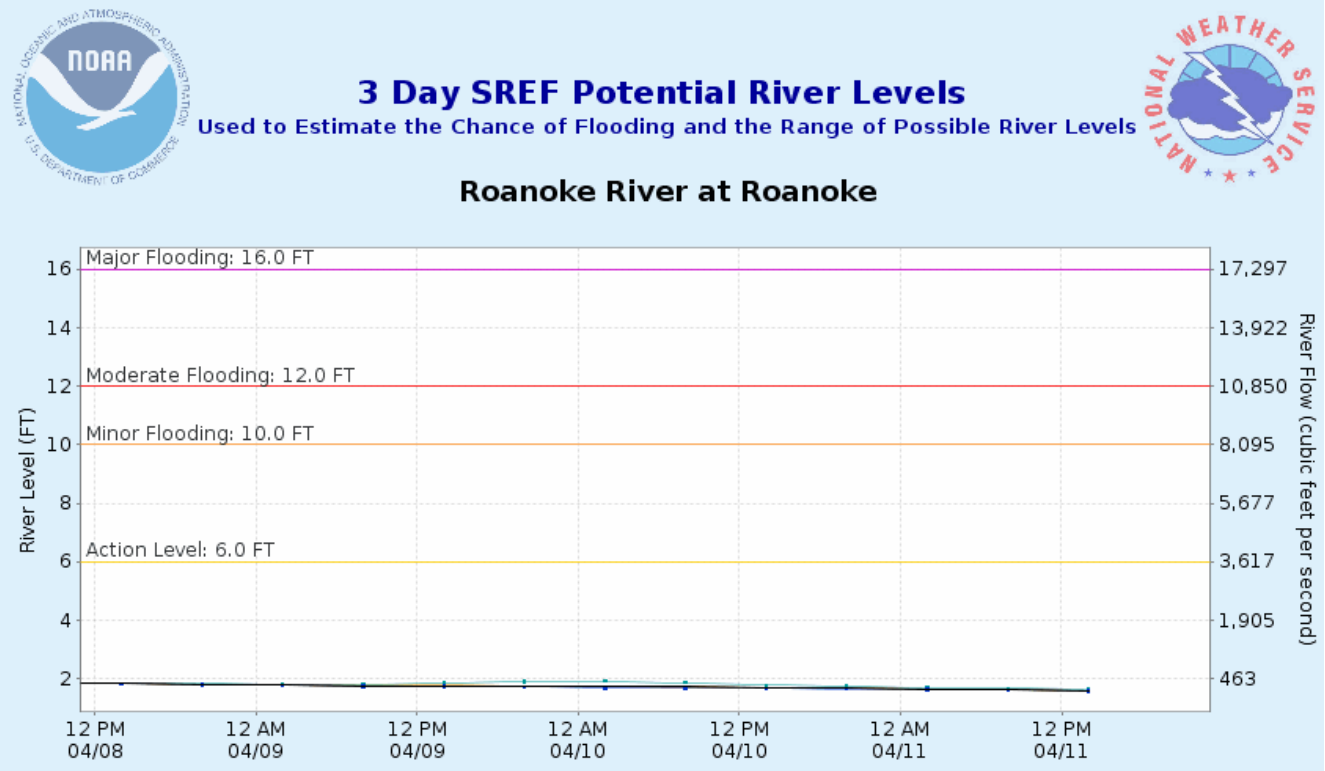
The Walnut Street Gauge is referenced in the Roanoke River section of the RLAA. This gauge helps City staff including first responders and citizens know the current and projected height or stage the Roanoke River will crest during high flow events. It's also used for recreation enthusiasts to understand when river levels may be too high or too low to navigate safely.

The National Weather Service in the Blacksburg Office oversees the Walnut Street Gauge which measures flood stage and velocity of speed of the flowing water. A hydrograph shows how the river level changes over time at a specific location. Links to past and forecast precipitation, river level impact and historical flood information are also included on Walnut Street Gauge webpage.



For example when the Walnut Bridge gauge measures the following heights there are certain areas that begin to be covered with water.

- 2.7 ft. - downstream Wiley Drive low water bridge is flooded. Gates closed to Smith Park
- 6 ft - Roanoke River Greenway path below Franklin Rd. bridge begins to flood
- 10.5 ft - Roanoke River Greenway in Wasena Park near bridge to Vic Thomas Park begins to flood



Minor flooding (occurs at a Walnut Bridge Gauge height of 10') is defined as minimal or no property damage, but possibly some public threat.

Moderate Flooding (occurs at a Walnut Bridge Gauge height of 12') with some inundation of structures and roads near stream. Some evacuations of people and/or transfer of property to higher elevations.

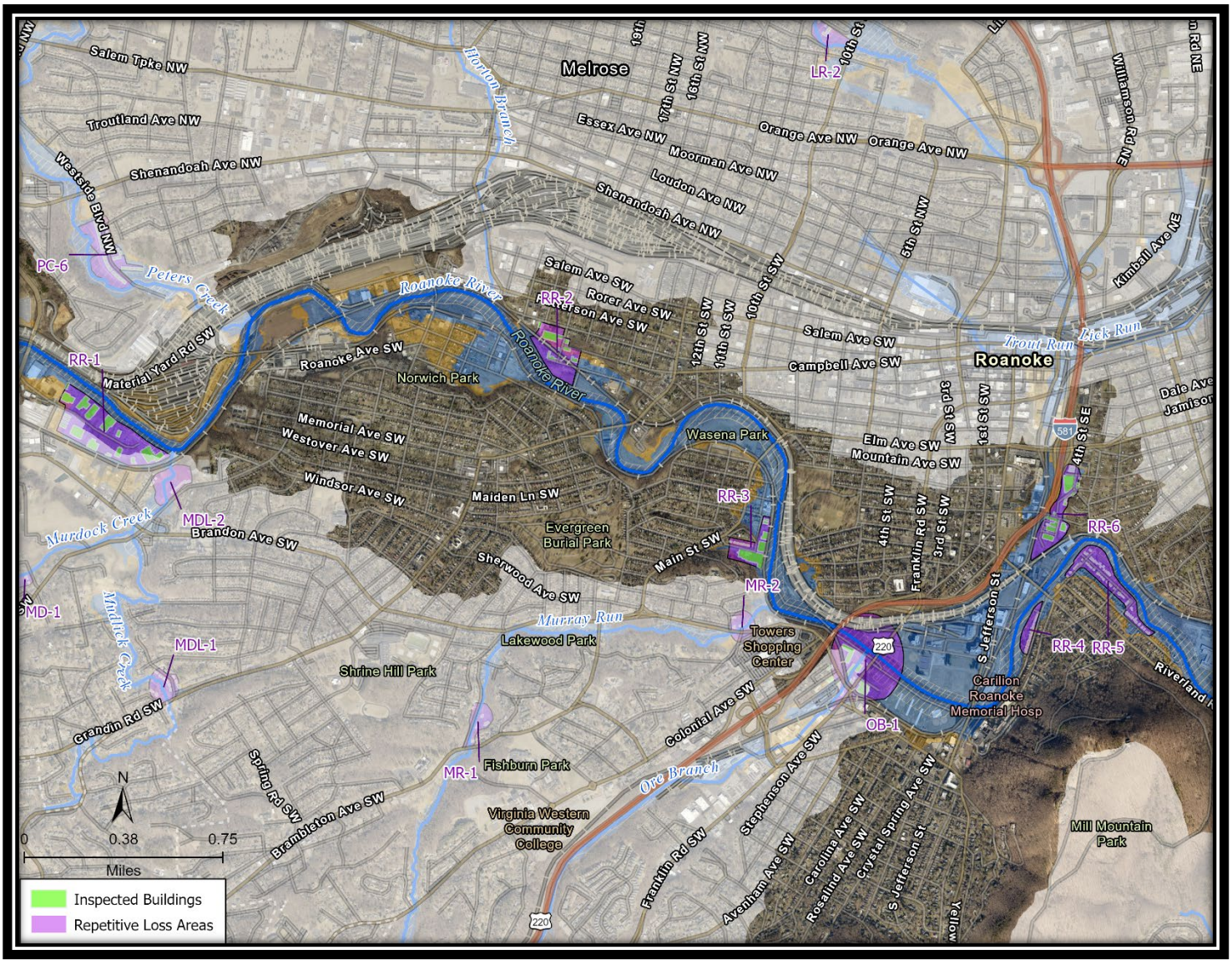
Major Flooding (occurs at a Walnut Bridge Gauge height of 16') with extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.

The Roanoke River heights in the following sections all reference the river height as measured by the Walnut Bridge gauge.

Roanoke River

Watershed Map

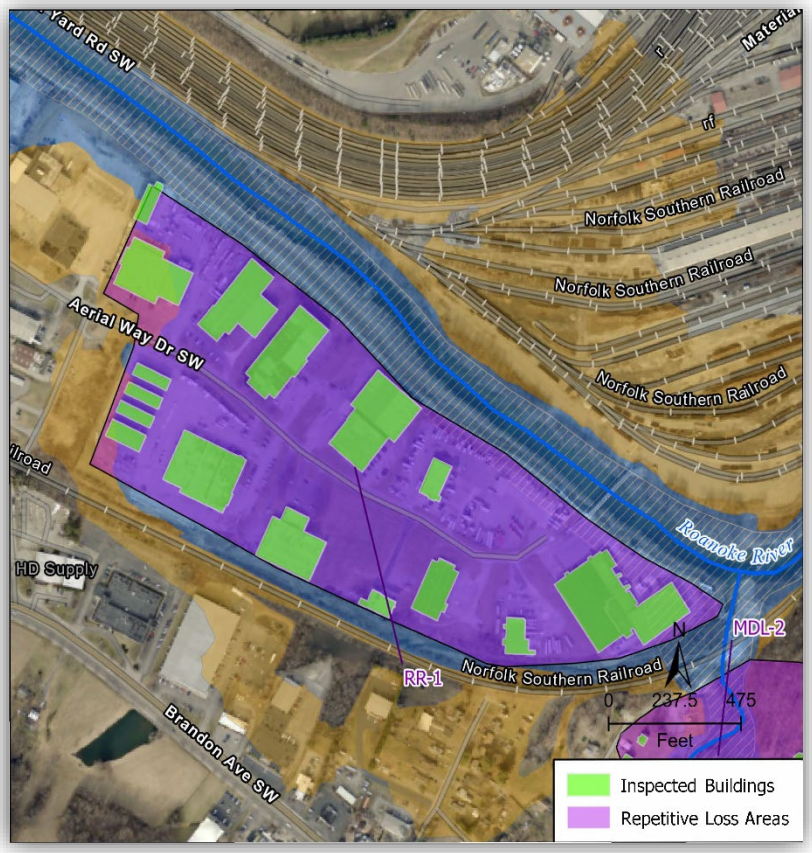
This map shows all repetitive loss areas included in this study in the Roanoke River watershed.



Roanoke River

Aerial Way Drive SW (RR-1)

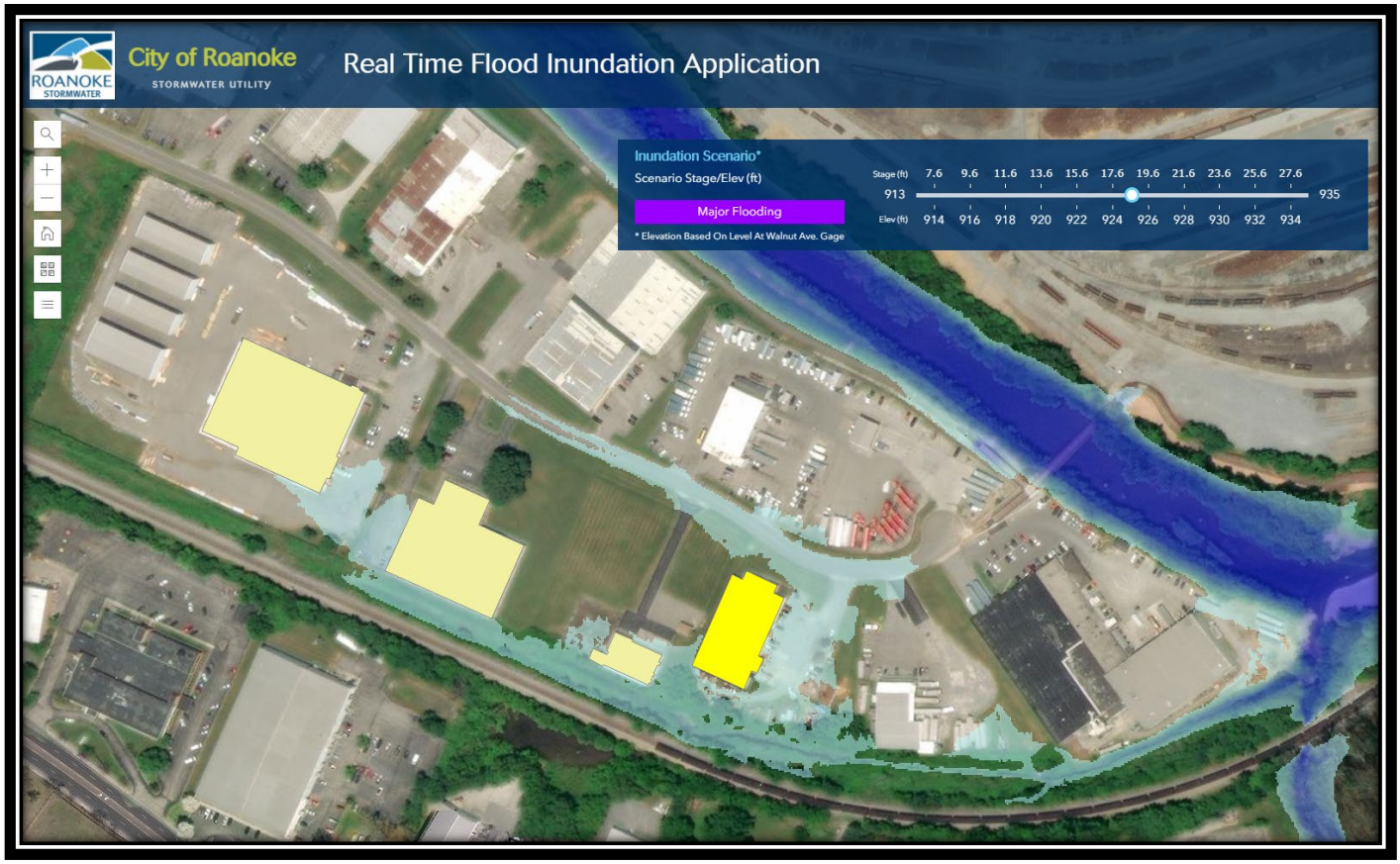
Aerial Way Drive SW Area Overview	
Floodway Structures	3
Repetitive Loss Structures	2
Flood Depth Range (1% chance flood)	0.31’ to 7.64’
Surveys Returned	1
Total Commercial Structures in Area	13
FEMA Documented Flooding Events (RL list)	1987, 1985, 1983 (survey), 1978



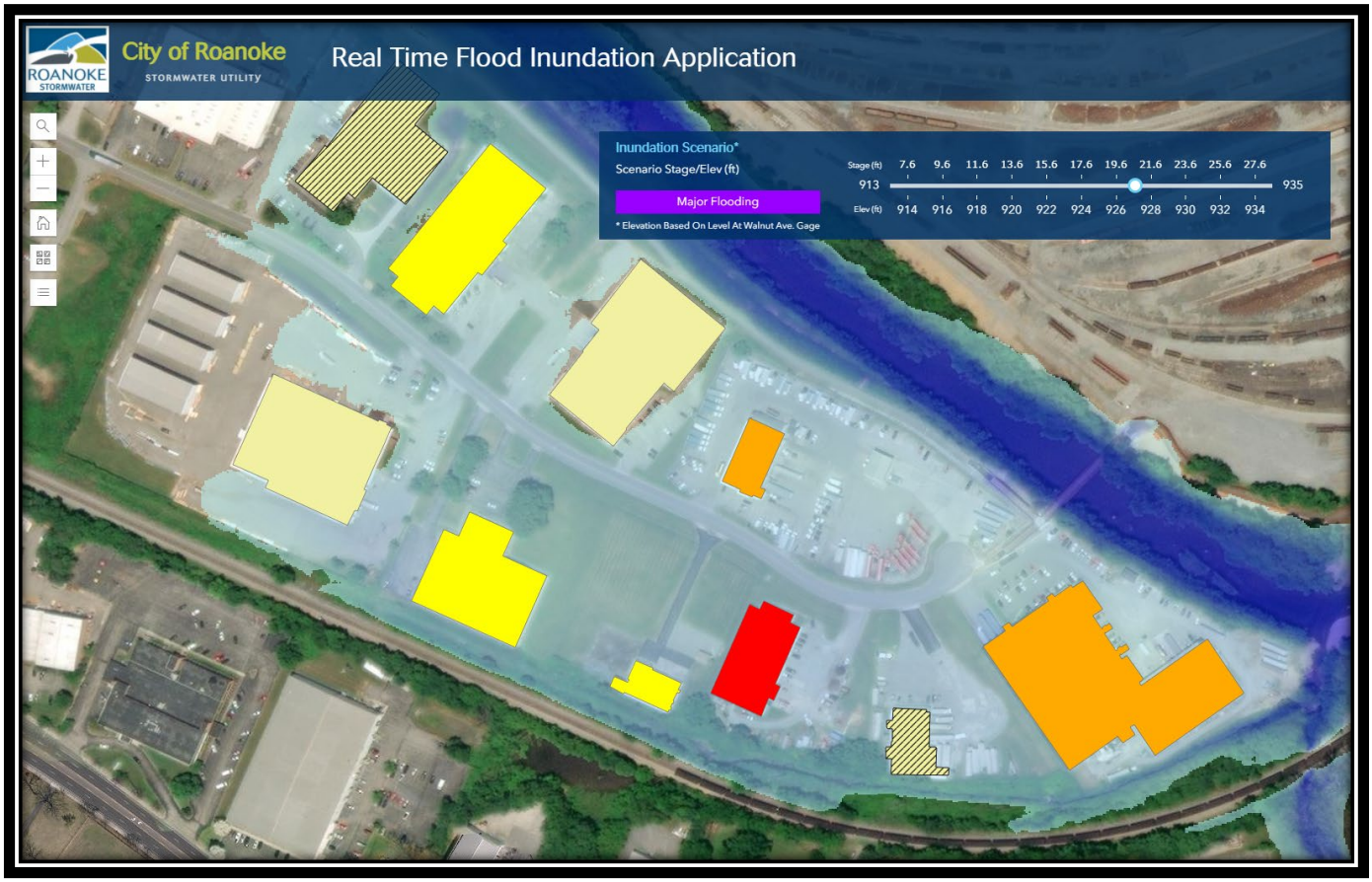
Flooding Summary:

Flooding comes from three different sources that affects this area: the Roanoke River, Mud Lick Creek, and an unnamed tributary to Mud Lick. The Mud Lick Creek confluence is at the downstream side of the Repetitive Loss Area which can contribute to flooding on a few buildings. Additionally, there is an unnamed tributary to Mud Lick that runs along the Norfolk Southern Railroad that contributes to flooding for buildings between Aerial Way Dr. SW and the NS Railroad under large flooding events due to backflow of the Roanoke River.

Back water from the Roanoke River and Mud Lick Creek begins to fill the unnamed tributary at river heights of 17.6’ as measured at the Walnut Bridge (water elevations of 924.0). By river height of 18.6’ (water elevations of 925.0), back water effects have flooded at least four buildings and spilled out into Aerial Way, as shown in the photo below.



Additionally properties along the Roanoke River boundary begin to see water at the flood stage of 18.6'. At 19.6' two additional buildings have been inundated. At 20.6', ten buildings experience inundation to various degrees.



By Roanoke River depths of 21.6', all buildings in the repetitive loss area are inundated. In general, flood depths become greater towards the cul-de-sac area.

City Consideration for Structures:

Ideally overtime this area can be redeveloped with elevated structures or determine if floodproofing is feasible for the commercial buildings.

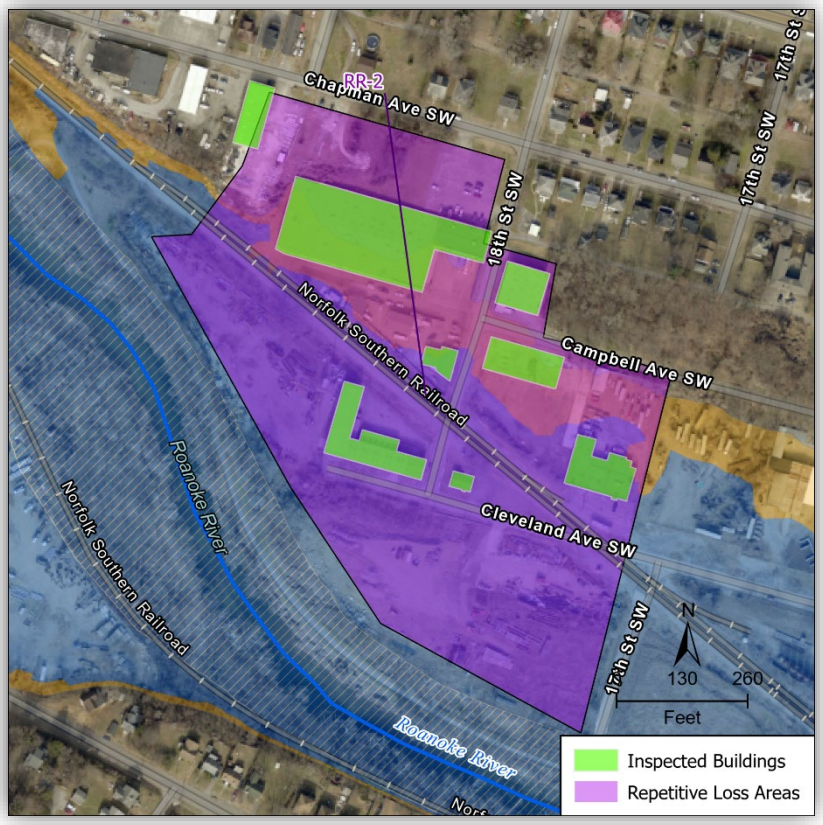
Recommended Property Owner Actions

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2' above the BFE
- Consider storing all materials out of the floodplain or be able to move vehicles & other stored materials out of the floodplain when high water events are to predicted to reach at least 18' as measured at the Walnut Bridge Gauge.
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Determine if floodproofing is feasible

Roanoke River

Cleveland Ave., Campbell Ave., 18th St., to Chapman Ave. (RR-2)

Cleveland Ave., Campbell Ave., 18th St., to Chapman Ave. Area Overview	
Floodway Structures	0
Repetitive Loss Structures	1
Flood Depth Range (1% chance flood)	5'-7.5'
Surveys Returned	0
Total Commercial Structures in Area	8
Structures w/ Basements	5
FEMA Documented Flooding Events (RL list)	1985, 1978



Flooding Summary:

This main threat of flooding is from the Roanoke River to the properties along the river boundary. Although close to the area, Hortons Branch does not impact this area. No Elevation Certificates or Floodproofing Certificates on file.

Buildings closest to the Roanoke River begin to be flooded at 17.6' (water elevation of 928.0) at the Walnut Ave. Bridge gauge. Most of the repetitive loss area is inundated at 23.6' (water elevation of 930.0).

Capital Improvement Project:

There will be a maintenance capital improvement project to capture stormwater runoff along 19th and will add curbing to the lower section of Chapman. These improvements will route stormwater from Chapman Avenue to Patterson Avenue where it will discharge into Hortons Branch. This project will be built in conjunction with a planned Department of Engineering project in 2022.

This corridor has the opportunity to become a model of sustainable redevelopment for the City. The Mountain View/Norwich Plan includes long-term redevelopment plans for this area.

Recommended Property Owner Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2’ above the BFE
- Consider storing all materials out of the floodplain, especially materials that contain hazardous materials or could become dangerous to downstream properties if picked up by floodwaters.
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Determine if floodproofing is feasible

Roanoke River

Kerns Ave SW and 8th St. SW (RR-3)

Kerns Ave SW and 8th St. SW Area Overview	
Floodway Structures	0
Severe Repetitive Loss Structures	1
Flood Depth Range	1.28'-6.69'
Vulnerability Index Score	-0.9
Surveys Returned	0
Total Structures in Area	13
Residential Homes	9
Commercial Structures	5
Structures w/ Basements	5

FEMA Documented Flooding Events (RL list)	Historic Crests (per NWS Walnut Bridge Gauge)
2011	7.81'
2005	7.11'
2004	17.82'
2003	15.57'
1987	18.09'
1986	Not in top 107 events
1985	23.35'

Flooding Summary:

This main threat of flooding is from the Roanoke River to the properties along the river boundary. There is a small tributary with headwaters near the cemetery and a channel that passes behind houses along the 1400 block of Main St. and then curving towards the commercial properties along Kerns Ave. where it is piped under a building and discharges into the Roanoke River. From the documented flooding events and the corresponding Roanoke River crests recorded by the NWS at the Walnut Ave. bridge, it appears that this area may flood around 7' crest height. This may be due to the River backing up through the conveyance pipe infrastructure and affecting the repetitive loss area from both directions.

Much of the repetitive loss area is inundated when the Walnut Ave. Bridge gauge is at 17.6' (water elevation of 924.0).

Capital Improvement Project:

The stormdrain system that also conveys the small stream is planned to be upsized from Evergreen Cemetery to Kerns Avenue to reduce flooding north and West of Main Street and to improve road drainage. Additionally, the stream bed will be improved from Main Street to the piped tributary section. This is classified as a major infrastructure project and is in the preliminary design stage. This project is ranked #8 on the list of 215 capital improvement projects. The city has identified this project for VDOT Revenue Sharing funds for Fiscal Years 2027 and 2028.

City Consideration for Structures:

Overtime, this area can be redeveloped with elevated structures or determine if floodproofing is feasible for the commercial buildings.

Recommended Property Owner Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2' above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Determine if floodproofing is feasible

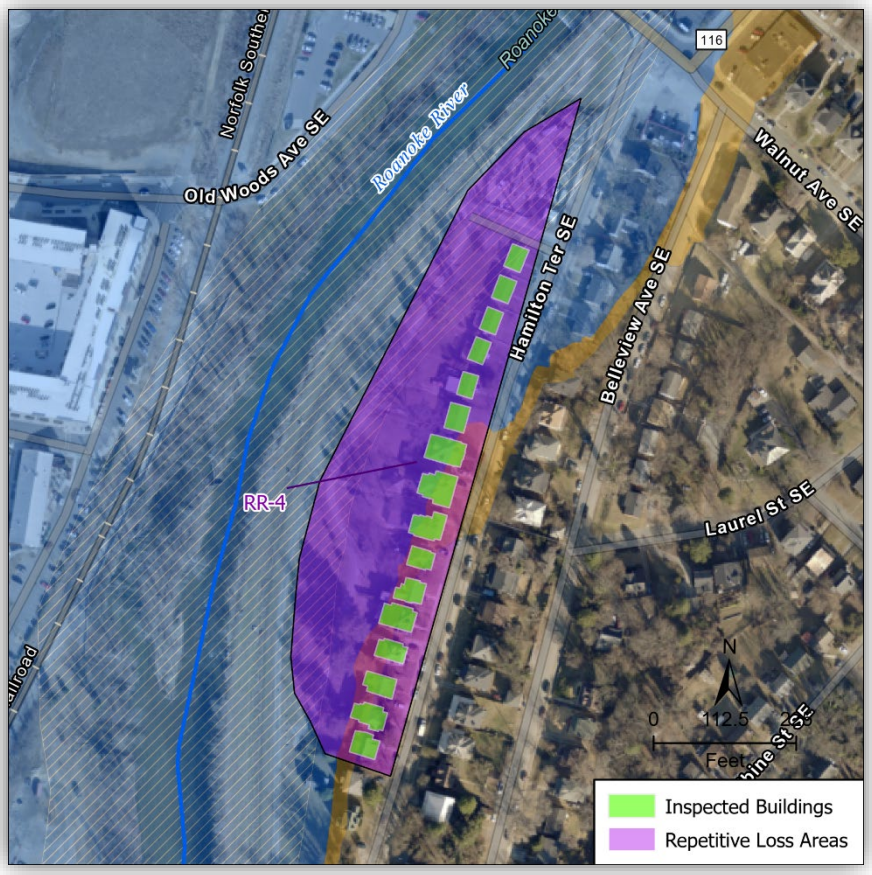
Roanoke River

Hamilton Terrace (RR-4)

This repetitive loss area is located entirely within the 1% chance floodplain (100-year, Zone AE) and the 0.2% chance floodplain (500-year). Most houses were built circa 1959 & 1960 in 1% chance floodplain and 0.2% chance floodplain circa 1910-1926. Houses in 0.2% chance floodplain do not have elevation certificates. Mechanicals, like HVAC appear to be below base flood elevation (BFE) for houses with Elevation Certificates.

The Roanoke River Flood Reduction Project constructed from 2005-2011, helps provide additional floodplain capacity storage for high water events up to the 4% chance flood (25 year flood).

Hamilton Terrace Overview	
Floodway Homes	2
Repetitive Loss Homes	4
Flood Depth Range	2.6’ – 8.43’
Vulnerability Index Score	0.3
Surveys Returned	1
Total Homes in Area	16
Houses with Basements	16
Owner Occupied	8
Potential Rentals	8



FEMA Documented Flooding Events (RL list)	Historic Crests (per NWS Walnut Bridge Gauge)
2018	16.64’
2013	14.38’
2004	17.82’
2003	15.57’
1992	18.09’
1985	23.35’
1978	18.95’

Flooding Summary:

Flooding occurs due to proximity of the Roanoke River. According to historic crest data provided by the National Weather Service at just upstream at Walnut Bridge, flooding in this area can occur at 14’. There have been seven documented flooding events for at least some of the houses in the Hamilton Terrace repetitive loss area since 1978.

City Consideration for Structures:

This area is a prime candidate for a FEMA grant to mitigate floodway structures through acquisition and demolition or relocation if the property owners are interested in participating.

Recommended Property Owner Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals, like HVAC to 2’ above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups.

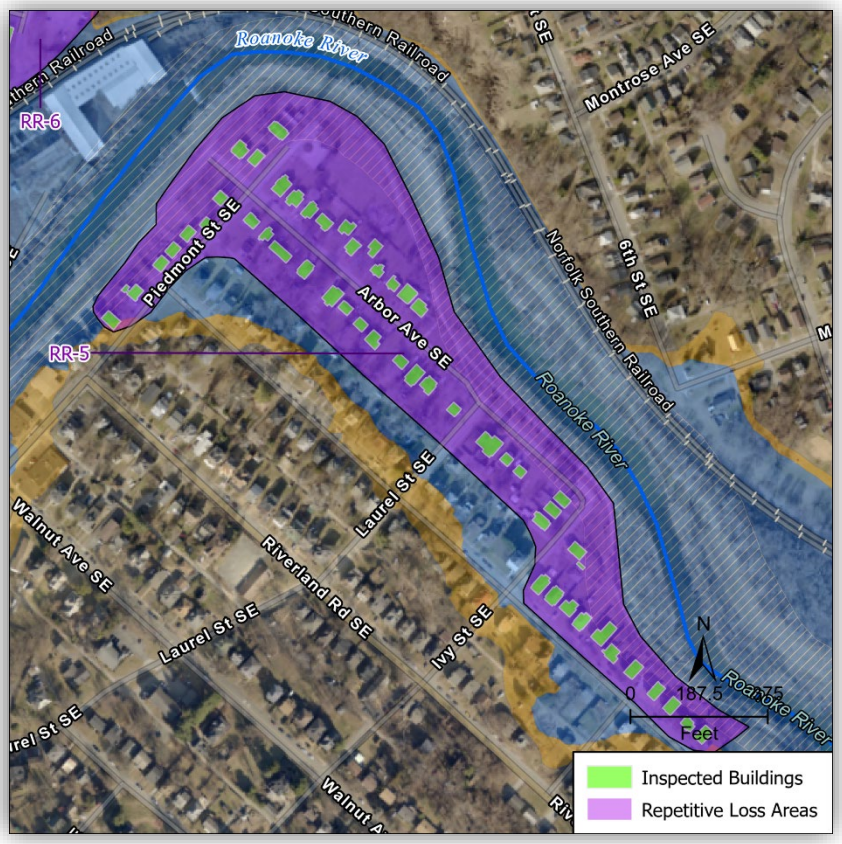
Roanoke River

Piedmont Park Area (RR-5)

This repetitive loss area is located entirely within the 1% chance floodplain (100-year, Zone AE). Many homes appear to have mechanicals like HVAC below base flood elevation (BFE). Flooding occurs due to proximity of the Roanoke River. According to historic crest data provided by the National Weather Service at just upstream at Walnut Bridge, flooding in this area can occur at just over 10’. There have been seven documented flooding events for at least some of the houses in the Piedmont Park repetitive loss area since 1978 with floodwater depths ranging from about 2-8’ depending on location within the area.

The Roanoke River Flood Reduction Project constructed from 2005-2011, helps provide additional floodplain capacity storage for high water events up to the 4% chance flood (25 year flood). Two homes in this area have taken owner-funded mitigation measures by elevating the structures including HVAC equipment.

Piedmont Park Area Overview	
Floodway Homes	19
Repetitive Loss Homes	14
Flood Depth Range	1.97’ – 7.86’
Vulnerability Index Score	0.3
Surveys Returned	0
Total Homes in Area	51
Houses with Basements	33
Owner Occupied	24
Potential Rentals	27

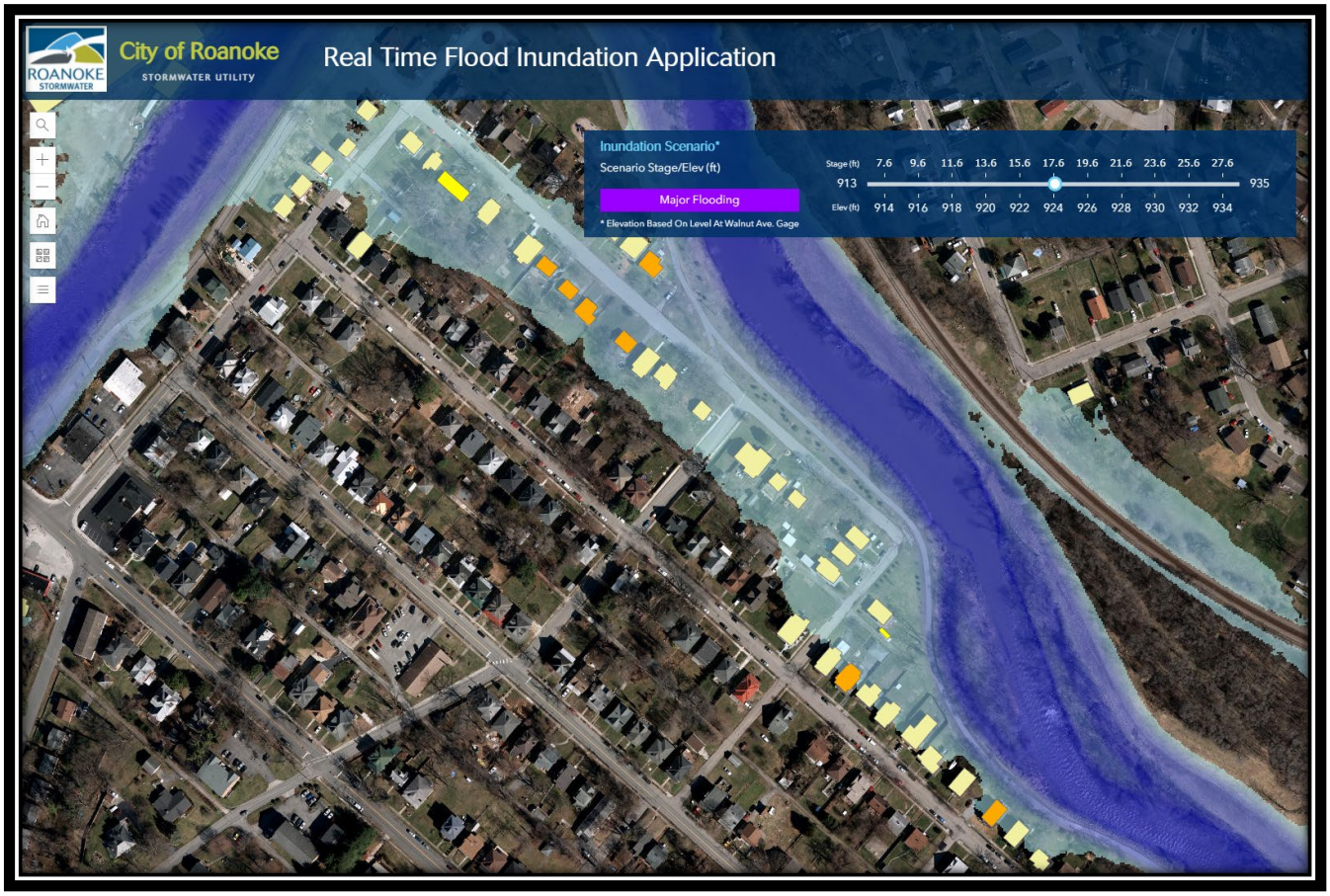


FEMA Documented Flooding Events (RL list)	Historic Crests (per NWS Walnut Bridge Gauge)
2018	16.64’
2009	10.33’
2004	17.82’
2003	15.57’
1992	18.09’
1985	23.35’
1978	18.95’

Flooding Summary:

The topography of this area contributes to flooding risk. The general area along Piedmont Park to Arbutus Ave. SE is bowl-like which contributes to flooding of property. There is only minor stormwater infrastructure in this area. Many houses on Arbor Ave. SE were built circa 1950, and many are on grade

Roanoke River flood waters breach a low point between the south end of Piedmont Park and the Roanoke River Greenway near Laurel St. SE at flood stage 11.6’ at the Walnut Ave. Bridge gauge (water elevations of 918.0’). Houses start to be flooded in this area by 13.6’. At flood stage, 15.6’ (water elevations of 922.0’), many houses along Arbor are inundated. By 17.6’ (water elevations of 922.0’), floodwaters reach beyond Piedmont St. SE and continue to an upstream section of the Roanoke River as shown below.



City Consideration for Structures:

This area is a prime candidate for a FEMA or Virginia Community Flood Preparedness Fund grant to mitigate floodway structures through acquisition and demolition or relocation. Additionally, all other structures are candidates for elevation or demolition and rebuilding.

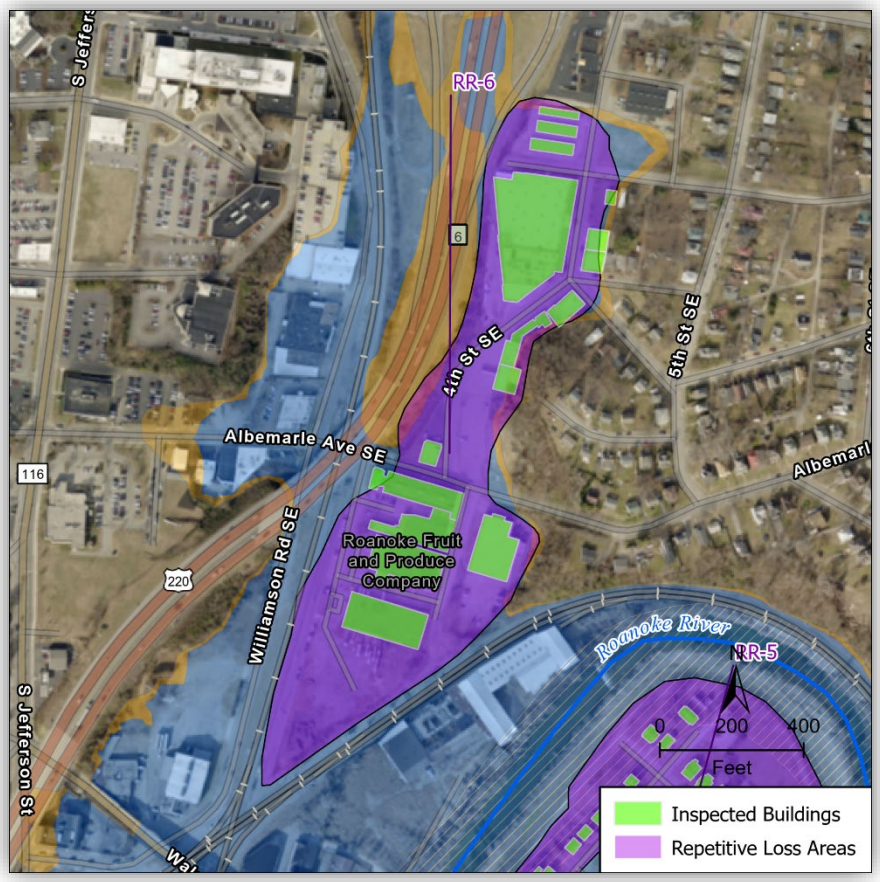
Recommended Property Owner Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals, like HVAC to 2’ above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups.

Roanoke River

4th St. SE and Albemarle Ave. SE (RR-6)

4th St. SE and Albemarle Ave. SE Area Overview	
Floodway Structures	0
Repetitive Loss Structures	3
Severe Repetitive Loss Structure	1
Flood Depth Range	4'-6.85'
Surveys Returned	0
Total Commercial Structures in Area	16



FEMA Documented Flooding Events (RL list)	Historic Crests (per NWS Walnut Bridge Gauge)
2005	7.11'
2004	17.82'
2003	15.57'
1992	18.09'
1985	23.35'

Flooding Summary:

This area is very flat and water gets trapped due to higher topography on either side. Smaller, intense rainfall events may cause flooding due to minimal stormwater infrastructure in this area.

Floodwaters begin to inundate Williamson Road in this vicinity at 18.6' by the Walnut Ave. Bridge gauge (water elevation 925'). At flood water depths of 19.6', this repetitive loss area experiences nearly complete inundation.

City Consideration for Structures:

This area is predominately zoned as Light Industrial and much of the area is registered as historic in the National Register. The National Register of Historic Places is the official list of the Nation's historic places worthy of preservation. Ideally, overtime this area can be redeveloped with elevated and/or flood proofed structures or existing historic buildings can be beneficially reused with floodproofing and flood resistant materials. In combination with redevelopment or reuse, additional stormwater infrastructure can be planned to avoid ponding in smaller storm events. This area is also included in the South Jefferson Redevelopment Plan.

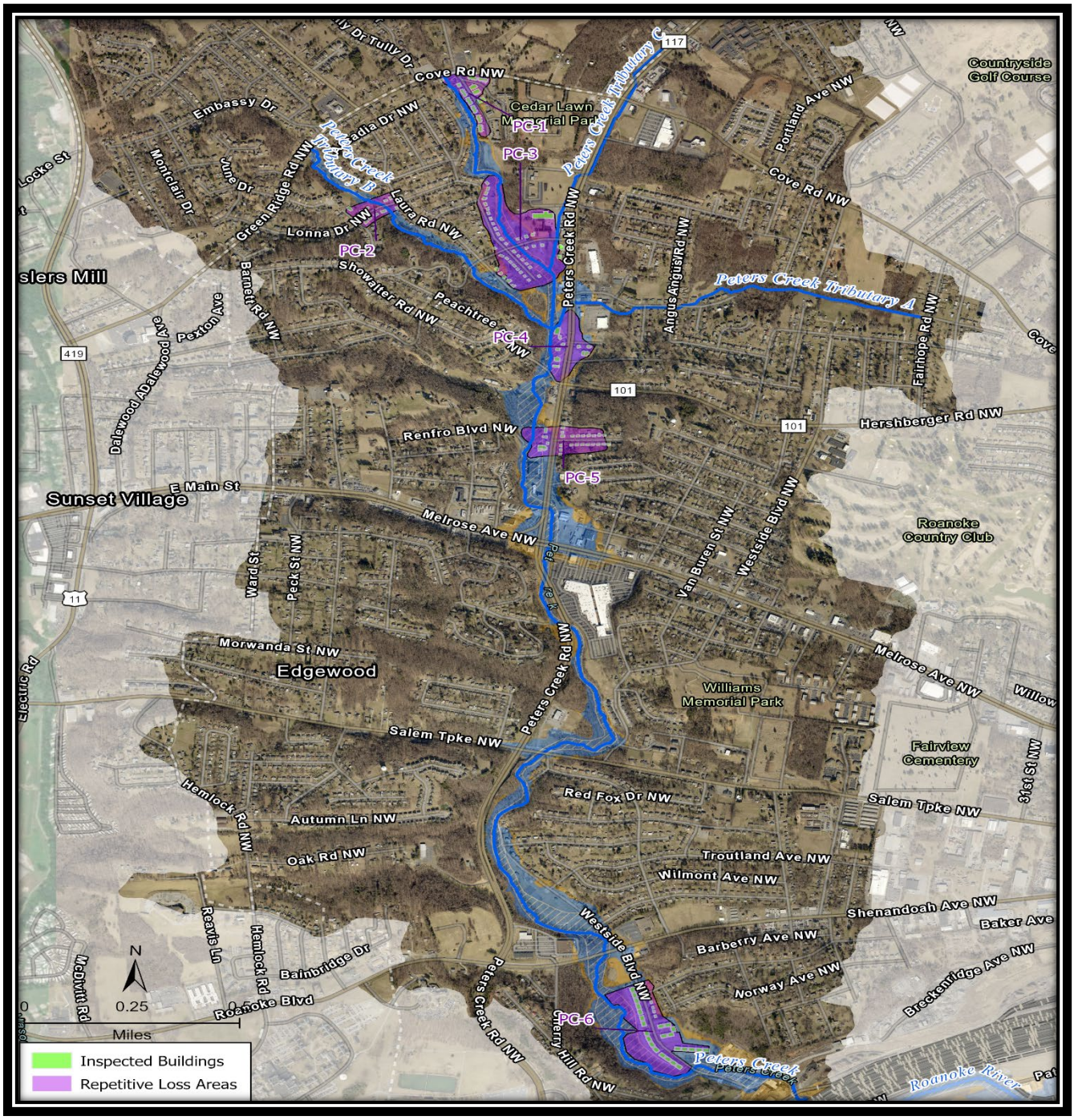
Recommended Property Owner Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2’ above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups.
- Determine if floodproofing is feasible

Peters Creek

Watershed Map

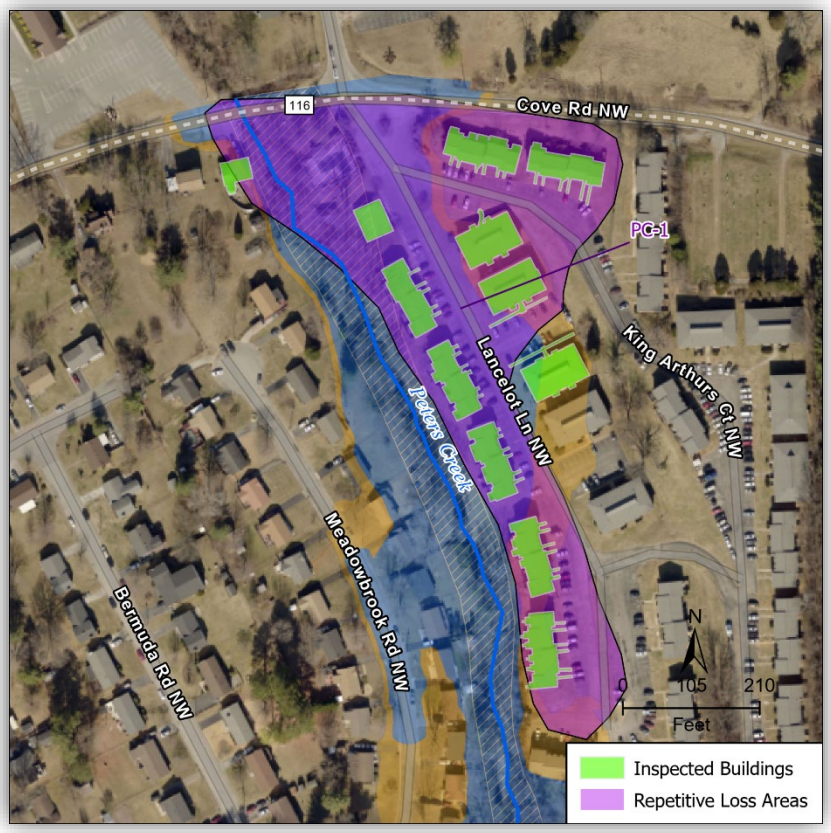
This map shows all repetitive loss areas included in this study in the Peters Creek watershed.



Peters Creek

Cove Rd. NW and Lancelot Lane NW (PC-1)

Cove Rd. NW and Lancelot Lane NW Area Overview	
Floodway Structures	2
Repetitive Loss Structures	3
Flood Depth Range (1% chance flood)	0.35’ to 2.43’
Vulnerability Index Score	0.7
Surveys Returned	0
Total Structures in Area	12
FEMA Documented Flooding Events (RL list)	1989, 1985



Flooding Summary:

Peters Creek is subject to flash floods due to the watershed topography. Flood depths appear to be deeper towards Cove Road and become more moderate moving downstream. This area is primarily zoned as RMF: Residential Multi-Family. In the Repetitive Loss Area, there are 11 structures in the 1% chance floodplain (100 year, Zone AE) and 5 structures in the 0.2% floodplain (500 year, Zone X).

Recommended Property Owner/Resident Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2’ above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Consider floodproofing measures for first floor apartments
- Maintain renters flood insurance coverage
- Move vehicles to higher ground during high water events

Peters Creek

Lonna Drive. NW (PC-2)

Lonna Drive NW Area Overview	
Floodway Homes	0
Repetitive Loss Homes	1
Flood Depth Range (1% chance flood)	Structure 1.09' above BFE
Vulnerability Index Score	0.7
Surveys Returned	1
Total Structures in Area	11
Structures w/ Basements	7
FEMA Documented Flooding Events (RL list)	2019, 2018

Flooding Summary:

This tributary to Peters Creek is subject to flash floods due to the watershed topography. There are 1 residential structures in the 1% chance floodplain (100 year, Zone AE) and 2 structures in the 0.2% chance floodplain (500 year, Zone X). The immediate repetitive loss issue in this area appears to be from basement water infiltration.

City Consideration for Structures:

This area may be considered for a FEMA or Virginia Community Flood Preparedness Fund grant to mitigate basement infiltration.

Recommended Property Owner/Resident Actions:

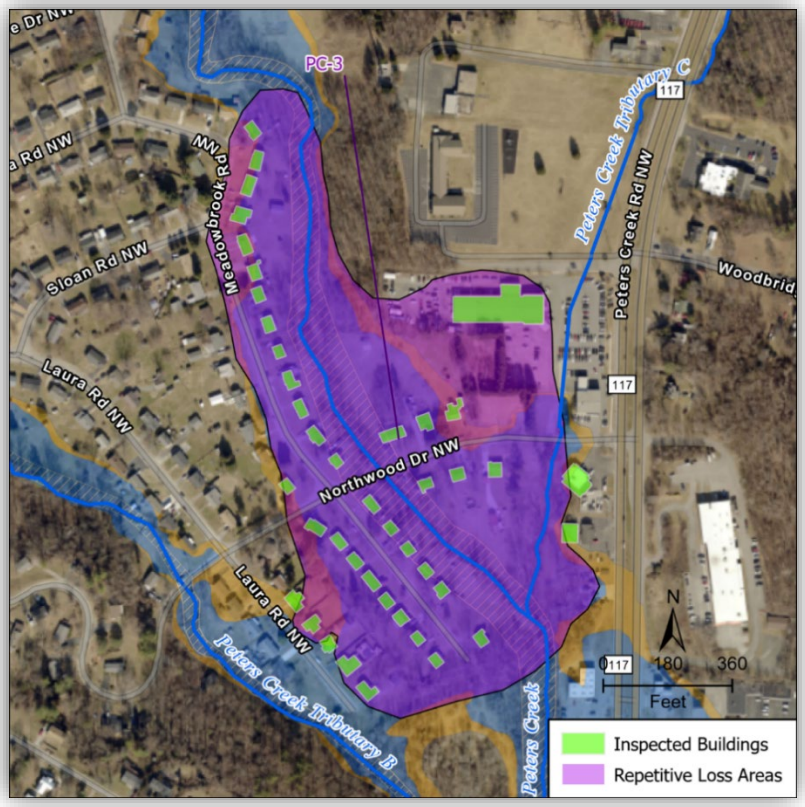
- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2' above the BFE
- Maintain flood insurance policies for property structure and contents
- Research and implement basement waterproofing techniques.
- Install back-up valves as applicable to prevent sewer backups

- Maintain owners/renters flood insurance coverage
- Move vehicles to higher ground during high water events
- Do not drive over flooded roadways and bridges even in smaller flood events.

Peters Creek

Meadowbrook Rd. NW (PC-3)

Meadowbrook Road NW Area Overview	
Floodway Homes	8
Repetitive Loss Homes	14
Flood Depth Range (1% chance flood)	0.65' – 4.75'
Vulnerability Index Score	0.7
Surveys Returned	7
Total Structures in Area	42 (3 commercial properties)
Structures w/ Basements	41
Documented Flooding Events from Surveys	2018, 1993, 1985
FEMA Documented Flooding Events (RL list)	1989, 1985



Flooding Summary:

Peters Creek is subject to flash floods due to the watershed topography. Flood depths generally increase towards the downstream section. There are 35 residential structures in the 1% chance floodplain (100 year, Zone AE) and 2 structures (1 residential and 1 commercial) in the 0.2% chance floodplain (500 year, Zone X).

City Consideration for Structures:

This area is a prime candidate for a FEMA or Virginia Community Flood Preparedness Fund grant to mitigate floodway structures through acquisition and demolition or relocation. Additionally, all other structures are candidates for elevation or demolition and rebuilding.

In 2019, the City submitted a PDM Grant for acquisition and demolition of five floodway homes. Additionally, the grant requested funds to remove the artificial fill on the parcel downstream of Meadowbrook and Laura Roads and create a wetland area and neighborhood amenity. By removing this fill, preliminary floodplain modeling show a reduction of base flood elevations for 13 property owners (as shown in the graphic below). A neighborhood stakeholder meeting will be held to provide additional information and allow for feedback from residents that will further inform and guide project development.


Meadowbrook Rd NW
ZONE AE
AJ
BFE Lowered
3.1 Ft.
Out of
Floodplain
117
BFE Lowered
3.1 Ft.
Northwood Dr NW
4428
Out of
Floodplain
1944
Northwood Dr NW
4512
1947
1933
1927
AJ
Peters Creek
1932
Meadowbrook Rd NW
1921
ZONE X
1928
1915
AJ
Laura Rd NW
ZONE X
1922
1916
Out of
Floodplain
1910
1903
1904
117
1805
BFE Lowered
3.1 Ft.
1806
4323
ZONE AE
Peters Creek Tributary C
ZONE X
1728
ZONE AE
Peters Creek Rd NW
Peters Creek Rd NW
ZONE AE
Proposed Floodplain
Streams
Cross Sections
Mitigation Type
FMA
Floodwater Diversion
PDM
N
ROANOKE
STORMWATER
0
75
150
Feet
Peters Creek
Peters Creek
AH
117

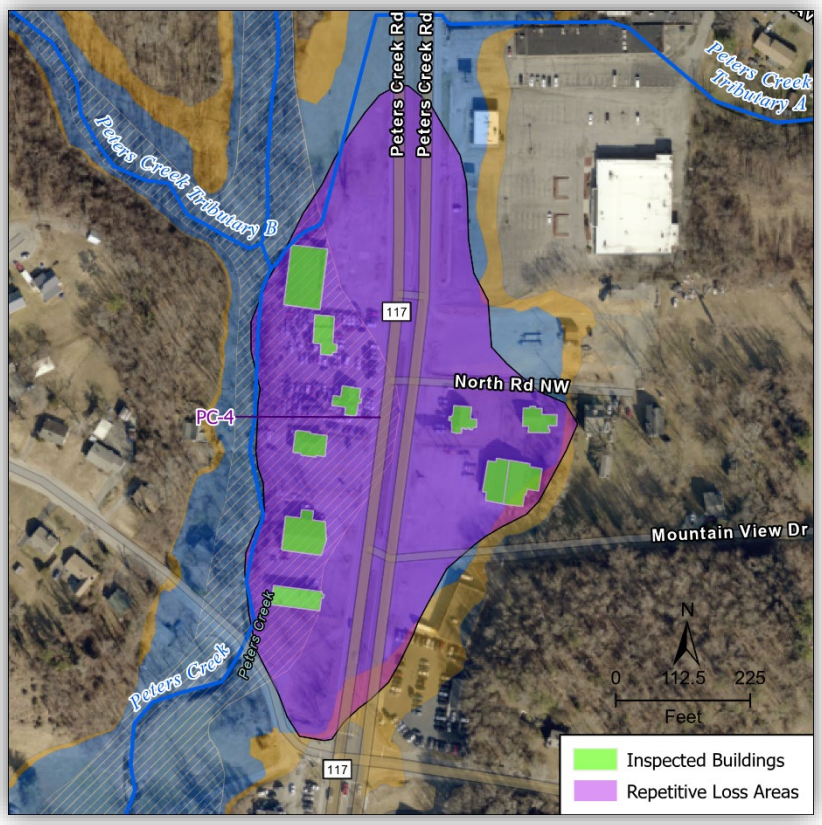
Recommended Property Owner/Resident Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2' above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Maintain renters flood insurance coverage
- Move vehicles to higher ground during high water events
- Do not drive over flooded roadways and bridges, like Northwood Drive, even in smaller flood events.

Peters Creek

Peters Creek Rd. NW & North Rd. NW (PC-4)

Peters Creek Rd. NW & North Rd. NW Area Overview	
Floodway Structures	6
Repetitive Loss Structures	2
Flood Depth Range (1% chance flood)	5.35'-10.91'
Vulnerability Index Score	0.7
Surveys Returned	0
Total Structures in Area	9
FEMA Documented Flooding Events (RL list)	2019, 2018, 2013, 1989, 1985, 1978



Flooding Summary:

Peters Creek is subject to flash floods due to the watershed topography. There are 6 commercial structures in the floodway and 3 additional commercial structures in the 1% chance floodplain (100 year).

City Consideration for Structures:

This area is a prime candidate for a FEMA or Virginia Community Flood Preparedness Fund grant to mitigate floodway structures through acquisition and demolition or relocation. At least one business has closed due to flooding in this area. Of concern to water quality and potential damages downstream during flooding, is the car repair business located in this repetitive loss area, a legally nonconforming use under the City's zoning ordinance and associated flood plain regulations. Additionally, at least one privately owned building has a connected structure that is dangerously close to an eroding stream bank.

Capital Improvement Project:

A project is proposed at the 1600 block of Peters Creek and North Rd. to upsize the existing system and relocate new inlets at ponding locations and recreate the roadside ditch along North Rd. to maximize runoff capture. This project is ranked 86th out of 215 total capital improvement projects. This project is in the preliminary design phase and no project date has been established yet.

Recommended Property Owner/Resident Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2' above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Move vehicles to higher ground during high water events so they do not become a danger for structures downstream or water quality threats.

Peters Creek

Peters Creek Rd. NW & Longwood Ave. NW (PC-5)

Peters Creek Rd. NW & Longwood Ave. NW Area Overview	
Floodway Structures	2
Repetitive Loss Structures	1
Flood Depth Range (1% chance flood)	1.26'-9.95'
Vulnerability Index Score	1.3
Surveys Returned	4
Total Structures in Area	26
FEMA Documented Flooding Events (RL list)	1994, 1989, 1987, 1985, 1978
Survey Documented Basement Flooding Events	2020, 2019, 2018, 2017

Flooding Summary:

Peters Creek is subject to flash floods due to the watershed topography. Additionally in the area is a stormwater drainage issue. There are 2 commercial structures in the floodway.

City Consideration for Structures:

One of the floodway properties has undertaken mitigation by elevation. Additional floodway properties could be acquired and demolished with successful FEMA or Virginia Community Preparedness Fund grant funding. Other floodplain properties could be elevated or demolished and redeveloped.

Capital Improvement Project:

There is an undersized culvert draining a low area near the Longwood Ave. cul-de-sac. This problem allows stormwater to flow downhill towards lower elevations and impact properties. This project is in the preliminary assessment phase and no project date has been established yet.

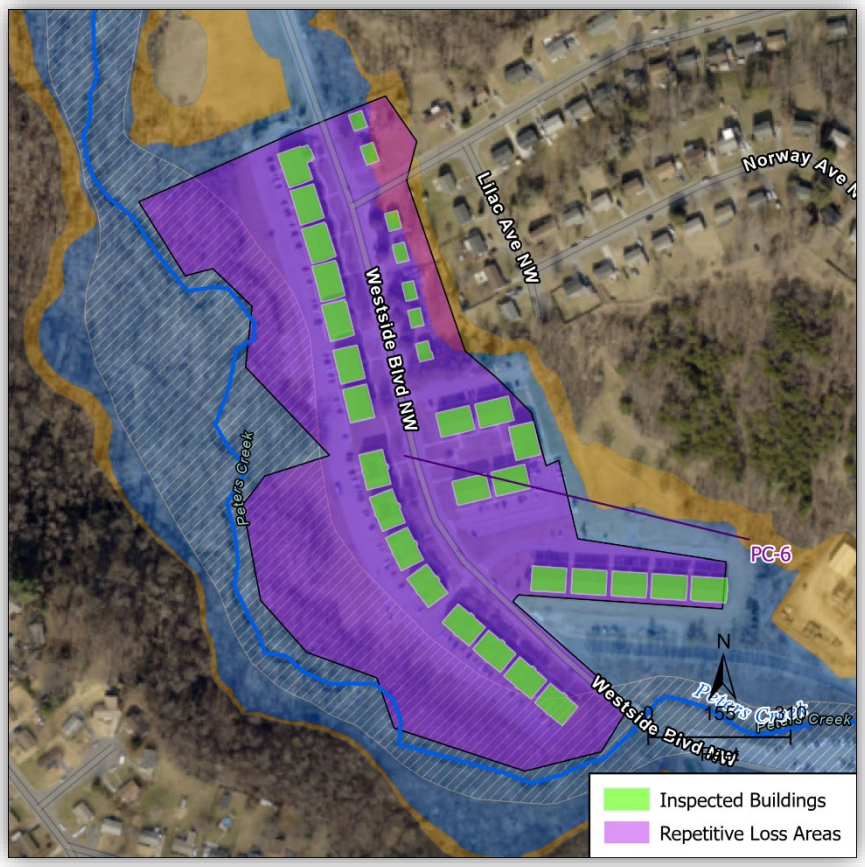
Recommended Property Owner/Resident Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2' above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Consider basement waterproofing techniques

Peters Creek

Westside Blvd. (PC-6)

Westside Blvd. NW Area Overview	
Floodway Structures	2
Repetitive Loss Structures	9
Flood Depth Range (1% chance flood)	0.18'-4.68'
Vulnerability Index Score	1.8
Surveys Returned	0
Total Structures in Area	32
FEMA Documented Flooding Events (RL list)	2018, 2013, 2010, 2004, 1996, 1989, 1985



Flooding Summary:

Peters Creek is subject to flash floods due to the watershed topography. The topopgrahy flattens out below Shenandoah Ave. into a wide floodplain. Additionally, there is a bridge just downstream of this repetitive loss area that could exacerbate flooding during medium to high water events. The first floor of buildings in the flood-prone apartment complex have been mitigated and are no longer residential living spaces. HVAC units have also been elevated. This ultimately brings the total down to two remaining repetitive loss structures.

City Consideration for Structures:

Non-mitigated floodplain properties that experience repeated flooding are prime candidates for FEMA or Virginia Community Preparedness Fund grant funding to elevate the structures, relocate them, or acquire and demolish the structures. Single family homes with basements may require waterproofing mitigation techniques.

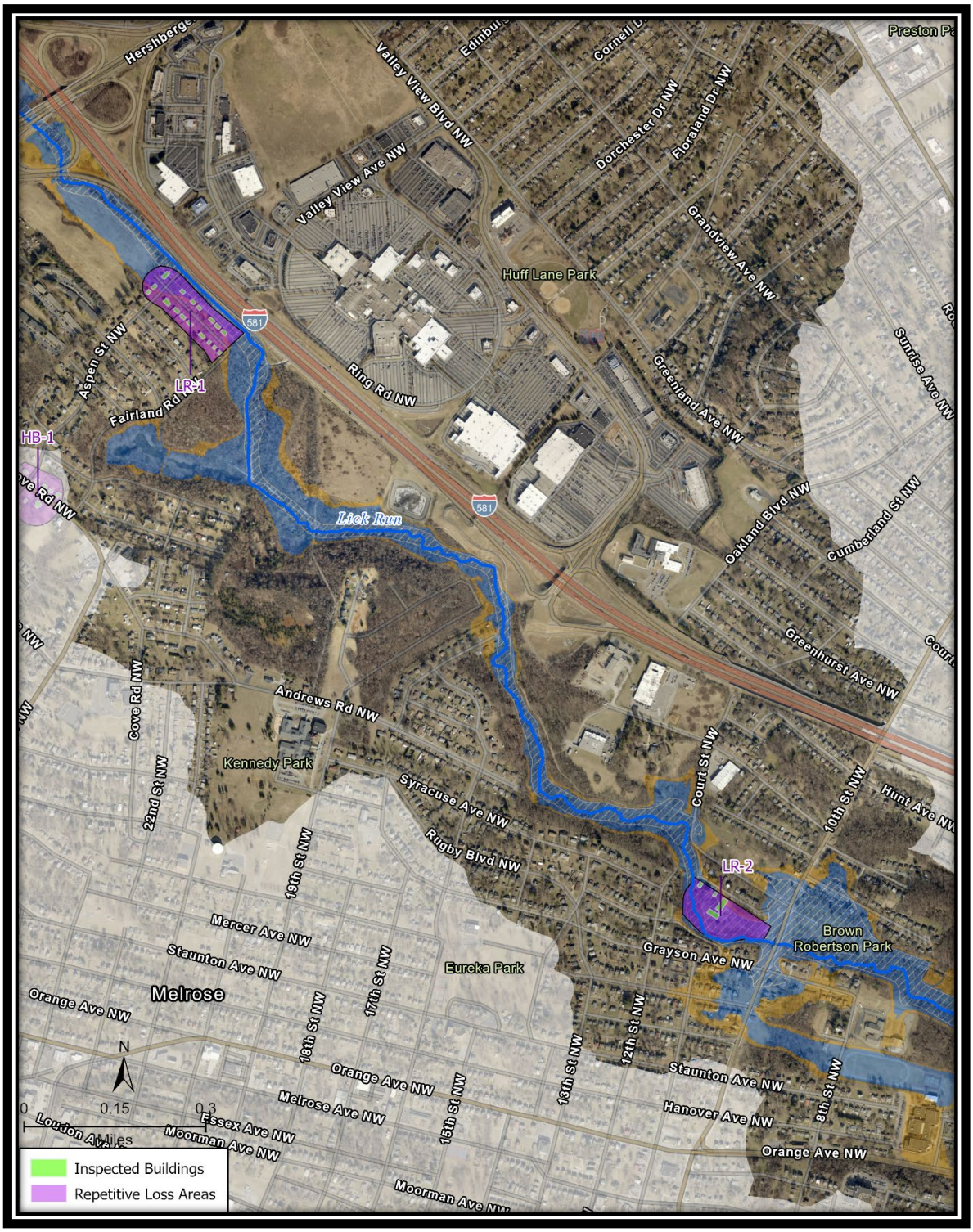
Recommended Property Owner/Resident Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2' above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Consider basement waterproofing techniques

Lick Run

Watershed Map

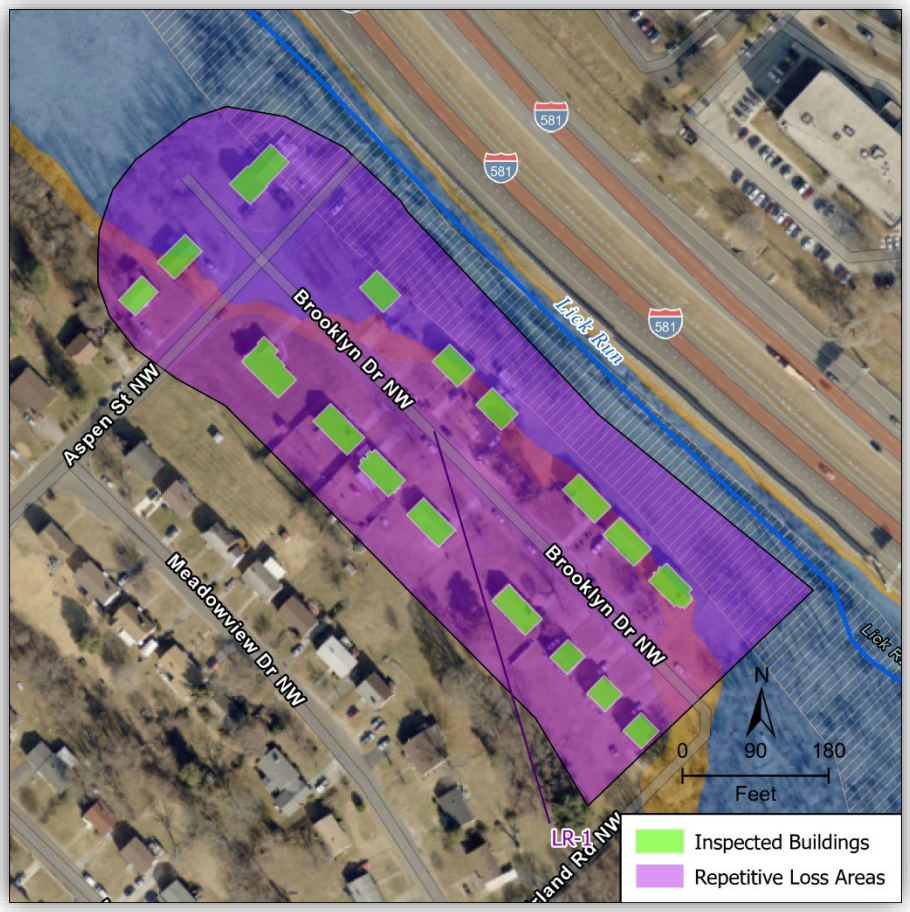
This map shows the repetitive loss areas included in this study in the Lick Run watershed.



Lick Run

Brooklyn Drive NW & Aspen St. (LR-1)

Brooklyn Drive NW & Aspen St. Area Overview	
Floodway Structures	1
Repetitive Loss Structures	1
Flood Depth Range (1% chance flood)	2.43'-5.16'
Vulnerability Index Score	0.7
Surveys Returned	2
Total Structures in Area	17
FEMA Documented Flooding Events (RL list)	2018, 2013
Survey Documented Basement Flooding Events	2018, 2013



Flooding Summary:

There are 8 residential homes in 1% chance floodplain (100 year, Zone AE). The residential properties border Lick Run and most structures have basements, which can flood or infiltrate with water.

City Consideration for Structures:

The City of Roanoke purchased two empty floodplain lots in 2019 and placed deed restrictions on the parcels to prevent development in the SFHA. Non-mitigated floodplain properties that experience repeated flooding are prime candidates for FEMA or Virginia Community Preparedness Fund grant funding to elevate the structures, relocate them, or acquire and demolish the structures. Single family homes with basements may require waterproofing mitigation techniques.

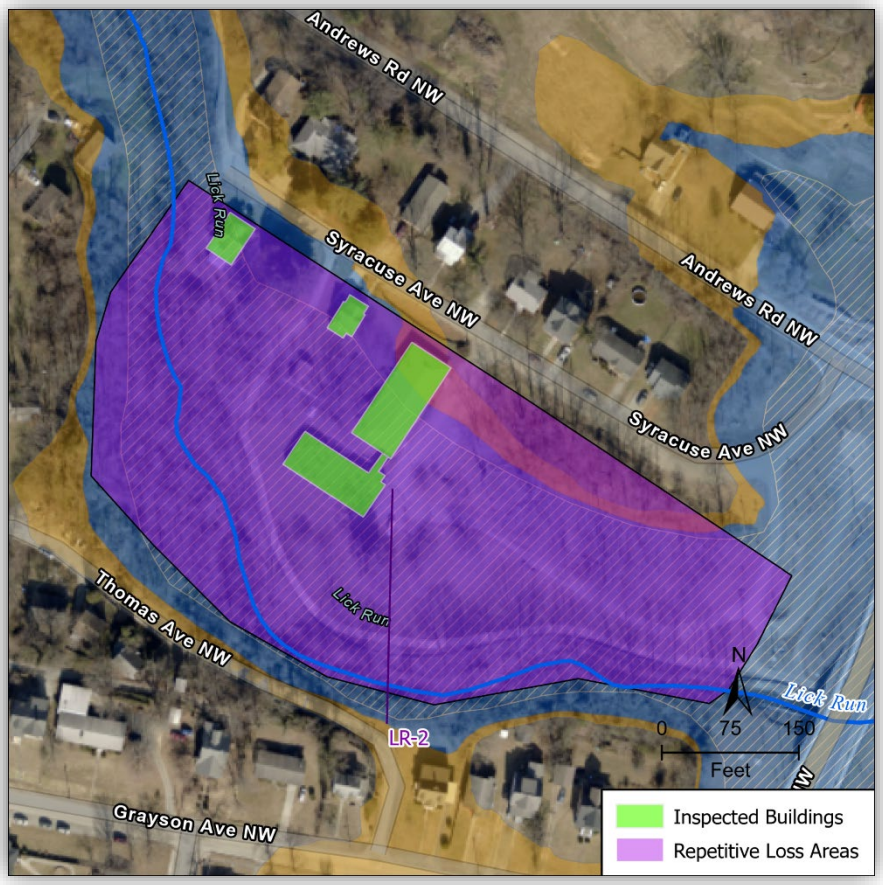
Recommended Property Owner/Resident Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2' above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Consider basement waterproofing techniques

Lick Run

Syracuse Ave. (LR-2)

Syracuse Ave. Area Overview	
Floodway Structures	4
Repetitive Loss Structures	2
Flood Depth Range (1% chance flood)	5.18'-14.19'
Vulnerability Index Score	2.6
Surveys Returned	0
Total Structures in Area	4
FEMA Documented Flooding Events (RL list)	2015, 2013, 1996, 1989, 1987



Flooding Summary:

There are two residential homes & 2 commercial structures in 1% chance floodplain (100 year, Zone AE). The residential properties border Lick Run and all structures have basements.

City Consideration for Structures:

FEMA PDM Grant applied for in 2019 and granted in 2021 for acquisition and demolition of vacant properties. Open space will be for community use.

Non-mitigated floodplain properties that experience repeated flooding are prime candidates for grant funding to elevate the structures, relocate them, or acquire and demolish the structures. Single family homes with basements may require waterproofing mitigation techniques.

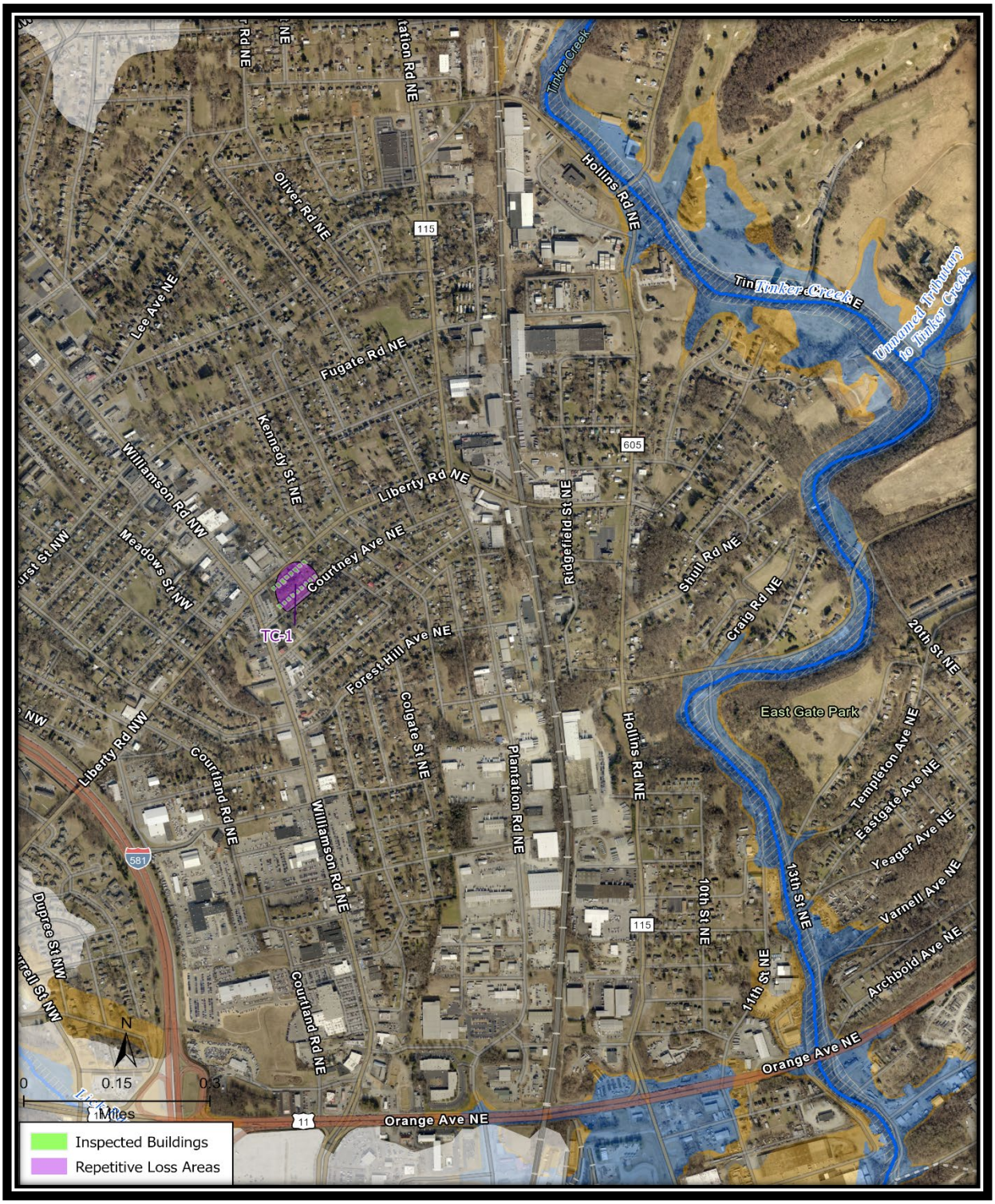
Recommended Property Owner/Resident Actions:

- Mark your breaker box to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2’ above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Consider basement waterproofing techniques

Tinker Creek

Watershed Map

This map shows the repetitive loss area included in this study in the Tinker Creek watershed.



Tinker Creek

Liberty Road/Williamson Area (TC-1)

Liberty Road/Williamson Road Area Overview	
Floodway Structures	0
Repetitive Loss Structures	1
Severe Repetitive Loss Structures	1
Flood Depth Range (1% chance flood)	~ 2’
Vulnerability Index Score	0.4
Surveys Returned	1
Total Structures in Area	17
Owner Occupied	7
Potential Rental Property	10
FEMA Documented Flooding Events (RL list)	2006, 1984, 1983, 1981, 1978

Flooding Summary:

The repetitive loss area along the Liberty Road receives almost 7 acres of run off which can cause ponding of stormwater under heavy and prolonged rain events. Additionally the properties along Liberty Road, NE have been constructed below road grade an average of 2-3 feet with structures not having adequate positive drainage. Changes to the natural topography of the area by surrounding construction and development has been a negative factor contributing to this problem.

Capital Improvement Project:

A Capital Improvement Project (CIP) in 1986 increased road inlets and pipe sizes in this immediate area, which has alleviated flooding from smaller storms. This area can still flood under heavy and prolonged rain events. A larger CIP has been delineated along the adjoining 2600-2700 block of Williamson Road corridor and Liberty Road, to increase the quantitative capture of the road runoff and to abandon an existing non-functioning Drainage Well. This project is currently ranked #57 out of 215 Capital Improvement Projects. Based on current supplemental funding by VDOT Revenue Sharing, the

expectation is this project to be available for design and construction in 2034, with an estimated cost of $375,000.

City Consideration for Structures:

The best course of action to break the repetitive loss cycle in this area of non-riverine flooding is to acquire and demolish houses that are currently below grade. Soil fill could be added with regrading of the lots to create positive drainage. Lots could be sold and redeveloped. This in combination with the Capital Improvement Project will correct the flooding problem.

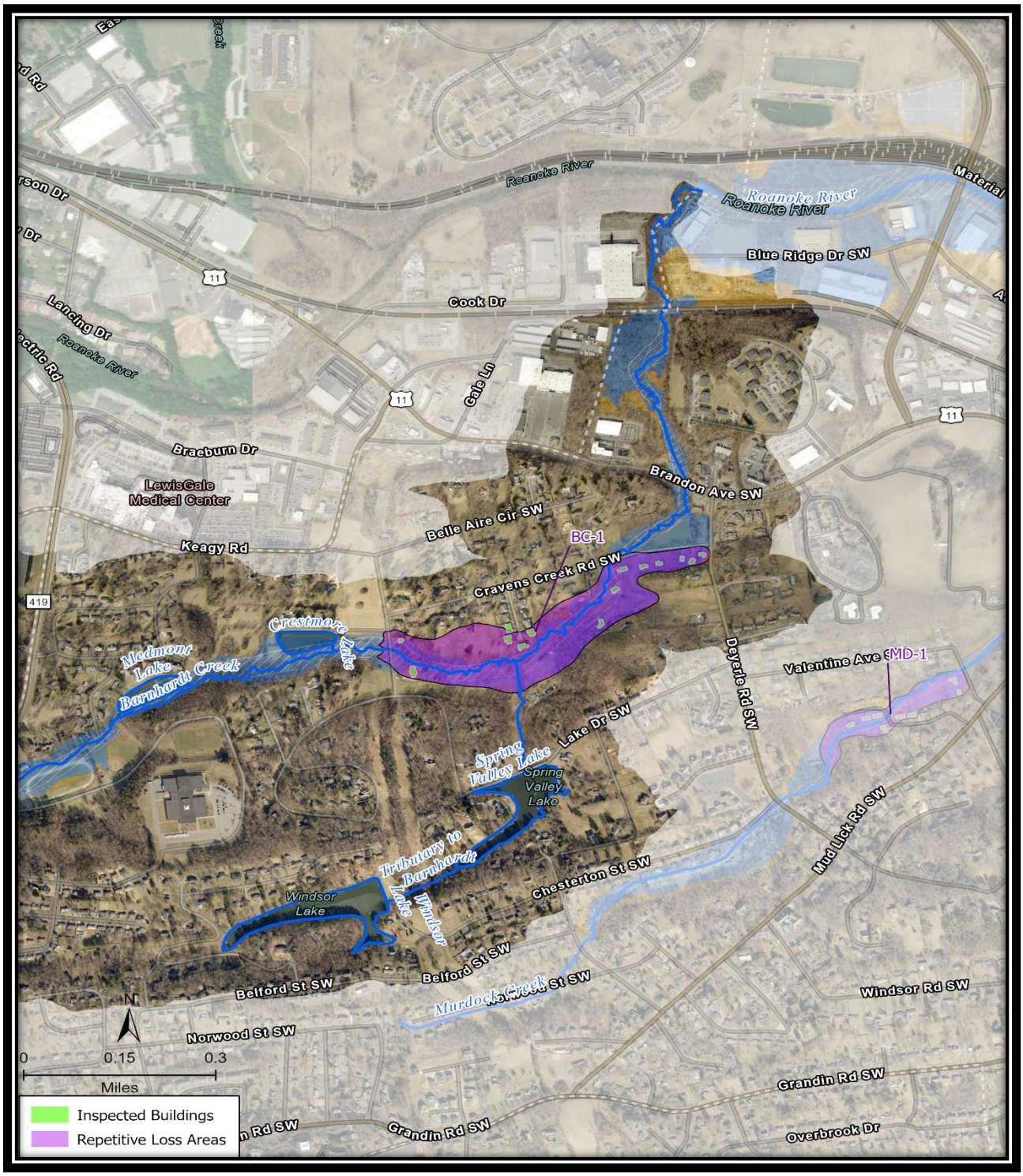
Recommended Property Owner/Resident Actions:

- Mark your breaker box to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2’ above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Consider basement waterproofing techniques

Barnhardt Creek

Watershed Map

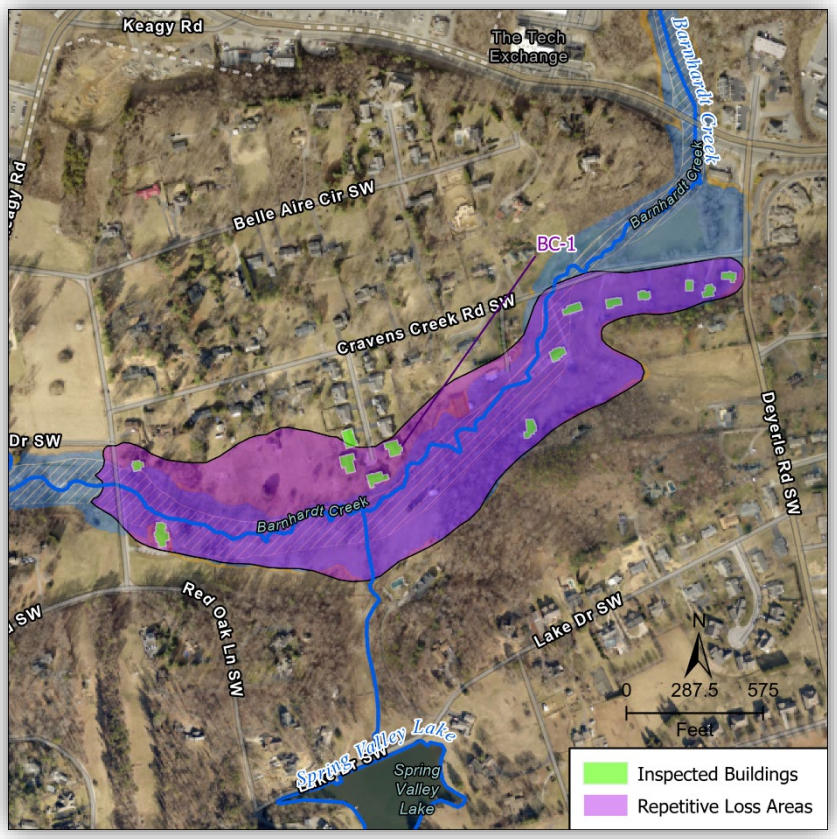
This map shows the repetitive loss area included in this study in the Barnhardt Creek watershed.



Barnhardt Creek

Craven's Creek Road from Crestmoor Drive to Deyerle Road (BC-1)

Craven's Creek Road from Crestmoor Drive to Deyerle Road Area Overview	
Floodway Structures	3
Repetitive Loss Structures	2
Flood Depth Range (1% chance flood)	~3-7'
Vulnerability Index Score	0.7
Surveys Returned	3
Total Structures in Area	14
Owner Occupied	12
Potential Rental Property	1
FEMA Documented Flooding Events (RL list)	2013, 2004, 1995



Flooding Summary:

There are nine houses located in the 1% chance floodplain (100 year, Zone AE). Three of these are located in the floodway or very close to it, which increases flooding risk and the potential for more damages. Additional risk could come from a potential dam failure on a tributary to Barnhardt Creek that could quickly impact residential structures downstream.

There are two privately owned dams creating lakes serving the Windsor and Spring Valley Neighborhoods. In the event that the Windsor dam should experience failure, homes along Cravens Creek Ln SW would be in the direct path to receive water from the lake via the unnamed tributary feeding and leading from the lake. A dam breach would have similar flood depths to a 1% chance flood (100 year flood) event; however, the time scale would be considerably short and under the worst case scenario for Windsor Dam taking 5.4 minutes to reach Craven's Creek Road and 11.4 minutes to reach Deyerle Drive and Brandon Road intersection. Modeled flood depths of a Windsor dam breach could range from 2.3-4.3' at these bridge sites depending on the type of breach and conditions. Specific residential lot topography would dictate flood depths for each individual property owner in the 1%

chance floodplain. Maximum, worst case modeled depths were no higher than 7' along Cravens Creek Road.

In the event that the Spring Valley dam should experience failure, homes along Cravens Creek Ln SW would be in the direct path to receive water from the lake via the unnamed tributary feeding and leading from the lake. A dam breach would have lower flood depths than a 1% chance flood (100 year flood) event; however, the time scale would be shorter and under the worst case scenario for Spring Valley, taking 10.6 minutes to reach Craven's Creek Road and 16.25 minutes to reach Deyerle Drive, and 16.8 minutes to reach the Brandon Road intersection. Modeled flood depths of a Spring Valley dam breach could range from 0.3'-2.73' at these bridge sites depending on the type of breach and conditions. Specific residential lot topography would dictate flood depths for each individual property owner in the 1% chance floodplain. Maximum, worst case modeled depths were no higher than 2.73' along Cravens Creek Road.

Each dam has an Emergency Action Plan's (EAP) with emergency procedures and a communication plan in place. Updates to the Windsor Lake EAP, along with an EAP drill were conducted 10.23.2020. Spring Valley conducted an emergency evaluation on 6.21.20.

Of note: Only two of the thirteen impacted residential floodplain structures in this repetitive loss area have an elevation certificate on file with the City of Roanoke.

Capital Improvement Project:

A project is planned to replace the Cravens Creek Road crossing over Barnhardt Creek with new box culverts to increase capacity to a 10-year storm. This project is #82 out of 215 Capital Improvement Projects and currently does not have an estimated implementation schedule.

City Consideration for Structures:

Floodway and floodplain properties that experience repeated flooding are prime candidates for FEMA or Virginia Community Preparedness Fund grant funding to elevate the structures, relocate them, or acquire and demolish the structures. Single family homes with basements may require waterproofing mitigation techniques.

Recommended Property Owner Actions:

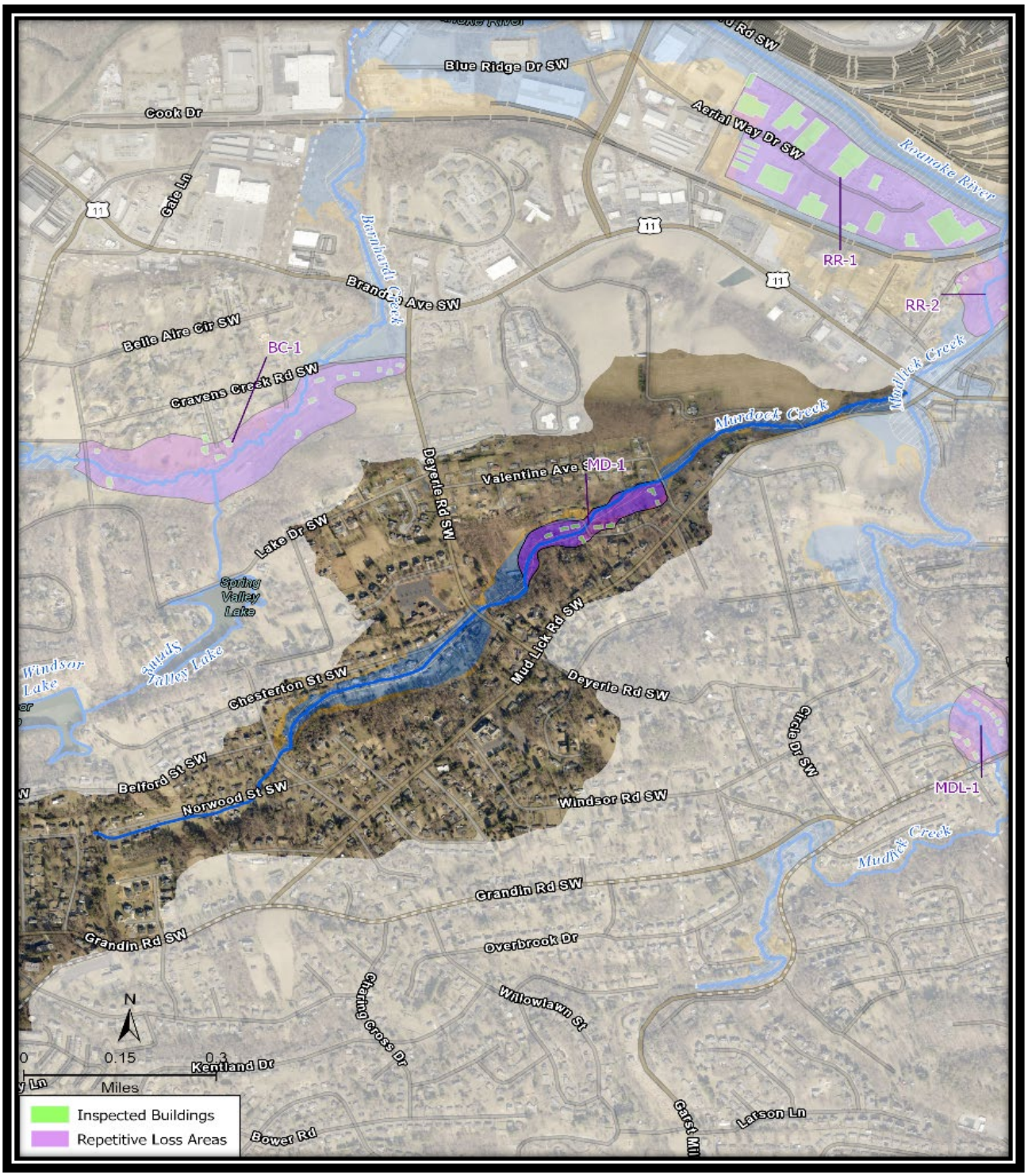
- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Consider getting an elevation certificate to establish base flood elevation and floor heights to adequate access risk and plan mitigation projects.
- Raising any mechanicals to 2' above the BFE

- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Consider basement waterproofing techniques

Murdock Creek

Watershed Map

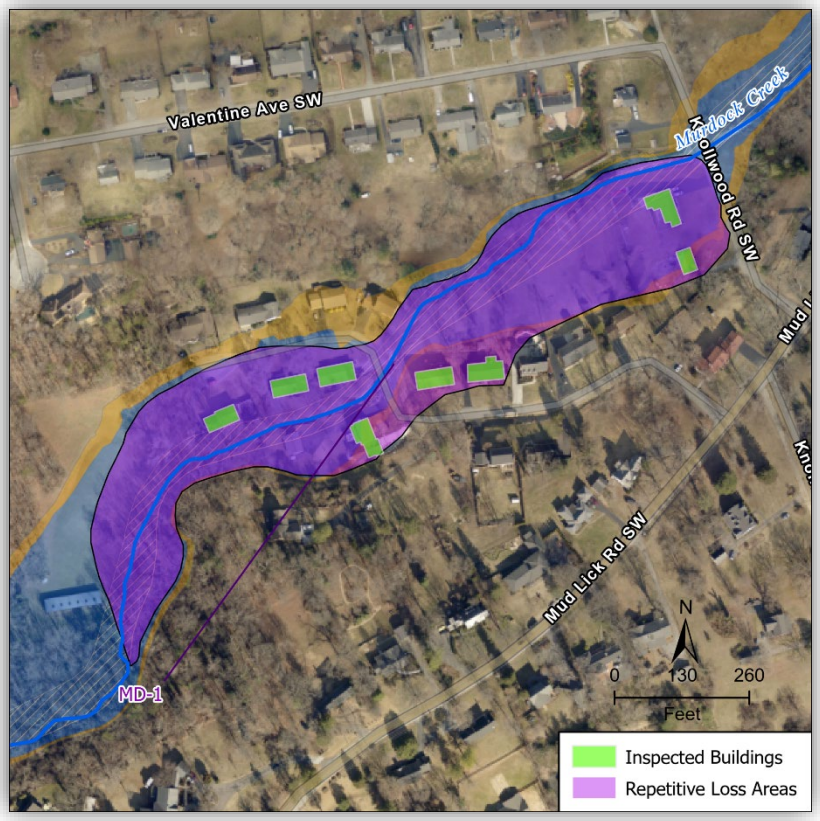
This map shows the repetitive loss area included in this study in the Murdock Creek watershed.



Murdock Creek

Clara Ave to Knollwood Rd (MD-1)

Clara Ave SW to Knollwood Rd SW Area Overview	
Floodway Homes	3
Repetitive Loss Homes	2
Severe Repetitive Loss Home	1
Flood Depth Range (1% chance flood)	2.21'-2.74'
Vulnerability Index Score	0.7
Surveys Returned	0
Total Structures in Area	8
Basements	6
Owner Occupied	8
FEMA Documented Flooding Events (RL list)	2009, 2004, 1997, 1996, 1989, 1982, 1979, 1978



Flooding Summary:

Murdock Creek is considered to be an intermittent stream. Six houses are in the 1% chance floodplain (100 year, Zone AE). Under large or intense rainfall events flooding can occur and can be intensified around culverts or bridges. Most of the stream has a concrete channel bottom that provides little flow resistance to reduce water speed.

Capital Improvement Project:

A smaller interim project was completed in 2019 to relieve some of the stormwater runoff affecting this area due to smaller storms. A permanent project is planned to increase culvert size under Mud Lick Road and install supplementary inlets to reduce runoff overland flow to the low point in the neighborhood. New pipe will direct stormwater across Knollwood Rd. to eastern side to minimize false ditches and utility conflicts. Pipe will outfall into Murdock Creek. This project is ranked 100th out of 215 total capital improvement projects. No implementation dates have been established to date.

City Consideration for Structures:

Floodway and floodplain properties that experience repeated flooding are prime candidates for FEMA or Virginia Community Preparedness Fund grant funding to elevate the structures, relocate them, or acquire and demolish the structures.

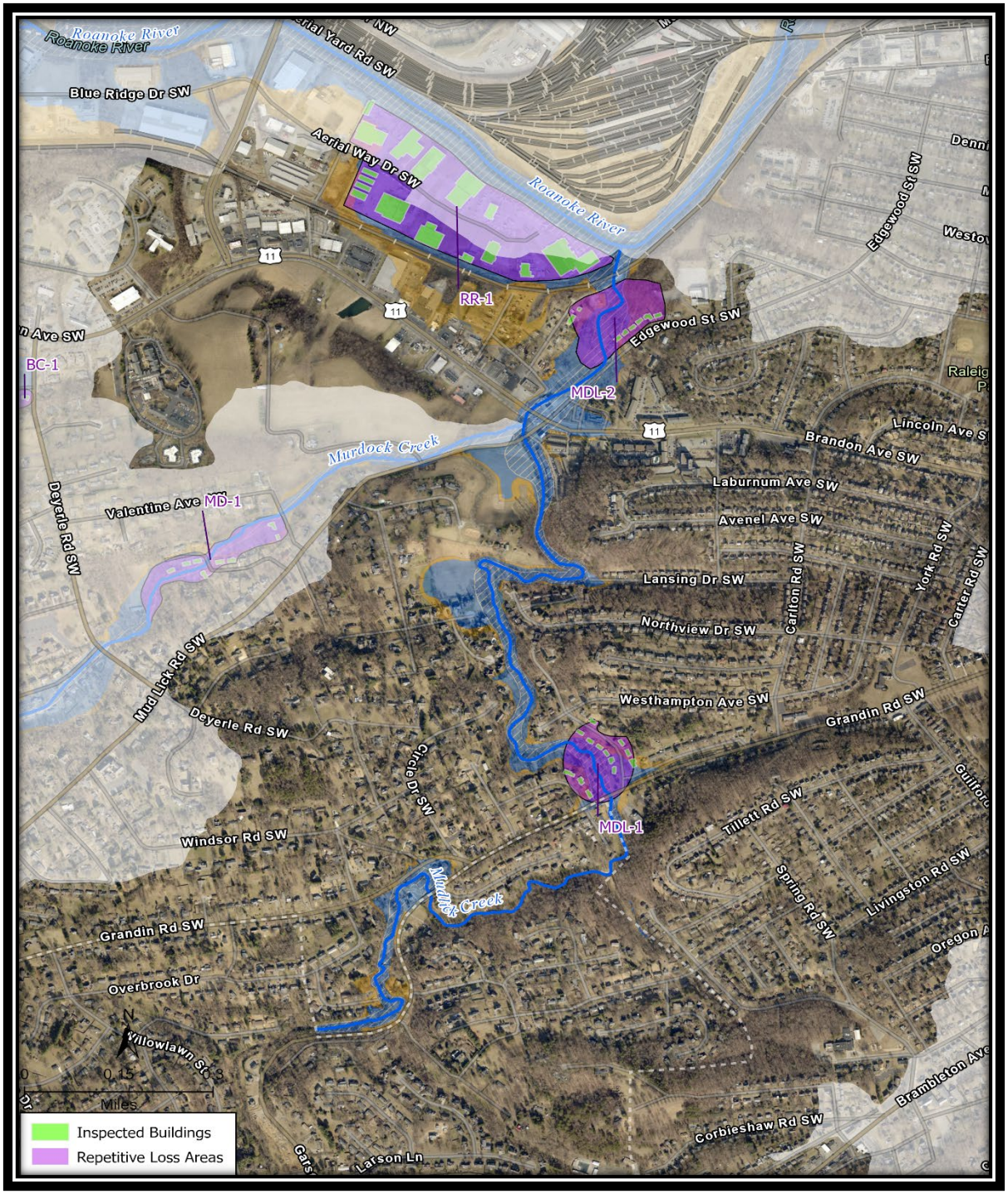
Recommended Property Owner Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2’ above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Consider basement waterproofing techniques

Mudlick Creek

Watershed Map

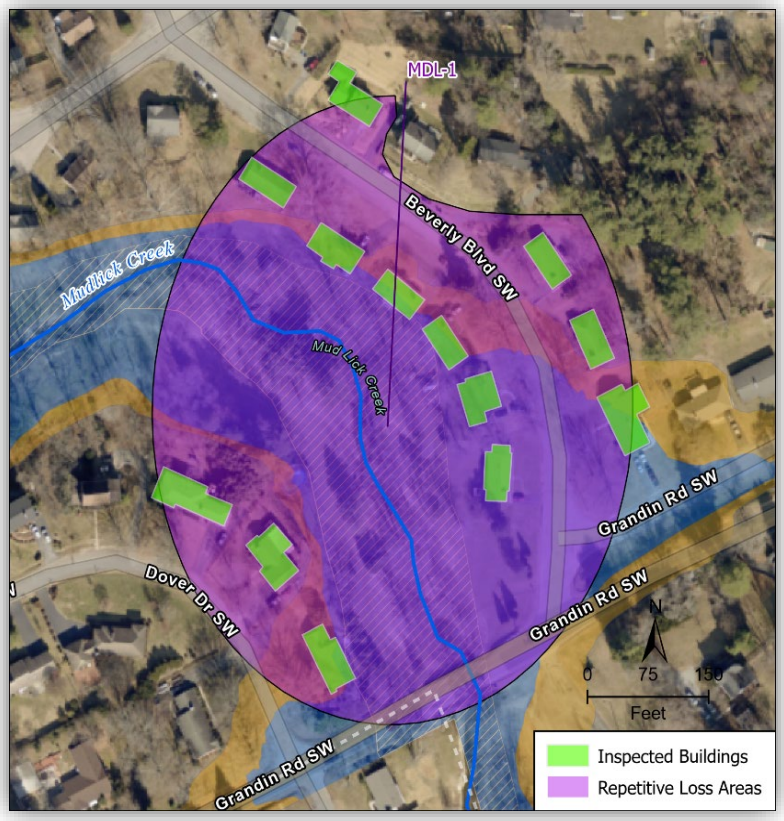
This map shows the repetitive loss areas included in this study in the Mudlick Creek watershed.



Mudlick Creek

Beverly Blvd. SW at Grandin Road SW (MDL-1)

Beverly Blvd. SW at Grandin Road SW Area Overview	
Floodway Structures	3
Repetitive Loss Structures	1
Flood Depth Range (1% chance flood)	1.7'-5.4'
Vulnerability Index Score	0.7 (Dover Dr.) to -0.6 (Beverly Blvd.)
Surveys Returned	2
Total Structures in Area	13
Owner Occupied	10
Potential Rental Properties	2
FEMA Documented Flooding Events (RL list)	2018 (2 separate events)
Survey Documented Flooding Events	2018 (2 separate events)



Flooding Summary:

Seven houses are in the 1% chance floodplain (100 year, Zone AE) and one house is in the 0.2% chance floodplain (500 year, Zone X). Three houses are in the floodway.

This area is part of the City Community Rating System's Drainage System Maintenance Program and is checked after large weather events and under regular annual maintenance checks.

City Consideration for Structures:

One of the floodway properties has undertaken mitigation by elevation. Additional floodway properties could be acquired and demolished with successful FEMA or Virginia Community Preparedness Fund grant funding. Other floodplain properties could be elevated or demolished and redeveloped.

The City regularly maintains this section of Mudlick Creek under the Community Rating System's Drainage System Maintenance Program.

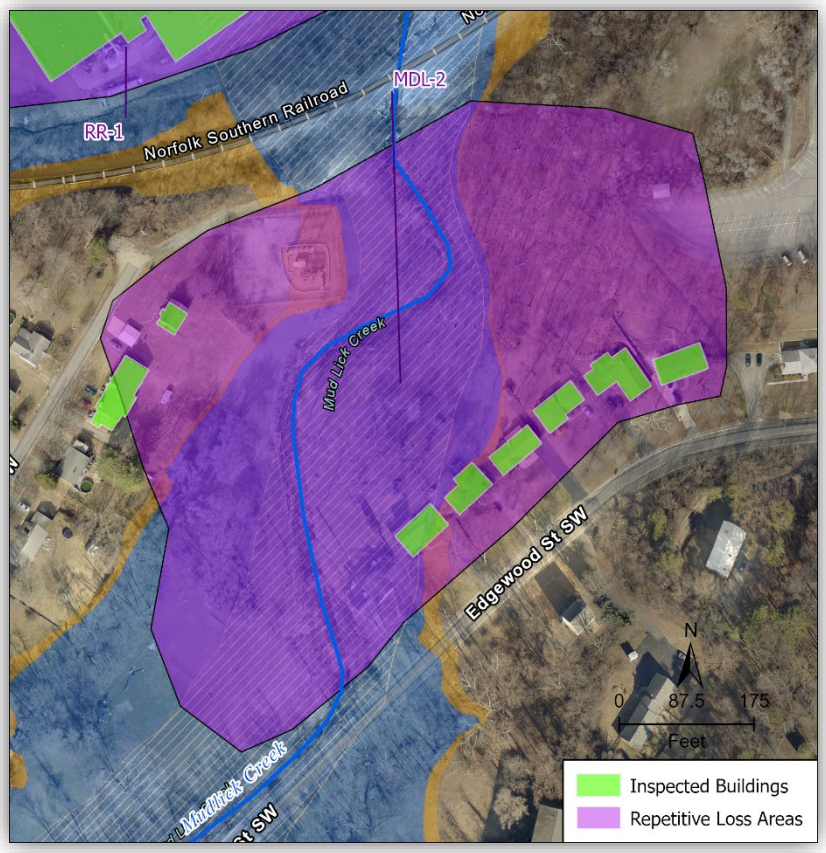
Recommended Property Owner/Resident Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2' above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Consider basement waterproofing techniques
- Report any Sanitary Sewer Overflows to Western Virginia Water Authority

Mudlick Creek

Edgewood Rd. (MDL-2)

Edgewood Rd. Area Overview	
Floodway Structures	1
Repetitive Loss Structures	1
Flood Depth Range (1% chance flood)	3.3'-6.8'
Vulnerability Index Score	0.7 (Overland Ave.) to 0.0 (Edgewood St.)
Surveys Returned	0
Total Structures in Area	8
Owner Occupied	6
Potential Rental Properties	2
FEMA Documented Flooding Events (RL list)	2018 (2 separate events)
Survey Documented Flooding Events	2018 (2 separate events)



Flooding Summary:

Four houses are in the 1% chance floodplain (100 year, Zone AE) and one house is in the 0.2% chance floodplain (500 year, Zone X). This area is subject to flooding from Mudlick Creek and also as the Roanoke River increases in flood elevation, floodwater from the Mudlick Creek watershed ponds and there is a Roanoke River backwater effect. Additionally, debris carried by floodwaters could cause a dam-effect against the Norfolk Southern Railroad.

This area is part of the City Community Rating System's Drainage System Maintenance Program and is checked prior to forecasted large weather events, after large weather events, and under regular annual maintenance checks.

City Consideration for Structures:

One of the floodway properties has undertaken mitigation by acquisition and demolition in 2019 and is no longer included in the flood structure count. Additional floodway properties could be acquired

and demolished with successful FEMA or Virginia Community Preparedness Fund grant funding. Other floodplain properties could be elevated or demolished and redeveloped.

The City regularly maintains this section of Mud Lick Creek under the Community Rating System's Drainage System Maintenance Program.

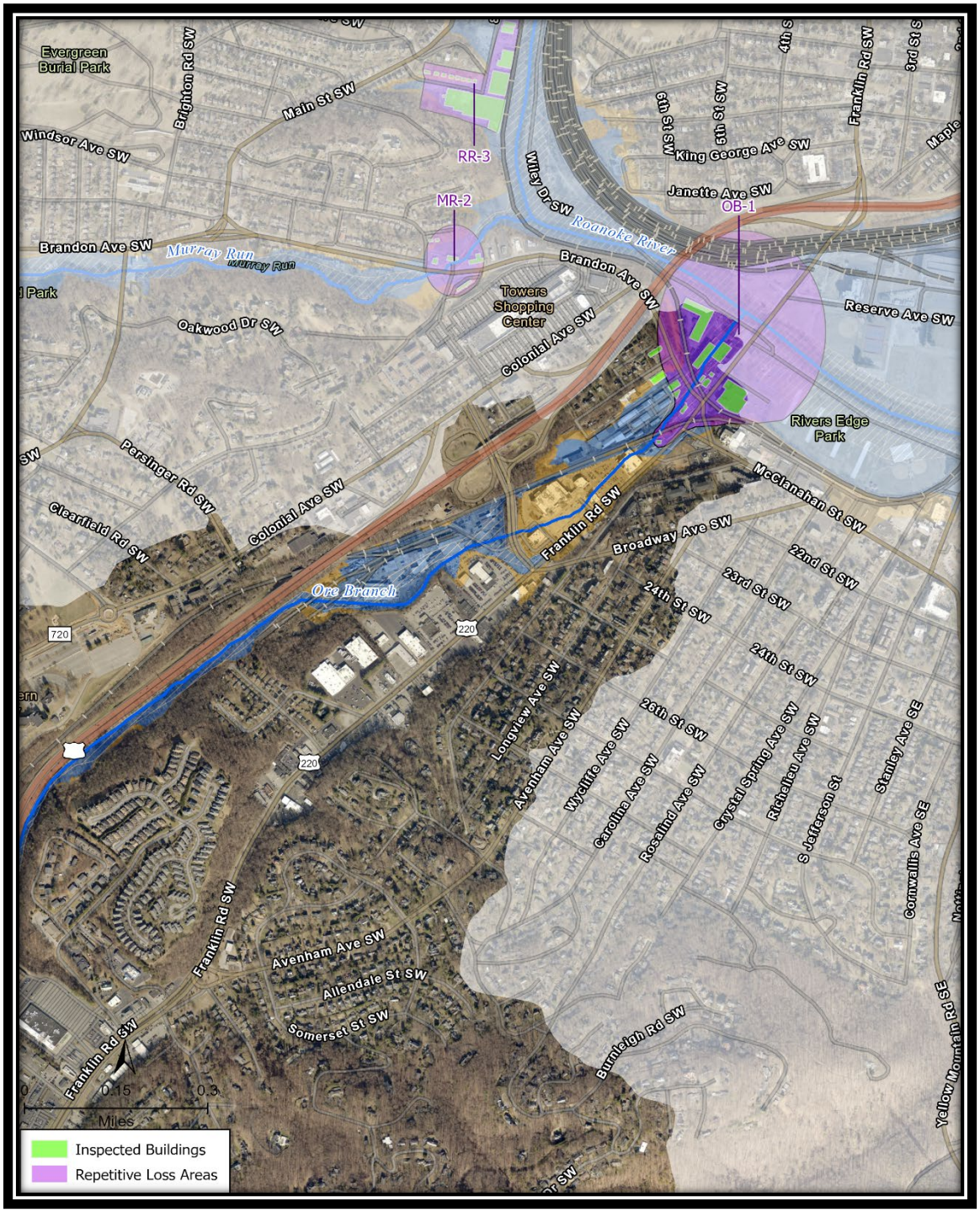
Recommended Property Owner/Resident Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2' above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Consider basement waterproofing techniques
- Report any Sanitary Sewer Overflows to Western Virginia Water Authority

Ore Branch

Watershed Map

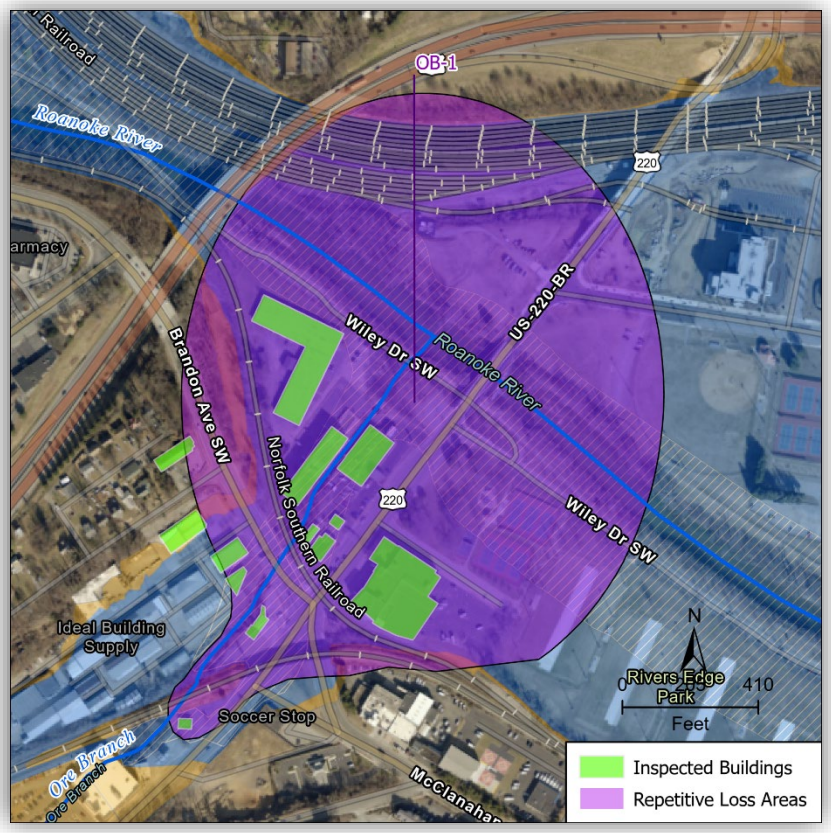
This map shows the repetitive loss area included in this study in the Ore Branch watershed.



Ore Branch

Franklin Road (OB-1)

Franklin Rd. Area Overview	
Floodway Structures	11
Repetitive Loss Structures	3
Flood Depth Range (1% chance flood)	3.11'-7.28'
Vulnerability Index Score	-0.1
Surveys Returned	0
Total Structures in Area	14
FEMA Documented Flooding Events (RL list)	2018, 2011, 2009, 2006, 2005, 2004, 2003, 1993, 1992, 1987, 1985, 1979, 1978
Survey Documented Flooding Events	2018 (2 separate events)



Flooding Summary:

Fourteen commercial structures are in the 1% chance floodplain (100 year, Zone AE). This area is subject to flooding from Ore Branch and many of these structures are in the 10% chance floodplain (10 year, Zone AE) so buildings can experience a greater frequency of flooding. Additionally, as the Roanoke River flood depths increase, river water can backflow into Ore Branch compounding flooding issues in this repetitive loss area.

City Consideration for Structures:

In 2019, the City submitted a PDM Grant for acquisition and demolition of three commercial structures. Additional floodplain properties could be acquired and demolished with successful FEMA or Virginia

Community Preparedness Fund grant funding. Other floodplain properties could be elevated or demolished and redeveloped.

Capital Improvement Projects:

There is a proposed project to install new box culverts at the Roanoke River Greenway Wiley Drive Crossing. This project is in the Preliminary Design Stage and is ranked #33 out of 215 Capital Improvement Projects.

A second project is proposed to add a supplemental box culvert to the stream channel crossing at Brandon Ave. This project is in the Preliminary Design Stage and is ranked #147 out of 215 Capital Improvement Projects.

A third proposed project at the Railroad crossing to add supplemental culvert(s) and enlarge stream channel to reduce backwater from Roanoke River and tailwater conditions due to Ore Branch. This project is in the Preliminary Design Stage and is ranked #58 out of 215 Capital Improvement Projects.

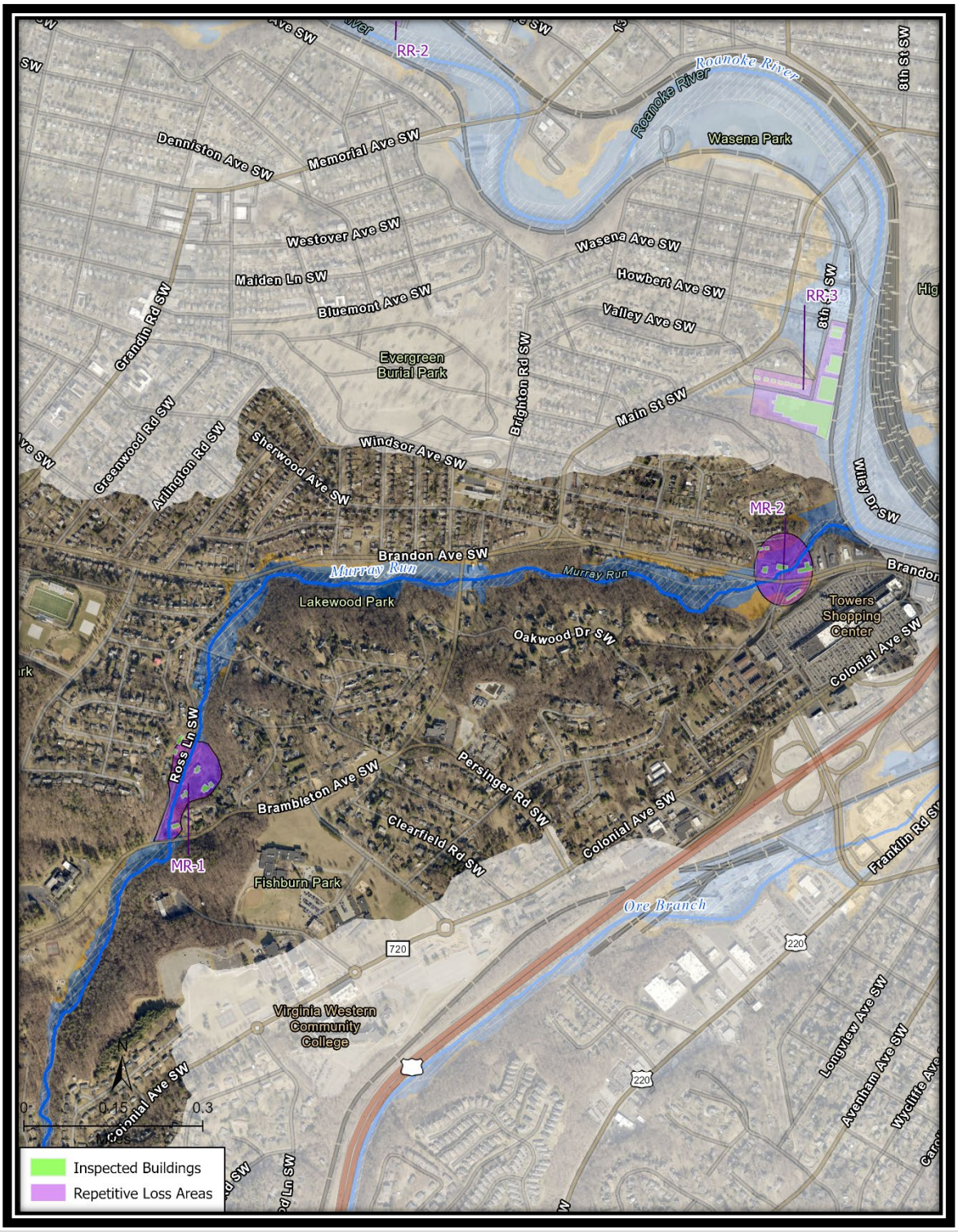
Recommended Property Owner/Resident Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2’ above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Consider floodproofing techniques

Murray Run

Watershed Map

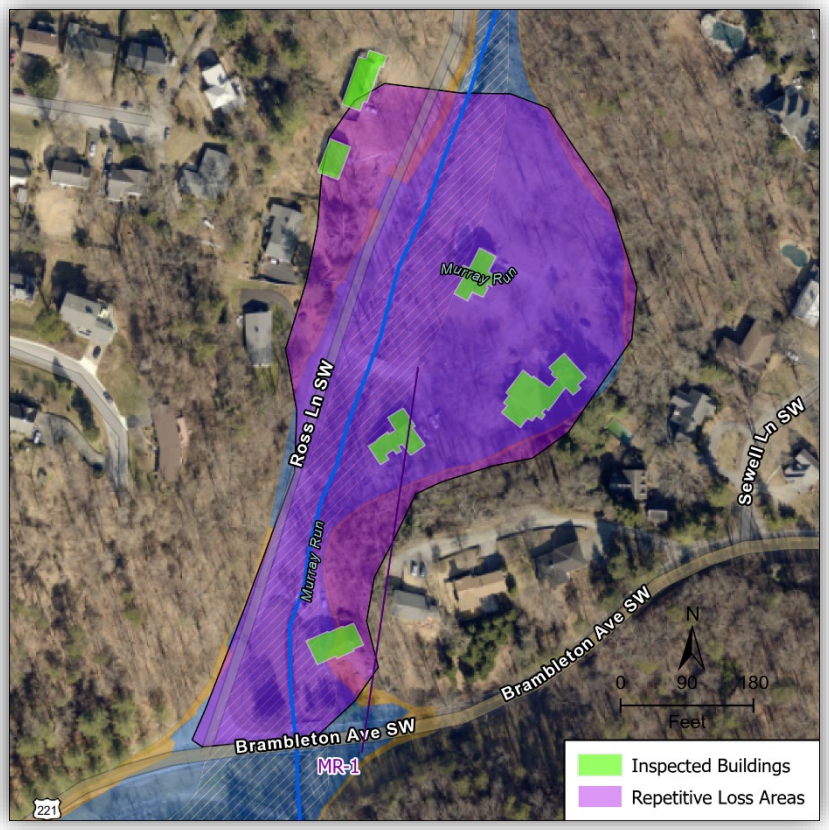
This map shows the repetitive loss areas in the Murray Run watershed.



Murray Run

Ross Lane (MR-1)

Ross Lane Area Overview	
Floodway Structures	3
Repetitive Loss Structures	1
Flood Depth Range (1% chance flood)	1-3' (based on BFE & topography)
Vulnerability Index Score	-0.1
Surveys Returned	0
Total Structures in Area	6
FEMA Documented Flooding Events (RL list)	2018, 2011, 2003



Flooding Summary:

Four houses are in the 1% chance floodplain (100 year, Zone AE). This area is subject to flooding from Murray Run. There are no Elevation Certificates on file with the City of Roanoke. All properties are owner occupied.

City Consideration for Structures:

Floodplain properties could be elevated, moved/demolished and redeveloped out of the floodway with successful FEMA or Virginia Community Preparedness Fund grant funding.

Recommended Property Owner/Resident Actions:

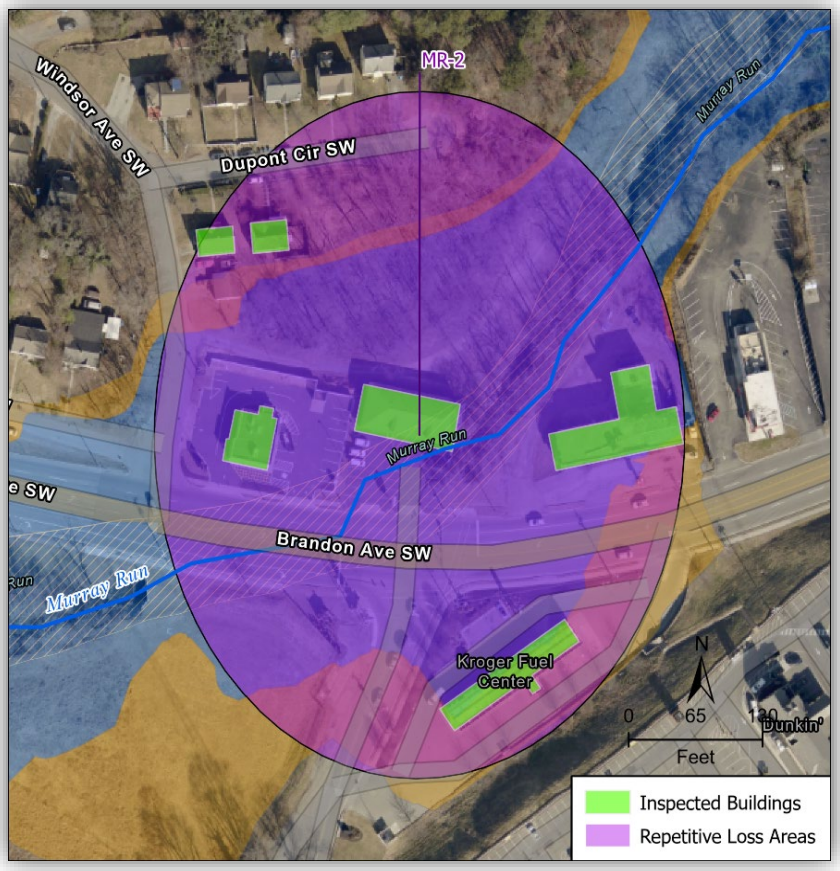
- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.

- Raising any mechanicals to 2’ above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups

Murray Run

Brandon Road near Towers (MR-2)

Brandon Road near Towers Area Overview	
Floodway Structures	1
Repetitive Loss Structures	1
Severe Repetitive Loss Structure	1
Flood Depth Range (1% chance flood)	4.13’ - 10’
Vulnerability Index Score	-0.1
Surveys Returned	0
Total Structures in Area	6
FEMA Documented Flooding Events (RL list)	2005, 2004, 2003, 1992, 1985, 1981, 1979, 1978



Flooding Summary:

There are four commercial structures houses are in the 1% chance floodplain (100 year, Zone AE). This area is subject to flooding from Murray Run. Additionally, as the Roanoke River flood depths increase, river water can backflow into Murray Run compounding flooding issues in this repetitive loss area.

Inundation modeling shows that as Roanoke River heights approach a flood stage of 16’ (923.0 water surface elevation), three commercial buildings experience flooding as shown in the image below.

City Consideration for Structures:

Floodplain properties could be elevated, acquired and demolished, or demolished and redeveloped with successful FEMA or Virginia Community Preparedness Fund grant funding.

Recommended Property Owner/Resident Actions:

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising any mechanicals to 2’ above the BFE
- Maintain flood insurance policies for property structure and contents
- Install back-up valves as applicable to prevent sewer backups
- Consider floodproofing techniques

Hortons Branch Watershed

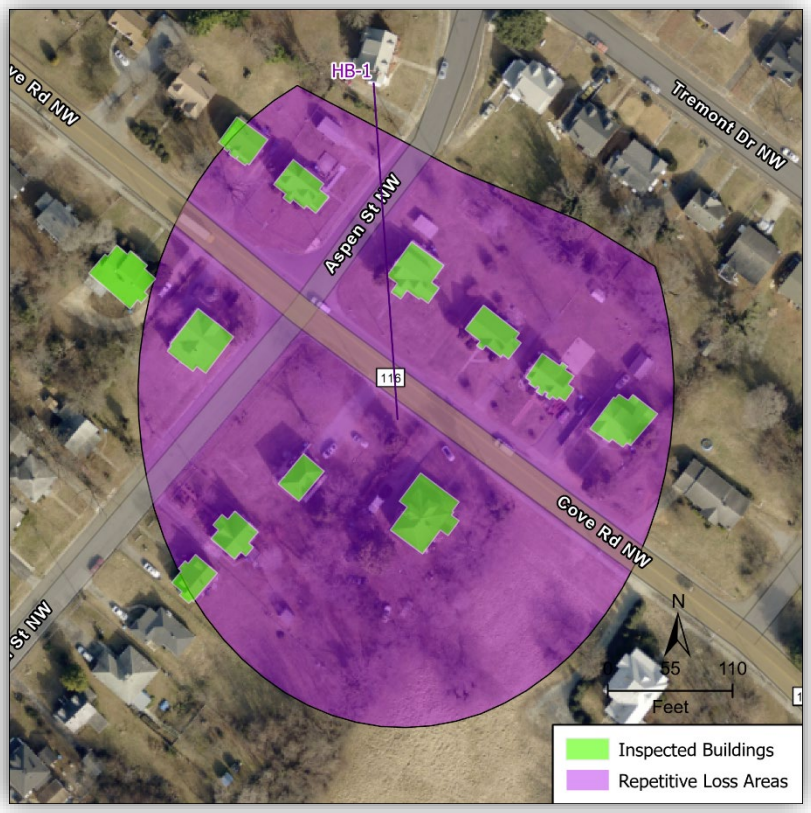
Watershed Map

This map shows the repetitive loss areas in the Hortons Branch watershed.

Hortons Branch Watershed

Cove Rd. NW and Aspen St. NW (HB-1)

Cove Rd. NW and Aspen St. NW Area Overview	
Repetitive Loss Homes	1
Ponding Depth	May vary due to site conditions but estimated to be no more than 2’ in large storm events
Vulnerability Index Score	1.3 to 0.7
Surveys Returned	1
Total Homes in Area	12
FEMA Documented Flooding Events (RL list)	2018, 2013
Survey Documented Flooding Events	2019, 2013



Flooding Summary:

The area is subject to non-riverine flooding. Frequent street flooding presently occurs due to insufficient pipe networks to carry large storm events. The combination of insufficient pipes and sparse curb and gutter cause multiple areas within this basin-like area to pond. The flooding effects many properties within the Cove/Aspen area. Currently, localized ponding and flooding occur in specific areas near homes. Soils in this section of the watershed have a moderately high-to-high rate of runoff potential, which exacerbates the issues.

Capital Improvement Project:

The Fresno & Aspen Project was completed in 2017. The project installed about 2,500 linear feet of storm drain pipe on Fresno Street, Aspen Street, Ajax Avenue, Cove Road, and Abbott Street, NW. This system was designed to handle the 10-year storm event. Additional projects may need to be considered in this specific repetitive loss area.

Recommended Property Owner Actions

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising mechanicals to 2' or known flood depth at specific sites.
- Maintain flood insurance policies for property structure and contents.
- Install back-up valves as applicable to prevent sewer backups.
- Consider basement waterproofing techniques

Hortons Branch Watershed

Aspen St. NW (HB-2)

Aspen St. NW Area Overview	
Repetitive Loss Homes	1
Ponding Depth	May vary due to site conditions but estimated to be no more than 2' in large storm events
Vulnerability Index Score	1.3
Surveys Returned	0
Total Homes in Area	13
FEMA Documented Flooding Events (RL list)	1983, 1978

Flooding Summary:

The area is subject to non-riverine flooding. Frequent street flooding presently occurs due to insufficient pipe networks to carry the storm event. The combination of insufficient pipes and sparse curb and gutter cause multiple areas within the basin to pond. The flooding effects many properties within the Aspen St. area. Currently, localized ponding and flooding occur in specific areas near homes. Soils in this section of the watershed have a moderately high-to-high rate of runoff potential which exacerbates the issues.

Capital Improvement Project:

A major project will upgrade the existing 48" main trunk line with a 60" main trunk line. Additionally, a new stormdrain system will be installed complete with curbing and inlets sized to accommodate a 10 year storm event. This project is in the Preliminary Design Stage and ranks #20 out of 215 on the Capital Improvement Project List. No implementation timeline has been established.

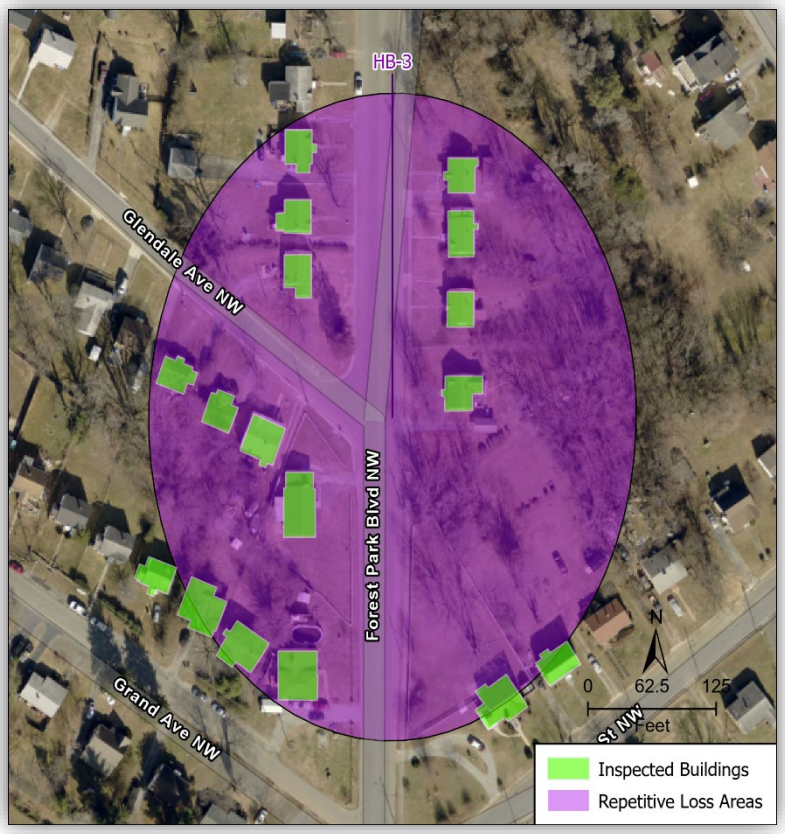
Recommended Property Owner Actions

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising mechanicals to 2' or known flood depth at specific sites.
- Maintain flood insurance policies for property structure and contents.
- Install back-up valves as applicable to prevent sewer backups.
- Consider basement waterproofing techniques

Hortons Branch Watershed

Forest Park Blvd. NW (HB-3)

Forest Park Blvd. NW Area Overview	
Repetitive Loss Homes	1
Ponding Depth	May vary due to site conditions but estimated to be no more than 2' in large storm events
Vulnerability Index Score	1.3
Surveys Returned	1
Total Homes in Area	17
FEMA Documented Flooding Events (RL list)	1998, 1995, 1989, 1985, 1978
Survey Documented Flooding Events	2020, 2019, 2018, 2017



Flooding Summary:

Frequent street flooding presently occurs due to insufficient pipe networks to carry the storm event. The combination of insufficient pipes and sparse curb and gutter cause multiple areas within the basin to pond. The flooding effects many properties within the Forest Park area. Currently, localized ponding and flooding occur in specific areas near homes. Soils in this section of the watershed have a moderately high-to-high rate of runoff potential, which exacerbates the issues.

Capital Improvement Projects:

There are five planned major projects that will help alleviate flooding problems above and below this repetitive loss area. Please note: These projects below are included in the Forest Park Plan which is 20 years old. Stormwater engineers are currently reassessing the projects in the upper portion of the

Horton's Branch watershed to make sure issues are being addressed in the best way as well as optimizing flood control and water quality measures.

1. **Melrose Ave.**

This Capital Improvement Project will enlarge carrying capacity under Melrose Ave along with improvements of inlets and outfalls. The existing 6' x 3' concrete box culvert under Melrose Avenue is not adequate for the 2-year event. The upstream and downstream channels are also inadequate for the 2-year event. There are signs of bank erosion and undercutting which indicates that the channel has insufficient capacity. Several homes experience flooding upstream of Melrose Avenue due to the backwater from the undersized culvert and inadequate channel capacity. This project is in the Preliminary Design Stage and ranks #2 out of 215 on the Capital Improvement Project List. The anticipated date this project will be installed is 2026, pending VDOT revenue sharing money.

2. **Forest Park Blvd. to Palm Ave.**

This Capital Improvement Project will install a new Stormdrain System will be installed complete with curbing and inlets sized to accommodate a 10 year storm event. This project is in the Preliminary Design Stage and ranks #11 out of 215 on the Capital Improvement Project List. No implementation timeline has been established.

3. **Forest Park Blvd. from Palm Ave. to Aspen St.**

This Capital Improvement Project will install a new Stormdrain System will be installed complete with curbing and inlets sized to accommodate a 10 year storm event. This project is in the Preliminary Design Stage and ranks #12 out of 215 on the Capital Improvement Project List. No implementation timeline has been established.

4. **Glenrose Ave., and Grand Ave, & Golfside Ave.**

This Capital Improvement Project will install a new Stormdrain System will be installed complete with curbing and inlets sized to accommodate a 10 year storm event. This project is in the Preliminary Design Stage and ranks #16 out of 215 on the Capital Improvement Project List. No implementation timeline has been established.

5. **Forest Park Ave. and Golfside Ave.**

This Capital Improvement Project will install a new Stormdrain System will be installed complete with curbing and inlets sized to accommodate a 10 year storm event. This project is in the Preliminary Design Stage and ranks #17 out of 215 on the Capital Improvement Project List. No implementation timeline has been established.

6. **Aspen St., Alder St., Prillaman Ave., & Dudley St.**

This Capital Improvement Project will install a new Stormdrain System will be installed complete with curbing and inlets sized to accommodate a 10 year storm event. This project is in the Preliminary Design Stage and ranks #19 out of 215 on the Capital Improvement Project List. No implementation timeline has been established.

Recommended Property Owner Actions

- Mark breaker boxes to show the circuits serving floodable areas such as a basement. Turning off the power to these areas before a flood can reduce property damage and save lives.
- Raising mechanicals to 2’ or known flood depth at specific sites.
- Maintain flood insurance policies for property structure and contents.
- Install back-up valves as applicable to prevent sewer backups.
- Consider basement waterproofing techniques

Understanding Your Property's Risk

The City of Roanoke's Floodplain Ordinance

The City of Roanoke participates in the National Floodplain Insurance Program (NFIP). The NFIP provides federally backed flood insurance within communities that enact and enforce floodplain regulations. These floodplain regulations guide development to reduce the potential for flooding damage on future development. The City's floodplain regulation or ordinance is found in the Zoning Ordinance and is referred to as the Floodplain Overlay District.

Today's zoning and building code provides safety factors to protect against potential flood risk. Examples of such measures include elevation of the first floor, mechanicals, & appliances to 2' above the base flood depth on a particular site for a 1% annual chance flood, which was previously known as the 100-year flood.

Many homes were built before these safety measures were in place, including locating homes within the floodway, which is area of the floodplain that conveys the swift moving floodwaters. Today the use of property in the floodway is limited and precludes new residential uses. Further, no structures are allowed to be built in the floodway without an engineering study to prove the house doesn't cause the water in the floodway to rise. This is similar to how an ice cube dropped in a glass of water causes the level of water to rise in a glass. These engineering studies are very expensive and can cost up to $10,000.

As a part of the Floodplain Overlay District or floodplain building requirements, it is important to understand what substantial damage means to an existing home in the floodplain. If structures become substantially damaged by fire, tornado, flooding, or any other cause, the structure is required to be brought up to today's building code per the NFIP regulations found in the City's Floodplain Overlay District referenced above. This may include a Hydrologic and Hydraulic (H&H) stream study, filling or eliminating a basement, and/or elevating the main living floor and all appliances to 2' above the base flood elevation, which is the depth of the 1% chance floodwaters.

For someone who has flood insurance including increased cost of compliance insurance, this may be feasible. However, if you don't have flood insurance, the cost may be so high that it prohibits you from fixing your home. If substantial damage occurs, there may not be help available from the City of Roanoke or from FEMA.

Definitions

Freeboard: A factor of safety usually expressed in feet above a flood level for purposes of floodplain management. "Freeboard" tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effect of urbanization in the watershed. The City requires base flood elevation plus twenty-four (24) inches freeboard.

Increased cost of compliance: Increased Cost of Compliance (ICC) coverage is one of several resources available for flood insurance policyholders who need additional help rebuilding after a flood. It provides up to $30,000 to help cover the cost of mitigation measures that will reduce flood risk. ICC coverage is a part of most standard flood insurance policies available under the Federal Emergency Management Agency's (FEMA's) National Flood Insurance Program (NFIP).

Substantial damage: Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed fifty (50) percent of the market value of the structure before the damage occurred.

Substantial improvement: Any reconstruction, rehabilitation, addition, or other improvement of a structure, taking place during a period of five (5) years, the cumulative cost of which equals or exceeds fifty (50) percent of the market value of the structure before the "start of construction" of the improvement. This term includes repetitive loss structures or structures that that have incurred substantial damage regardless or the actual repair work performed.

Floodway Development:

Sec. 36.2-333 (d)(2)(i) Within any floodway area, no encroachments, including fill, new construction, substantial improvements, or other development shall be permitted unless it has been demonstrated through hydrologic and hydraulic analysis performed in accordance with standard engineering practice that the proposed encroachment will not result in any increase in flood levels within the community during the occurrence of the base flood discharge. Hydrologic and hydraulic analyses shall be undertaken only by professional engineers or others of demonstrated qualifications, who shall certify that the technical methods used correctly reflect currently-accepted technical concepts. Studies, analyses, computations, etc., shall be submitted in sufficient detail to allow a thorough review by the Zoning Administrator.

How important is Flood Insurance?

Scenario Examples for Individual Flooding or 5-Year Cumulative Events leading to Substantial Damage Losses

These examples are provided to help you think through your individual risk for your property and location. These are general and may not take into account all risk factors. If you have a federal backed mortgage and your property is in the Special Flood Hazard Area (SFHA), you are required to have flood insurance. However, if you own your home, your property is in the SFHA, and you do not have flood insurance, these examples may help assess potential additional costs.

1. **Substantially Damaged Home due to flooding WITHOUT Flood Insurance:**

Example:
Fair market house value excluding land value $100,000

- Actual damage to home = at least $50,000
- Money to fill basement and raise structure = projected to be at least $30,000

End result = This scenario would be almost as expensive as rebuilding your home, without any financial assistance.

2. **Substantially Damaged Home due to a cause other than flooding WITHOUT Flood Insurance:**

Example:
Fair market house value excluding land value $100,000

- Actual damage to home = at least $50,000
    - Normal home owners insurance would pay for damages caused by fire, tornado, tree damage, etc. but not flooding/water damage
- Money to fill basement and raise structure = projected to be at least $30,000

End result = This scenario would allow for the repair of the home with normal home owners insurance but would not cover the upgrades needed to meet the City's Floodplain Overlay District and current building code requirements.

3. **Substantially Damaged Home due to flooding WITH Flood Insurance & Increased Cost of Compliance (ICC):**

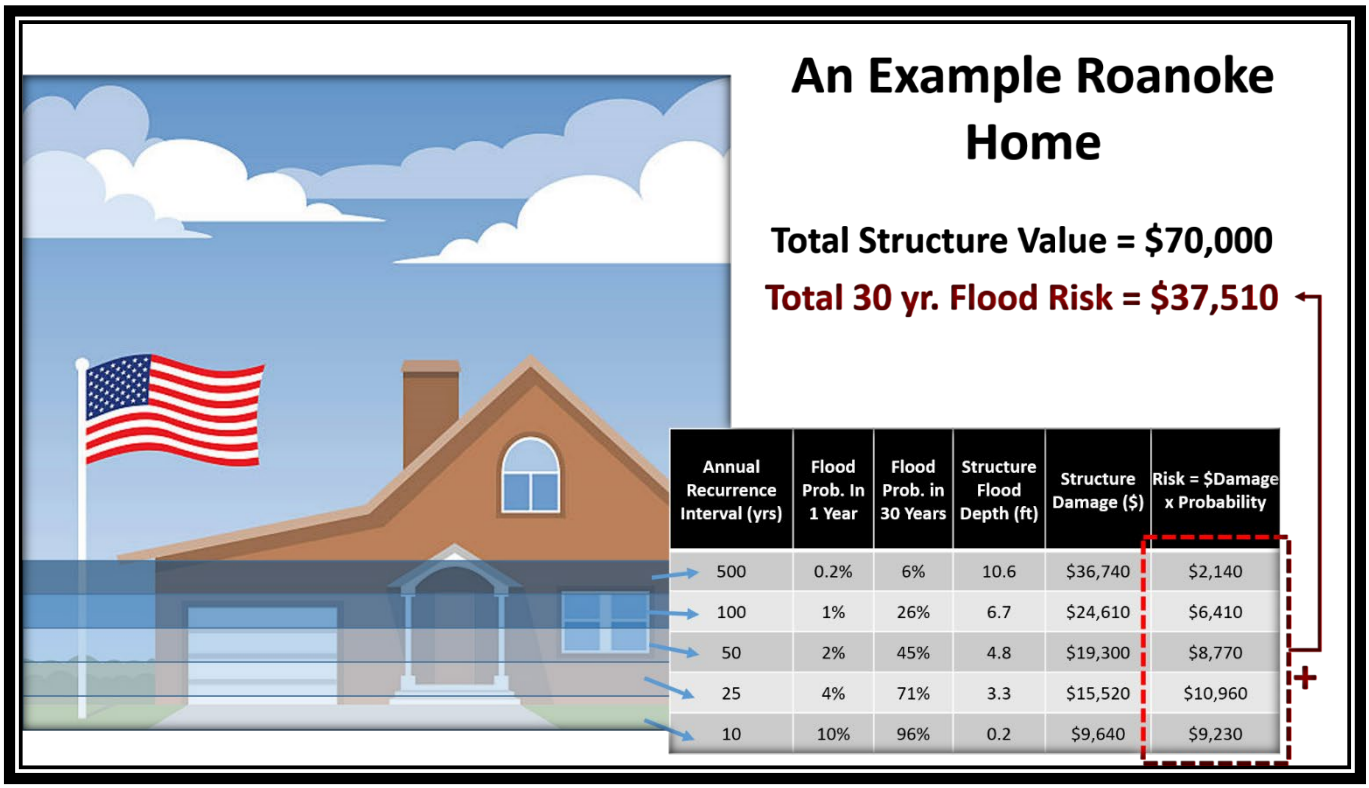
Example:
Fair market house value excluding land value $100,000

- Actual damage to home = at least $40,000-$50,000

- Money to fill basement and raise structure = projected to be at least $30,000

End result = The Owner receives money to repair the home and up to $30,000 to bring the house into compliance with today's building code.

Thinking About Your Individual Risk & Investment Over A 30 Year Mortgage



It is difficult to speculate on risk over the lifetime of a mortgage when there are so many more pressing items to think about on a daily basis. However, it's important to stop and understand the potential financial risk flooding can bring so that you and your family can protect the life you've built by implementing mitigation projects.

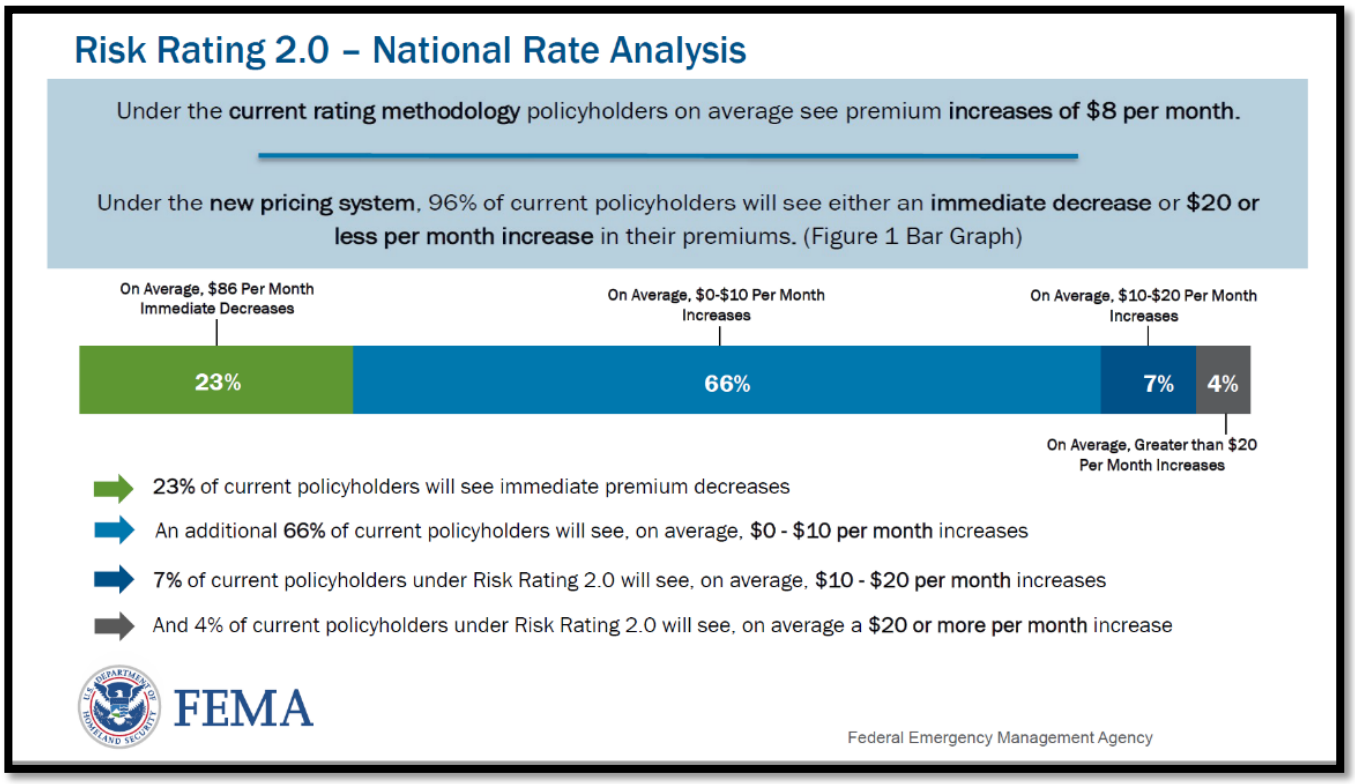
The graphic above shows flooding probabilities, damages, and risks associated with an example Roanoke home. The table at right shows information for the most severe but least likely flood on the top row, through the least severe but most likely flood on the bottom row. Each of these floods has a statistical likelihood of occurring in a single year, and a (much higher) likelihood of occurring over the course of a typical 30-year mortgage as shown in the 2nd and 3rd columns. The flood depth for each of the floods was estimated based on a hydraulic model, and the damage to the structure was estimated based on the flood depth using a national database of flood damages from the U.S. Army Corps of Engineers. Finally, the risk for each flood was estimated as the probability of the flood occurring multiplied by the damage incurred by the flood. The total 30 year flood risk is the sum of the risk associated with each individual flood.

For example, the 50-year flood has a 2% chance of occurring in any given year, and a 45% chance of occurring over a typical 30 year mortgage. For this example property, the depth of flooding for the 50-year flood is 4.8 feet, and the damage associated with this flood depth is $19,300. The risk associated with the 50 year flood over a 30 year assessment window is therefore 45% x $19,300 = $8,770. If the risk of all the statistical events is summed, the flood risk associated with this property over a 30-year mortgage is $37,510 – greater than half of the assessed property value.

This example demonstrates how to quantify flood risk for an example property but is not representative of all properties. For more information on estimation of flood risk for specific properties, see the article from Bloomberg Green, and for an estimate of flood risk for your property from the First Street Foundation, visit floodfactor.com.

Risk Rating 2.0

FEMA is updating the National Flood Insurance Program's (NFIP) risk rating methodology through the implementation of a new pricing methodology called Risk Rating 2.0. The methodology leverages



industry best practices and cutting-edge technology to enable FEMA to deliver rates that are actuarially sound, equitable, easier to understand, and better reflect a property's flood risk.

With Risk Rating 2.0, FEMA now has the capability and tools to address rating disparities by incorporating more flood risk variables. These include flood frequency, multiple flood types—river overflow, storm surge, coastal erosion and heavy rainfall—and distance to a water source along with property characteristics such as elevation and the cost to rebuild. Currently, policyholders with lower-valued homes are paying more than their share of the risk while policyholders with higher-valued homes are paying less than their share of the risk. Because Risk Rating 2.0 considers rebuilding costs, FEMA can equitably distribute premiums across all policyholders based on home value and a property's unique flood risk.

When will Risk Rating 2.0 go into effect?

FEMA is conscious of the far-reaching economic impacts the pandemic has had on the nation and existing policyholders and is taking a phased approach to rolling out the new rates. **Beginning Aug. 1, 2021 current National Flood Insurance Program policyholders can contact their insurance company or insurance agent to learn more about what Risk Rating 2.0-Equity in Action means to them.**

- **Phase I**: New policies beginning Oct. 1, 2021 will be subject to the Risk Rating 2.0 rating methodology. Also beginning Oct. 1, existing policyholders eligible for renewal will be able to take advantage of immediate decreases in their premiums.
- **Phase II**: All policies renewing on or after April 1, 2022 will be subject to the Risk Rating 2.0 rating methodology.

Learn more about Risk Rating 2.0: https://www.fema.gov/flood-insurance/risk-rating

Homeowner Resources

Federal Resources

FEMA Homeowner's Guide to Retrofitting (FEMA P-312, 3rd Edition, June 2014)
https://www.fema.gov/sites/default/files/2020-08/FEMA_P-312.pdf

FEMA Flood Map Service Center
https://msc.fema.gov/

FEMA Risk Rating 2.0
https://www.fema.gov/flood-insurance/risk-rating

State Resources

Virginia Flood Risk Information System
https://www.dcr.virginia.gov/dam-safety-and-floodplains/fpvfris

Virginia DCR Community Flood Preparedness Fund Grant
https://www.dcr.virginia.gov/dam-safety-and-floodplains/dsfpm-cfpf

Local Resources

Inundation Map for Roanoke River
http://floodwatch.roanokeva.gov/

Flooding in Roanoke Information Guide
https://roanokeva.gov/DocumentCenter/View/10566/Flooding-in-Roanoke-

Flood Preparedness
https://www.roanokeva.gov/1884/Flood-Preparedness

Appendix A

Department of Public Works
Stormwater Utility
1802 Courtland Rd NE
Roanoke, Virginia 24012
Phone 540-853-5900
Fax 540-853-5919

May 19, 2021

Property Address:
Tax Number:

Dear:

The City of Roanoke participates in the National Flood Insurance Program (NFIP). The NFIP is a Federal program to mitigate flood losses through sound, community-based building and zoning ordinances and to provide access to affordable, federally backed flood insurance protection for property owners.

The City is committed to protecting citizens and their property from floods, as well as taking actions that reduce flood insurance rates for citizens. As such, the City participates in the voluntary Community Rating System (CRS) Program. Participation in this additional NFIP Program gives citizens discounts on flood insurance premiums. The City of Roanoke is currently a class 7 in the CRS Program, which provides a 15% discount on flood insurance premiums for properties in Special Flood Hazard Area (SFHA) and a 5% premium reduction in Non-SFHA for City residents. This discount should be itemized on your flood insurance invoice.

As a member of the CRS Program, the Stormwater Utility, a division of the City's Public Works Department, is undertaking a required analysis of repetitive loss areas. The Floodplain Manager will begin the analysis in early summer, which includes review of existing flood data and studies. Only publicly available information is used for the analysis and no personal identifiers will be used. The Repetitive Loss Area Analysis will be updated annually.

The repetitive loss analysis will evaluate the following property level data elements:

- Property Card Report from the City's Real Estate Valuation Department
- Building permit records for mitigation projects
- Structure and site elevation information (elevation certificates if available)
- City construction and maintenance projects related to storm drainage and flooding
- Potential projects identified in City Watershed Master Plans
- Building code / floodplain development regulations when suggesting mitigation projects
- Historical flood event information (when events occurred, amount of damage to property, etc.)

The goal of this effort is to provide options for mitigation tailored to each repetitive loss area that could include small projects to be undertaken by homeowners or larger projects that the City could apply for grant funding to implement. The results of the repetitive loss analysis will include a review of potential approaches for property protection measures and drainage improvements where feasible. Once the analysis is complete, a copy of the report will be available online or can be emailed or mailed by request.

Property owners/renters are encouraged to provide any relevant flooding information. You can help us perform this analysis by completing and returning the survey by June 30, 2021. If you have any questions please call the Stormwater Utility at (540) 853-5900 or email leighanne.weitzenfeld@roanokeva.gov.

Sincerely,

Leigh Anne Weitzenfeld, MNR, ENV SP, CFM
Water Quality Administrator
City of Roanoke - Stormwater Utility

Department of Public Works
Stormwater Utility
1802 Courtland Rd NE
Roanoke, Virginia 24012
Phone 540-853-5900
Fax 540-853-5919

Repetitive Loss Area Analysis Survey

Please fill out the survey and return it by mail using the envelope provided, email it to stormwater@roanokeva.gov, or you may complete it online by scanning the QR code below. You may also call the Stormwater Utility at (540) 853-5900 to complete the questionnaire over the phone.

Scan QR code to the survey or
visit roanokeva.gov/RLAA

Name:_____TaxID#_____

Property Address: _____Do you rent or own the home? _____

1. Has this home / building or property ever been flooded or had a water problem?
   a. Yes
   b. No (if "no" please complete only items 6-8)

2. Please provide each year the property flooded and put a check mark or water depth where the water reached:

Year		Year		Year		Year	
Basement		Basement		Basement		Basement	
Crawl Space		Crawl Space		Crawl Space		Crawl Space	
First Floor		First Floor		First Floor		First Floor	
Second Floor		Second Floor		Second Floor		Second Floor	
Length of time water stayed in house		Length of time water stayed in house		Length of time water stayed in house		Length of time water stayed in house	

3. What do you feel was the cause of your flooding? Circle all that apply.
    a. Storm sewer backup
    b. Sanitary sewer backup
    c. Standing water next to house / building
    d. Drainage from nearby properties
    e. Saturated ground / leaks in basement walls
    f. Overbank flooding from nearby stream
    g. Other:_____

4. Have you installed any flood protection measures on the property? Circle all that apply.
    a. Sump pump
    b. Waterproofed the outside foundation
    c. Re-graded yard to keep water away
    d. Moved things out of basement
    e. Raised HVAC system outside
    f. Raised appliances in basement
    g. Backup power system / generator
    h. Sandbagged
    i. Other:_____

5. Did any of the measures circled in item 4 work? If so, which ones? If not, do you know why they did not work?

_____

_____

_____

6. Do you have FEMA flood insurance?
    a. Yes
    b. No
    c. Not Sure

7. Would you like more information on protecting your home / building from flooding?
    a. Yes
    b. No

8. Please include any additional information and comments you may have about flooding in your area:

_____

_____

_____

_____

Please return by June 30, 2021 to:
Stormwater Utility
1802 Courtland Rd, NE
Roanoke, VA 24012