

CITY OF LEAGUE CITY

Repetitive Loss Area Analysis

May 2020



CAHOON CONSULTING



Photos on Cover Page (L to R): Entrance to League City from State Highway 3; a view of Clear Creek from Walter Hall Park; the 100+ year old Ghirardi Live Oak tree in WaterSmart Park

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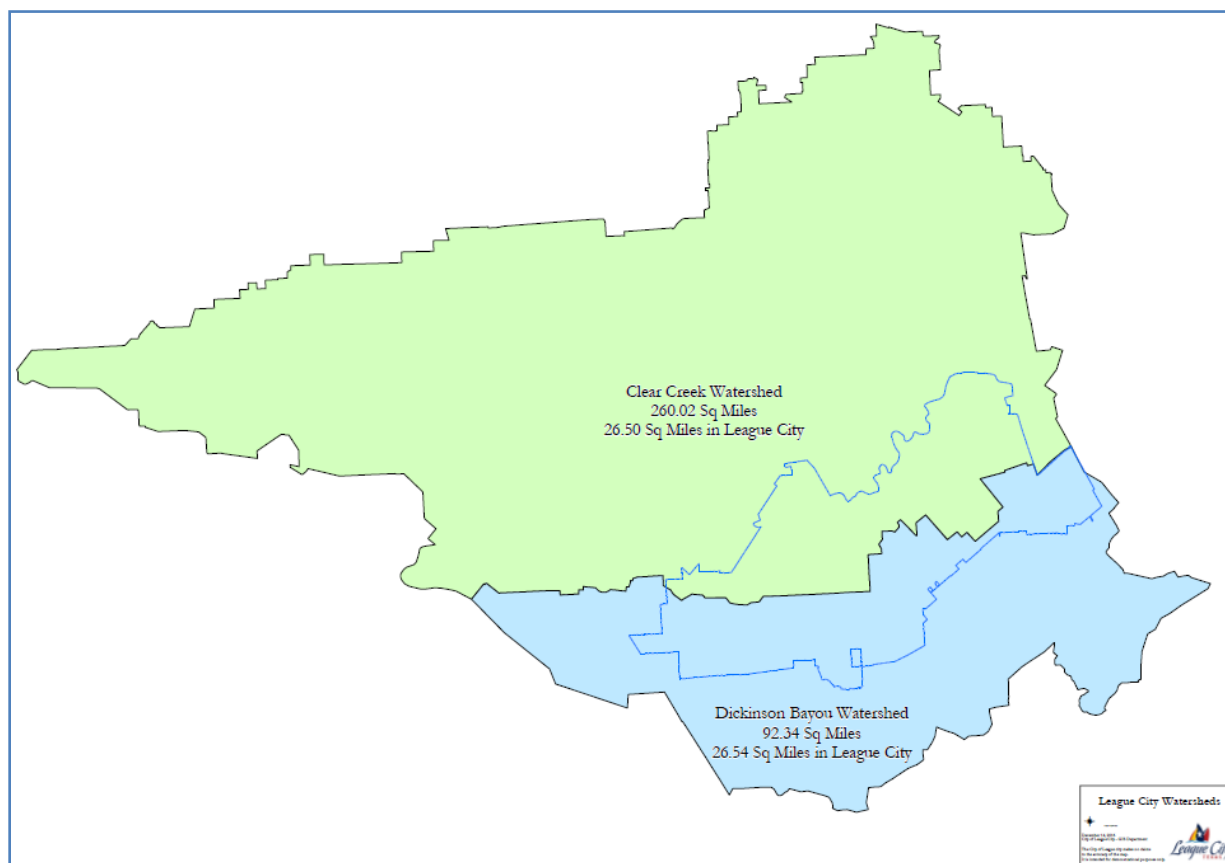
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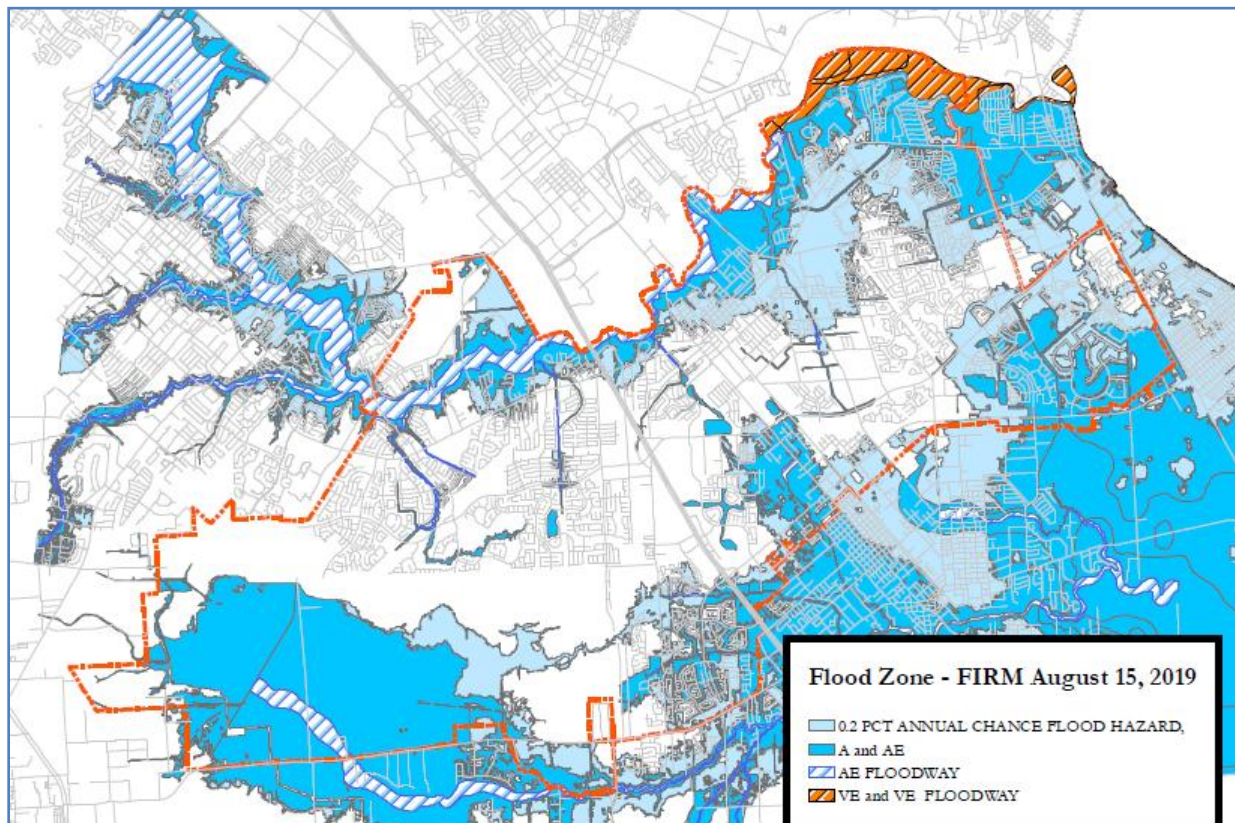
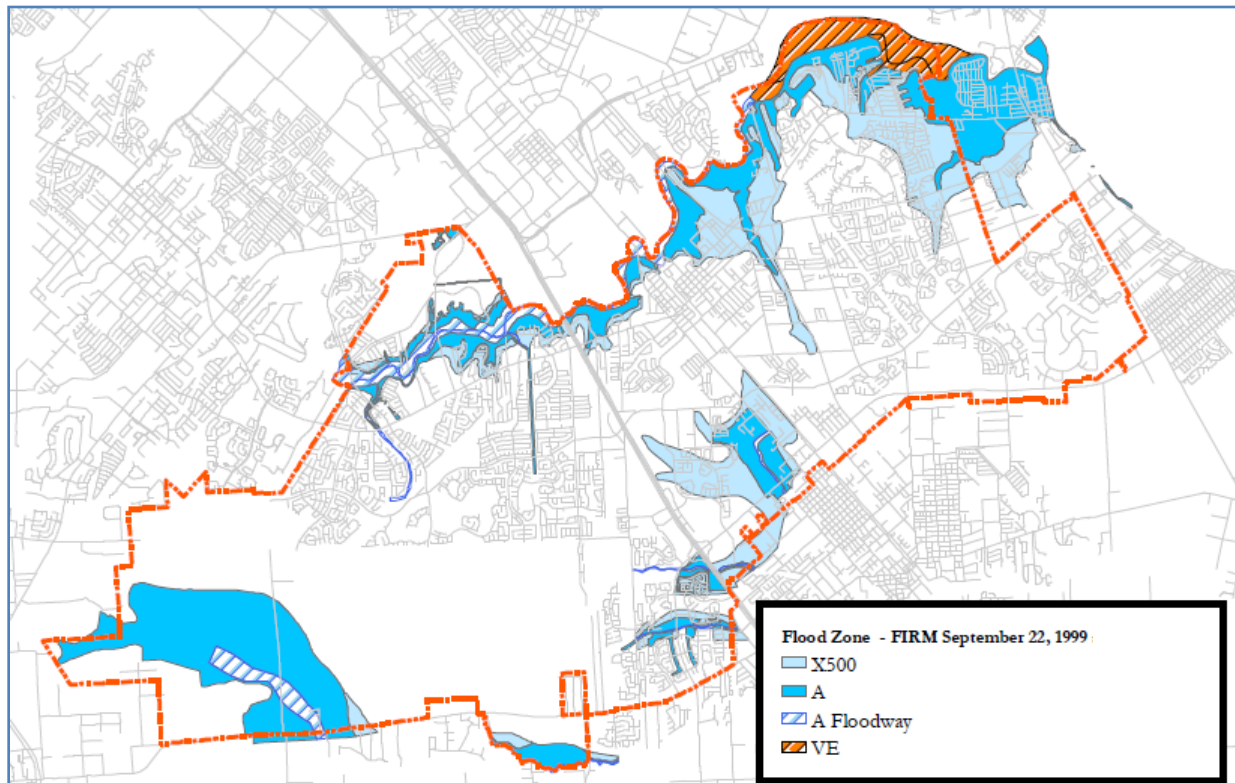
1.0 INTRODUCTION

League City is a suburb located twenty miles southeast of downtown Houston, Texas. Roughly 98% of the city is located in Galveston County with the remainder in Harris County. The 2010 census shows a population of 83,560. The city has grown in population since the 2010 census, and is now the largest city in Galveston County. One unique feature about League City is the numerous live oak trees that were planted in the late 1870s. Besides creating a quaint atmosphere in the city, the live oak trees also reduce storm water runoff in urban areas by up to 17%. The canopy of a single, large live oak can intercept up to 28% of a major rainfall, thereby, reducing the effects of flooding. (source: *League City Historical Society*, <http://leaguecityhistory.org/>)

League City is split evenly between two watersheds: 26.50 square miles of the city in the Clear Creek watershed and 26.54 square miles in the Dickinson Bayou watershed. The flood zones within League City primarily trail along the following boundaries: Clear Creek to the north, Galveston Bay to the east, Benson Bayou and Geisler Bayou to the south central, Dickinson Bayou to the southwest, and Clear Creek to the north. There are numerous secondary watersheds and other drainage features that carry water across the city and, ultimately, empty into Galveston Bay.



Previously, the City had been regulating under the 1999 FEMA Flood Insurance Rate Maps (FIRMs) dated September 22, 1999, and FEMA had been working on developing new countywide maps since 2012. The Galveston County FIRMs were finalized and issued with an effective date of August 15, 2019. In League City, the new maps showed a 126% increase in floodplain area. The next page shows a comparison of the two FIRMs.



1.1 Flooding History

Residents of Galveston and Harris counties have seen their fair share of flooding events. In the last 20 years, Galveston County and Harris County have experienced five major flooding events, with the last three occurring within two and a half years of each other.

- Tropical Storm Allison (June 2001)
- Hurricane Ike (September 2008)
- Tax Day Flood (April 2015)
- Memorial Day Flood (May 2016)
- Hurricane Harvey (August 2017)

The most recent storm, Hurricane Harvey, dumped over four feet of rain over southeast Texas. In League City, Hurricane Harvey hit in waves that more accurately resembled three 500-year events over the course of 48 hours or so. Some areas flooded that had never flooded before and, despite their best efforts, no community's storm system in this region could have been capable of handling the heaviest storms of the hurricane. As a result of Hurricane Harvey and in an effort to further protect residents from flooding, the City of League City now requires that streets limit ponding to a maximum of nine inches during a 100-year storm; however, the majority of the existing, typical drainage systems are simply not equipped to handle the magnitude of events that exceed that standard.

1.2 Flood Insurance Coverage

City staff work hard to educate the public on the importance of flood insurance, and to ensure that citizens understand that flood damage is not covered by regular homeowner's insurance. Given the flat topography of the area, the purchase and maintenance of a flood insurance policy is strongly encouraged for every resident and business owner in the city. In events such as Tropical Storm Allison where 80% of its associated flooding countywide occurred *outside* the floodplain, flood insurance should always be a consideration regardless of flood zone or location. More recent flooding events, where rainfall amounts were more than half the annual total, have given citizens a heightened awareness of the flood hazard and put a greater focus on the importance of flood insurance. The table below is a breakdown of flood insurance data in League City based on the 2019 FIRM flood zones.

	# of Policies	Amt. of Premium + Policy Fee	Total Insurance Coverage
All A Zone	1,845	\$1,024,198	\$571,587,300
All V Zone	11	\$24,613	\$3,760,000
X Zone	17,552	\$7,512,954	\$5,715,660,500
Zone Unknown/Invalid	13	\$7,800	\$923,000
TOTAL	19,421	\$8,569,565	\$6,291,930,800

The City is committed to making flood insurance more affordable for its residents, especially since the new FIRMs show more homes in the floodplain that were not in that zone at the time they were built. The City's participation in the Community Rating System (CRS) as a class six has given policyholders located in the floodplain a 20% discount on their annual flood insurance premiums. The CRS program also grants a 10% discount to those policyholders in the 0.2% flood zone (aka, shaded X zone or 500-year

floodplain), as well as policyholders in the X zone who have had more than two claims or have made one claim and filed for disaster assistance which makes them ineligible to maintain the more affordable Preferred Risk Policy (PRP). Only those policyholders whose structures have no loss history are qualified to have a PRP and they do not get a CRS discount because they are already paying the cheapest rate possible. As of the development of this RLAA, the City of League City, as a whole, is saving more than \$260,000 as a result of the City's efforts as a class six in the CRS program. (Source: FEMA Community Information System)

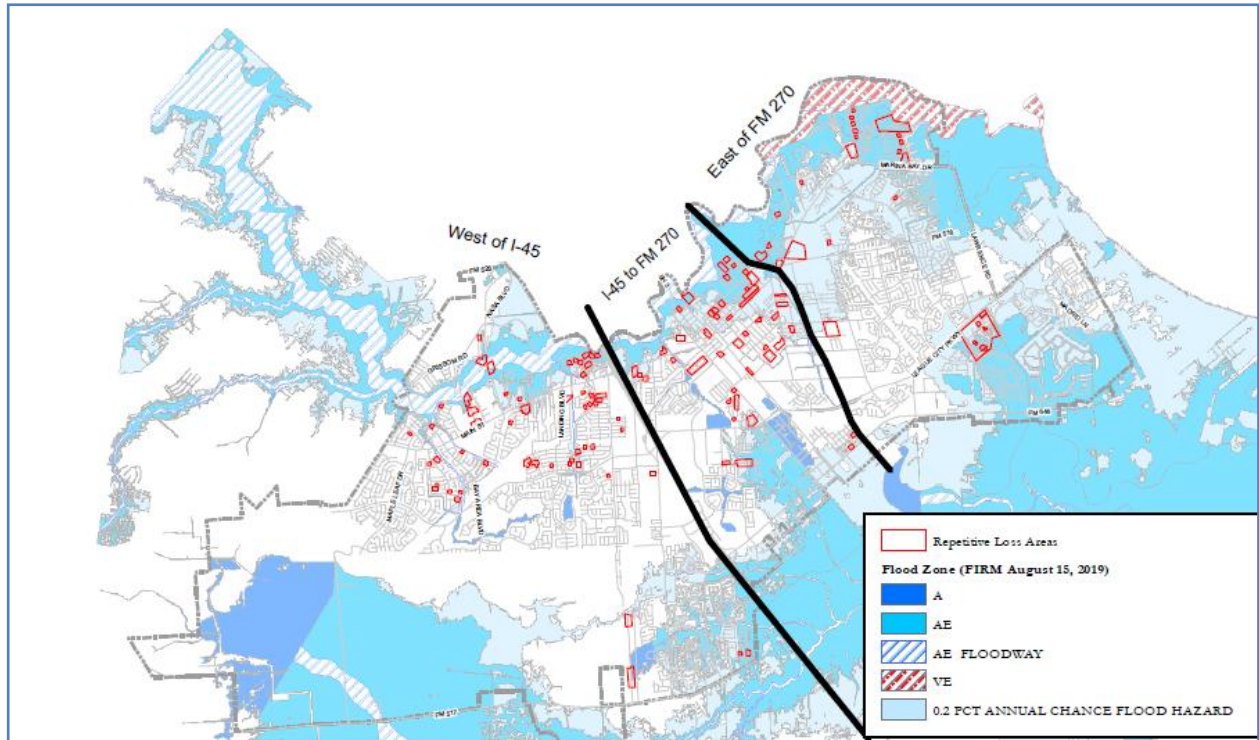
2.0 IDENTIFY REPETITIVE LOSS AREAS

The City continues to look for new ways to ease the financial burden of flood insurance for its citizens. One way is to improve the City's CRS class from a 6 to a 5 which would increase the savings for flood insurance policyholders in the floodplain from 20% to 25%. In late 2019, the City of League City contracted with Cahoon Consulting (Consultant) to provide assistance in a modification to improve the City's CRS class. One of the activities included in the modification was to develop a Repetitive Loss Area Analysis (RLAA), per Activity 510 in the 2017 *CRS Coordinator's Manual*. An RLAA is a report that identifies repetitive loss areas (RLAs) and recommends alternatives to mitigate the effects of future flooding. A property is classified as repetitive loss if it has had two or more claims of more than \$1,000 that have been paid by the National Flood Insurance Program (NFIP) within any 10 year period since 1978. Repetitive loss properties have been a drain on the NFIP for over 40 years, counting for a fourth of all NFIP payments since 1978. FEMA maintains a list of repetitive loss properties, and makes it available to any CRS community on an annual basis or by request. The list includes property specifics, loss dates, and claims information. (Due to the sensitivity of the data, the information is protected by the Privacy Act of 1974 and cannot be shared with the general public.) Repetitive loss properties remain on FEMA's list for the life of the structure, and are classified as either mitigated or unmitigated. A mitigated property means the structure has been protected against future flood damage through elevation, acquisition, demolition, structural control project, or other form of resolution.

The City obtained the latest repetitive loss list from FEMA (current as of June 30, 2019), and evaluated properties nearby that may suffer from the same cause of flooding but that are not on FEMA's list for various reasons. It may be that nearby structures have never flooded but are at a higher risk based on their proximity to channels, drainage system features, age and foundation of the structure, or other factors. Another reason to include some properties in the RLAs is that they may have flooded in the past but the homeowners did not have flood insurance or did not file for disaster assistance. These properties may be one loss away from ending up on FEMA's repetitive loss list. FEMA's number of losses/claims and flood insurance policy statistics were also relevant factors. All of the above factors were deemed reasonable enough to group particular properties into RLAs.

2.1 Divisions

Due to the size of the city and the number of properties in the RLAs (1,183), the city was divided into three divisions based on location relative to two major thoroughfares: West of I-45, I-45 to FM 270, and East of FM 270. The map below shows the location of the divisions spread across League City. Those three locations contain 58 RLAs among them.



The names of the RLAs in each division represent neighborhoods and/or streets they encompass, and each RLA is explored in depth in this analysis in sections 6-8. Several of the RLAs are broken down further into sub-areas. This was done to concentrate on the properties most at risk and still group them with the same cause of flooding. The table below breaks down the numbers for all three divisions.

Division	# of RL Areas	# of RLA Properties	# of Total Flood Ins. Policies	# of FEMA Rep. Loss Properties
West of I-45	20	426	229	115
I-45 to FM 270	24	490	259	90
East of FM 270	14	267	158	69
TOTAL	58	1,183	646	274

The City and Consultant followed guidance outlined in the 2017 *CRS Coordinator's Manual* with regards to steps in the RLAA process such as contacting property owners, contacting entities that may have projects affecting the League City RLAs, and collecting data on each structure. The report goes on to assess the cause(s) of flooding in each RLA and examines mitigation options including, but not limited to, those suggested from the list of typical property protection measures included in the 2017 *CRS Coordinator's Manual* and FEMA's mitigation categories:

- Preventative
- Property Protection
- Natural Resource Protection
- Emergency Services
- Structural Projects
- Public Information

3.0 CONTACT PROPERTY OWNERS

In February 2020, over a three-day period, the City mailed 1,196 letters to property owners identified in the 58 RLAs. (Owners with multiple properties only received one letter, and subsequent investigation reduced the final number of RLA properties to 1,183.) The letter explained to the property owner about the RLAA, its purpose, and what kinds of information would be used in the report including permit records, appraisal district records, field data, and photographs taken at the site. The letter also notified property owners that the draft report would be posted on the City's website for comments and included a link to an online, 10-question Flood Protection Survey regarding specific flood damage history and options for property protection. Approximately 130 responses were compiled from the online survey and, of those, 53% of the respondents had experienced flood damage in their homes.

Feedback from the homeowners provided valuable insight and put a personal perspective on the stress and frustration homeowners suffer as a result of a major flooding event. While streets are designed to be part of the drainage system to keep stormwater out of homes, it can be somewhat unsettling for homeowners to see street flooding accumulating too quickly or for too long, especially in their own neighborhoods. In the life of a 30-year mortgage, there is a 26% chance of flooding in any given year; however, homeowners tend to dismiss their risk of flooding if they have never flooded before or if they are in a low risk zone on the FEMA FIRM. Answers to the survey also helped determine which mitigation alternatives would be better suited for some homeowners than others. For example, 20% of respondents reported either having had flood insurance at one time but letting it lapse or never having a policy at all. The City may choose different methods to encourage those property owners about the importance of purchasing and maintaining a flood insurance policy. (A copy of the letter, questions from the Flood Protection Survey, and a summary of the responses are included in Appendix A.)

4.0 COLLECT BUILDING DATA

An essential part of the RLAA process involved assessing the flood risk each building faced based, in part, on the specific characteristics of that structure. Each structure was examined using three resources: the Galveston County Appraisal District, the Harris County Appraisal District, and observations and photographs taken in the field.

4.1 Galveston County Appraisal District

Building data was gathered for each address in the 58 RLAs via the Galveston County Appraisal District website at www.galvestoncad.org or the Harris County Appraisal District website at www.hcad.org. The information found on the sites included year of construction, foundation type, and overall condition of the structure. The data from the appraisal districts was combined with the data available on FEMA's repetitive loss list to form a comprehensive view of the structures at risk in these areas. (Specific data per address is located in Appendix B, and is not available to the public per the Privacy Act of 1974.)

The building data helped to identify how a common source of flooding might affect a house built in 1940 compared to a house built 60 years later, or how a slab foundation versus a home built on crawlspace would be impacted. The overall condition of the structure provided valuable information as well. For

instance, an older home in poor condition is more likely to suffer substantial damage and be more expensive to rebuild than one in excellent condition. A substantially damaged building is one where the cost of repairing the structure to its pre-flood condition is greater than 50% of the market value of the structure. When a structure has been declared substantially damaged, it is required that the structure be brought into current code and regulations. Most often, the regulations require elevation as a means to compliance. For League City, elevation includes meeting or exceeding a two-foot freeboard above the base flood elevation per the City's Flood Damage Prevention Ordinance.

4.2 Harris County Appraisal District

Similar to the property search on the Galveston County Appraisal District website, those properties in League City that are located in Harris County were researched on the Harris County Appraisal District.

4.3 Field Data

In addition to data from the Galveston County and Harris County appraisal districts, City staff observed the properties in the field. City staff canvassed the RLAs and took photographs from the street or sidewalk that captured ground elevation differences, drainage patterns, and nearby drainage features such as inlets or storm drains. This data helped in understanding where and how each property drained, and whether or not water collecting in the lot or drainage from nearby structures contributed to the flooding risk, and served as confirmation of the structure's overall condition as listed in the Appraisal District records. City staff also conducted observations of the natural channels and drainage systems to see how vegetation or other obstructions may be affecting the channel's ability to function optimally. This information was added to the property data tables located in Appendix B (not accessible to the public per the Privacy Act of 1974).

5.0 CONTACT OTHER AGENCIES

Before determining the best mitigation alternative for the properties in the RLAs, it was necessary to know what studies and projects were planned for the areas by other cities and organizations. The City's Floodplain Administrator contacted four entities for this information.

5.1 City of League City

The City of League City has identified 25 drainage projects in their FY 2020-2024 Capital Improvement Plan (CIP). Projects include Lower Clear Creek and Dickinson Bayou watershed studies, overland flow improvements, detention ponds, culvert and ditch improvements, channel widening, removing silt and trees, and clearing and desnagging, among others. Several of the projects will significantly reduce the flooding in some of the RLAs, and are explained in sections 6-8 as recommended mitigation alternatives. (For more detail on the CIP drainage projects, visit <https://www.leaguecity.com/2803/5-year-Capital-Improvement-Plan>.)

The City is also involved in six Hurricane Harvey-related drainage studies in subdivisions and neighborhoods around League City. The City has hired consultant engineering firms to conduct the

studies, and have already had public meetings and City Council workshops to explain the projects to citizens. (For more detail, visit <https://www.leaguecity.com/3082/Drainage-Studies>.) The City of League City is active in both the Clear Creek Watershed Steering Committee and the Dickinson Bayou Watershed Steering Committee. Both partnerships are to coordinate efforts for flood mitigation along the respective bayous with other municipal, county, and drainage district entities. All projects considered for these two watersheds are discussed by the committee members.

In addition, the City is the lead on the Lower Clear Creek and Dickinson Bayou Watershed Study. For this project, League City has partnered with the US Corps of Engineers, Harris County Flood Control District, Galveston County, Brazoria Drainage District #4, the City of Friendswood, the City of Pearland, the City of Webster, and the City of Nassau Bay to study the Lower Clear Creek Watershed (from approximately Dixie Farm Road to the Bay). League City has partnered with the US Army Corps of Engineers, Galveston County, City of Friendswood, and City of Dickinson to study the Lower Dickinson Bayou Watershed. Information on this project can be found at <https://www.leaguecity.com/LCCDB>.

5.2 City of Friendswood

Friendswood is a Houston suburb adjacent to League City on the northwestern side, and is one of the communities that shares the Clear Creek watershed. Currently, the City of Friendswood is working on two projects along Clear Creek. The first is an inline detention project in conjunction with the Galveston County Consolidated Drainage District. The second is an offline detention basin at the Forest Bend subdivision in Friendswood. Neither project impacts the RLAs identified in League City.

5.3 Harris County Flood Control District

The Harris County Flood Control District is responsible for the maintenance and improvements on the drainage system of major channels in Harris County including a small portion of League City. The District collaborates with the US Army Corps of Engineers on numerous projects to mitigate the widespread flooding that has plagued the county for decades. The City reached out to the District via email in April 2020 to confirm the status of projects that may affect the 58 RLAs. The following link highlights seven (7) planned projects along Clear Creek: <https://www.hcfcd.org/Resilience>. At this time, it does not appear that any of these projects will impact the RLAs identified in League City.

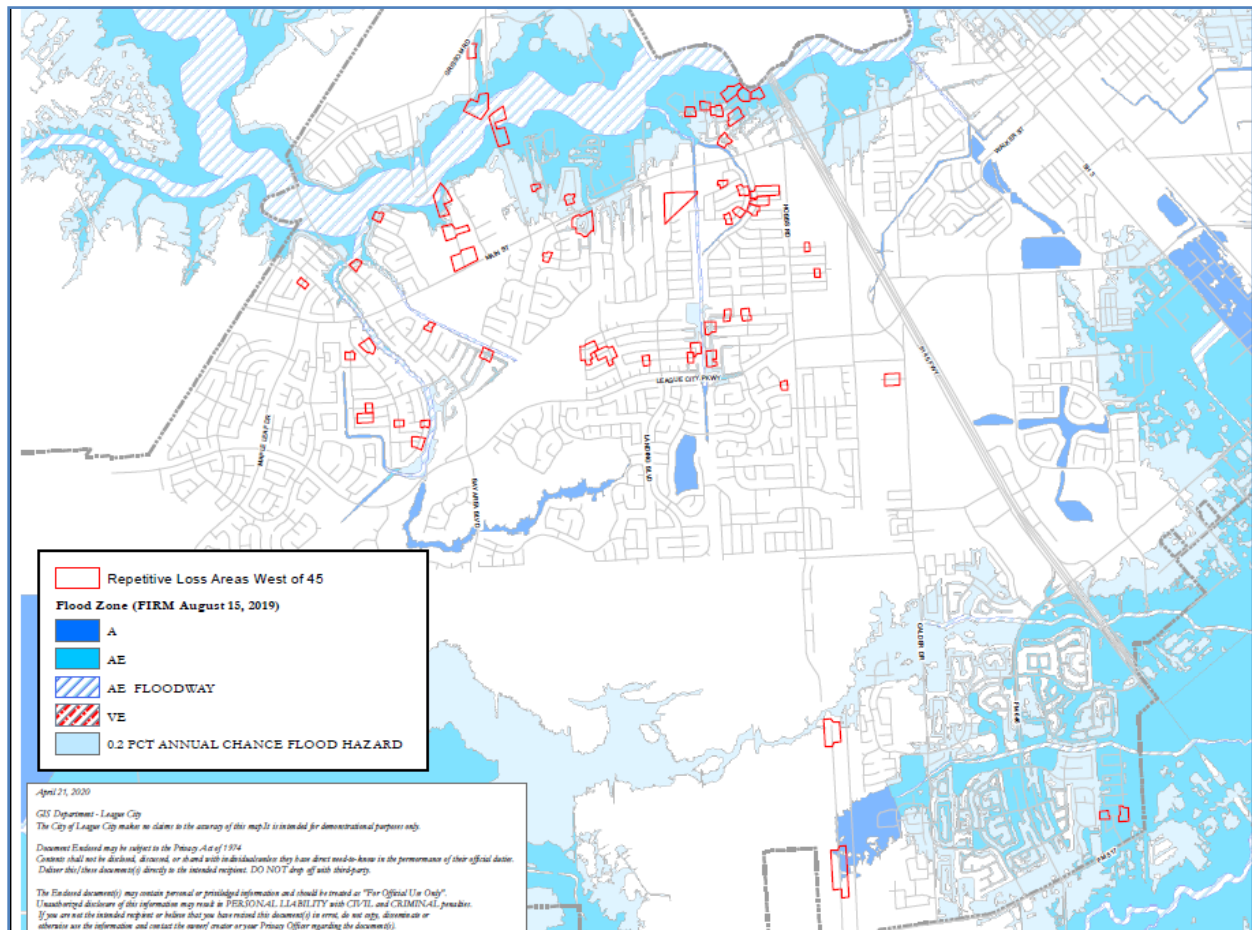
5.4 Galveston County

Galveston County has embarked on a Master Drainage Plan to identify flood mitigation projects in the mainland portion of Galveston County. The project is being funded by the General Land Office and is ongoing, with the study scheduled for completion in December 2020.

6.0 REPETITIVE LOSS AREAS – WEST OF I-45 DIVISION

The West of I-45 division includes 20 RLAs (listed below) containing 426 properties total. Over half of the City's total repetitive loss properties are in this division. Most of the RLAs are in the northern part of the city closer to Clear Creek.

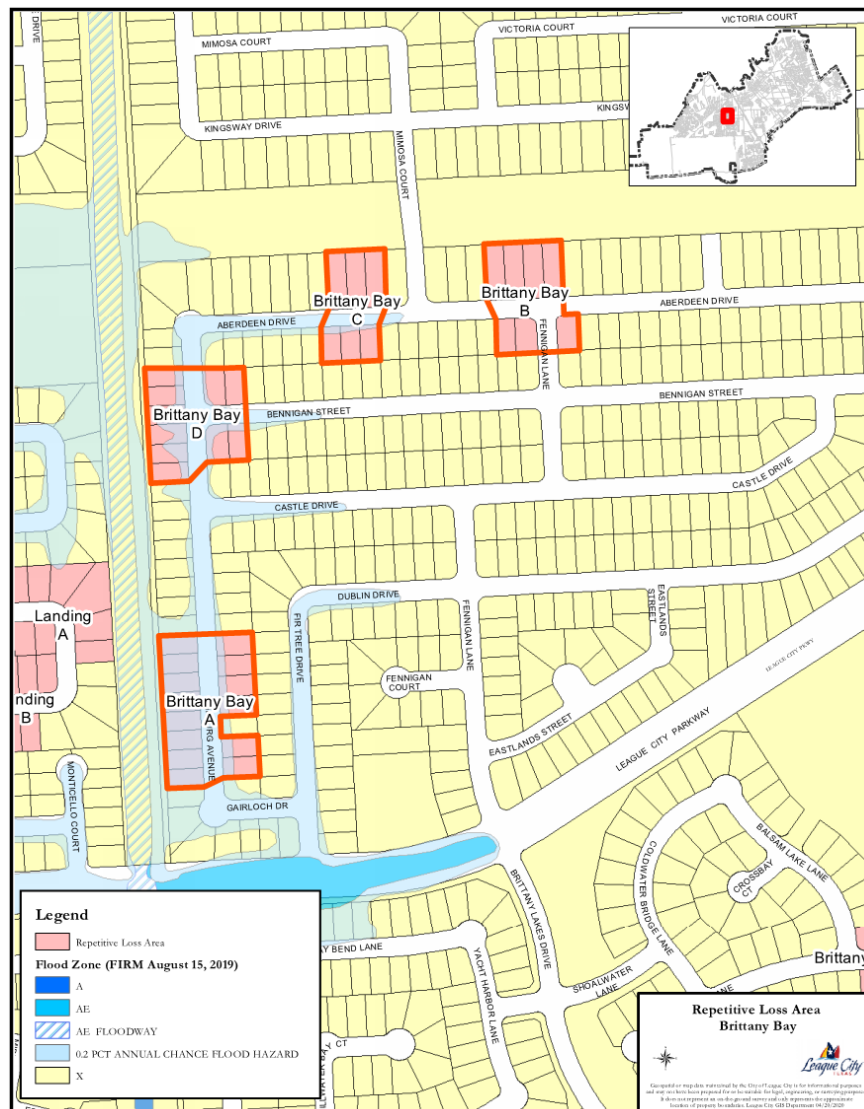
- Brittany Bay
- Brittany Lakes
- Claremont Park
- Clear Creek Heights
- Clear Creek Village
- Countryside North
- Countryside Southeast
- Countryside Southwest
- Dove Meadows
- Ellis Landing
- Ellis Road
- Greenridge
- Landing
- Magnolia Estates
- Mary Lane
- Newport
- Oak Creek
- Palomino
- Shady NASA
- Weyer Avenue



6.1 BRITTANY BAY

The Brittany Bay RLA contains four sub-areas with a total of 36 properties. Sub-area A and sub-area D have homes with most of the properties located in the 0.2% flood zone, while sub-area B and sub-area C are located in the X zone with only a sliver of land touching the 0.2% flood zone. Homes in this area were built mostly in the mid to late 1980s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Brittany Bay	A	13	8	2
	B	7	6	2
	C	6	3	2
	D	10	6	3



6.1.1 Cause of Flooding

The Brittany Bay subdivision drains directly to Landing Ditch through four drainage outfalls to the west (two 24-inch Corrugated Metal Pipes (CMP), one 30-inch CMP, and one 42-inch CMP). Based on LIDAR contours, the sheet flow pattern is from east to west toward Landing Ditch. The existing storm sewer outfalls are located in 10-foot wide drainage easements. The extreme event's sheet flow (100-year flow minus pipe capacity) in the streets drain to Landing Ditch through these four drainage easements. There are also three drainage outfalls draining Brittany Bay subdivision into a tributary of Landing Ditch along Brittany Bay Blvd (two 24-inch Reinforced Concrete Pipes (RCP), one 30-inch RCP). Existing fences and heavy vegetation are partially blocking the sheet flow through the easements. As currently graded, the existing drainage easements do not have sufficient capacity to carry the extreme event's sheet flow from the streets to Landing Ditch. This factor, combined with blockage of the drainage easements by fences and/or vegetation, causes excessive ponding in the street during 1% exceedance rainfall events.

Another cause of flooding in this RLA is due to the capacity and flow rate of Landing Ditch and Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into Landing Ditch which, in turn, prevents stormwater within Brittany Bay from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

6.1.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Brittany Bay RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Brittany Bay RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to "a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation." Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

A short-term mitigation project in the City's FY 2020-2024 CIP would include (1) a drainage study and HEC-RAS Model of Landing Ditch to ensure all drainage areas feeding into the creek are accounted for and to ensure the improved flows from the proposed drainage improvements can discharge into the creek without negatively impacting downstream neighborhoods along Landing Ditch; and (2) the installation of concrete and gravel paver overflow swales at existing drainage easement sites within the subdivision. Another short to mid-term mitigation project in the City's FY 2020-2024 CIP would include the desnagging and removal of vegetation from Landing Ditch. It is anticipated that this project would increase Landing Ditch's capacity by approximately 34%.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Brittany Bay RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Structural improvements included in the City's FY 2020-2024 CIP
- Annual outreach conducted by the Engineering Department using operating budget funds
- Elevation of high-risk structures via post-disaster mitigation grant funding

6.2 BRITTANY LAKES

The Brittany Lakes RLA is a small section of five properties located in the X zone. Homes in this area were built in the late 1990s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Brittany Lakes	(none)	5	1	1

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Clear Creek Heights RLA.

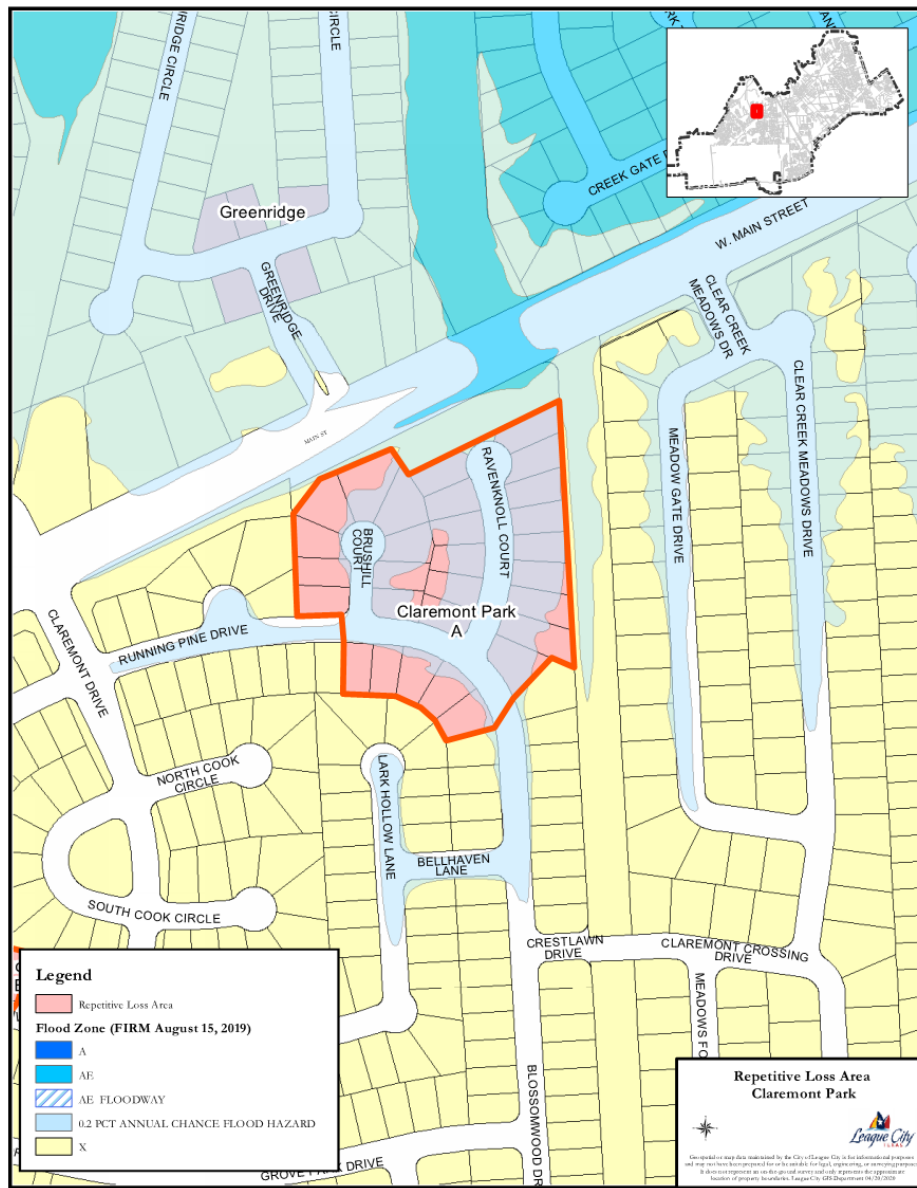
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

6.3 CLAREMONT PARK

The Claremont Park RLA contains sub-area A and sub-area B with a combined total of 36 properties located mostly in the 0.2% flood zone. Most of the homes were built in the late 1990s and early 2000s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Claremont Park	A	29	20	16
	B	7	3	1



6.3.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into the tributary which in turns prevents stormwater within Claremont Park from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

6.3.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Claremont RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Claremont RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Claremont RLA.

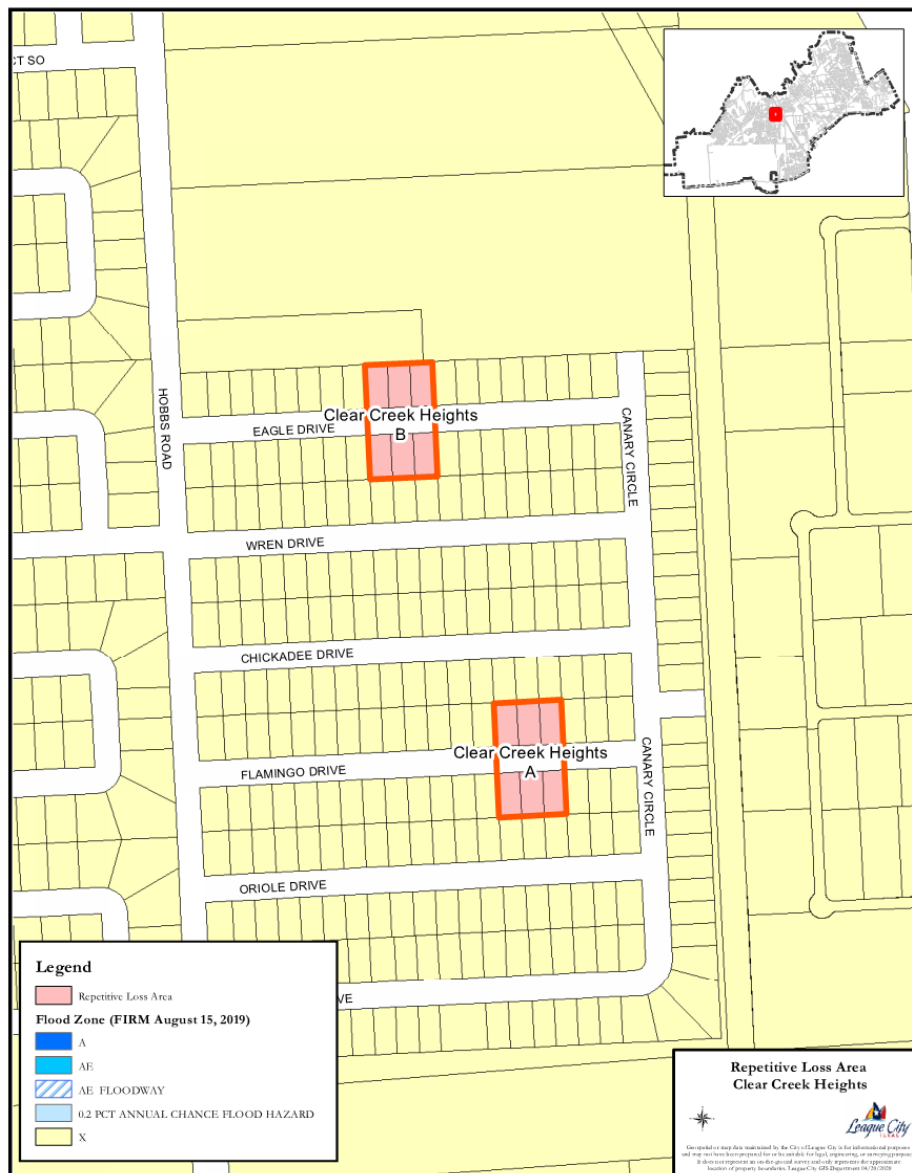
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

6.4 CLEAR CREEK HEIGHTS

The Clear Creek Heights RLA is equally divided into two sub-areas, each with six properties for a total of 12. All of the structures are located in the X zone, and were built in the early to mid-1970s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Clear Creek Heights	A	6	3	1
	B	6	1	1



6.4.1 Cause of Flooding

This area was constructed prior to League City's detention requirements. Stormwater drains west to east into Corum Ditch. Flooding in this area appears to be due to the capacity and flow rate of Corum Ditch. Once the ditch reaches capacity, it pushes stormwater back into the neighborhood which in turns prevents stormwater within Clear Creek Heights from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

6.4.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Clear Creek Heights RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future

flood risk. Below is a summary of mitigation alternatives considered and recommended for the Clear Creek Heights RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Clear Creek Heights RLA.

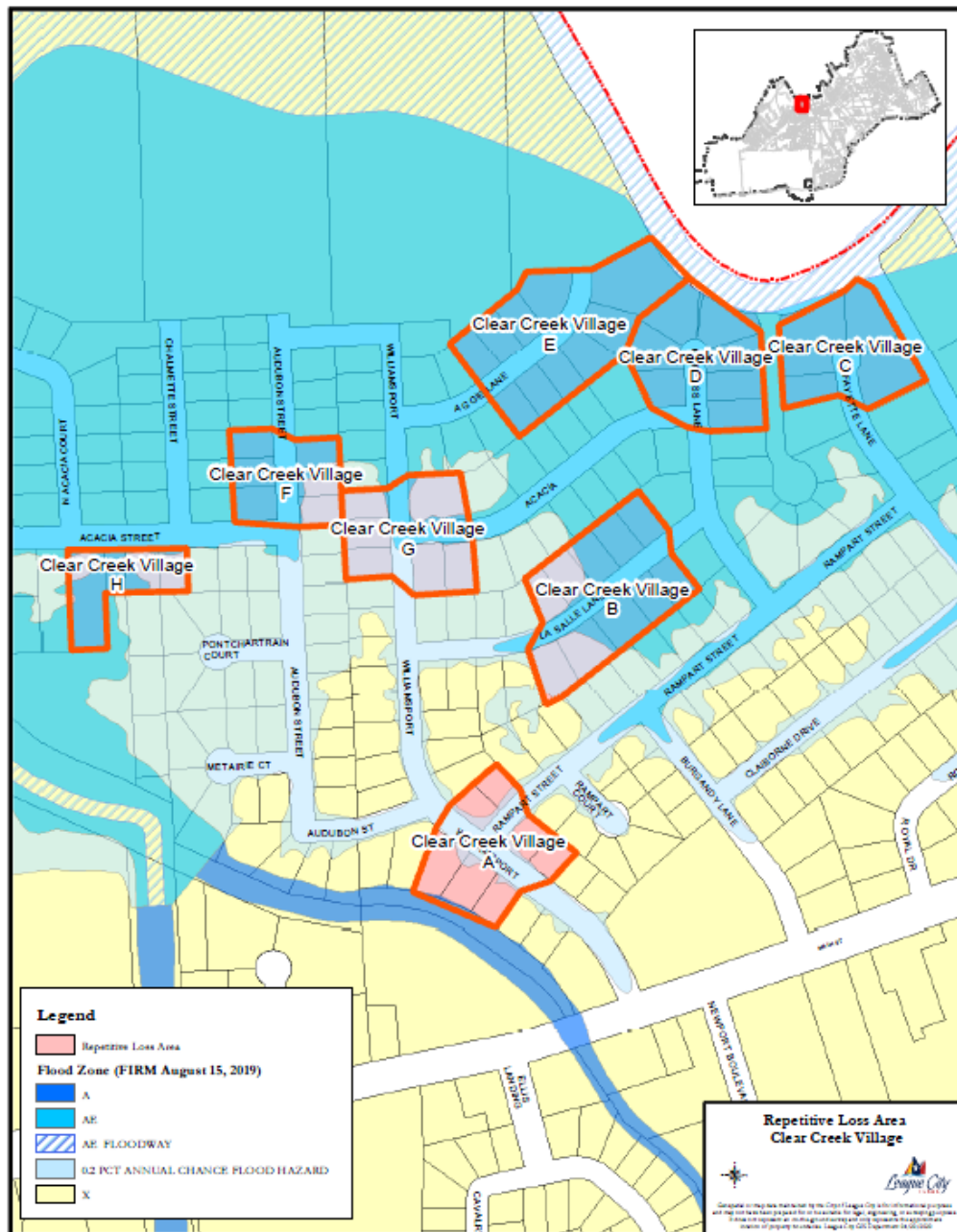
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

6.5 CLEAR CREEK VILLAGE

The Clear Creek Village RLA contains eight sub-areas for a total of 53 properties. Most of the structures are located in the floodplain. Homes were built in the 1970s and mid-1990s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Clear Creek Village	A	7	4	1
	B	10	2	2
	C	4	4	1
	D	7	6	5
	E	10	10	2
	F	6	5	1
	G	6	4	1
	H	3	2	1



6.5.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Clear Creek. Once Clear Creek reaches capacity, it prevents stormwater within Clear Creek Village from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

6.5.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Clear Creek Village RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Clear Creek Village RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Clear Creek Village RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

6.6 COUNTRYSIDE NORTH

The Countryside North RLA is divided into two sub-areas for a total of 11 properties. All of the structures are located in the X zone, with a small portion in the floodway. The homes were built in the late 1970s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Countryside North	A	6	3	1
	B	5	2	1



6.6.1 Cause of Flooding

The Countryside Subdivision drains directly to Magnolia Creek through nine drainage outfalls to the east (two 18-inch CMPs, three 24-inch CMPs, one 30-inch CMP, one 36-inch CMP, one 42-inch CMP, and one 54-inch CMP). Based on LIDAR contours, the sheet flow pattern is from west to east toward Magnolia Creek. The existing storm sewer outfalls are located in 16 to 30-foot-wide drainage easements. The extreme event's sheet flow (100-year flow minus pipe capacity) in the streets drains to Magnolia Creek through these nine drainage easements. The existing drainage easements, as currently graded, do not have sufficient capacity to carry the extreme event's sheet flow from the streets to Magnolia Creek. This factor, paired with blockage of the drainage easements by fences and/or vegetation causes excessive ponding in the street during the 1% exceedance rainfall event.

Another cause of flooding in these areas is due to the capacity and flow rate of Magnolia Creek and Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into Magnolia Creek which, in turn, prevents stormwater within Countryside from properly draining during 1% exceedance events causing excessive ponding in the street and, in extreme events, can lead to structural inundation.

6.6.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Countryside North RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Countryside North RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to "a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation." Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

A short-term mitigation project in the City's FY 2020-2024 CIP would include (1) a drainage study and HEC-RAS Model of Magnolia Creek to ensure all drainage areas feeding into the creek are accounted for

and to ensure the improved flows from the proposed drainage improvements can discharge into the creek without negatively impacting downstream neighborhoods along Magnolia Creek; and (2) the installation of concrete and gravel paver overflow swales at existing drainage easement sites within the subdivision. Another short to mid-term mitigation project in the City's FY 2020-2024 CIP would include the desnagging and removal of vegetation from Magnolia Creek. It is anticipated that this project would increase Magnolia Creek's capacity by approximately 53%.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Countryside North RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Structural improvements included in the FY 2020-2024 CIP
- Annual outreach conducted by the Engineering Department using operating budget funds

6.7 COUNTRYSIDE SOUTHEAST

The Countryside Southeast RLA is equally divided into two sub-areas, each with six properties for a total of 12. All of the structures are located in the X zone with only the roadway of sub-area B in the floodplain. The homes were built in the mid to late 1990s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Countryside Southeast	A	6	5	1
	B	6	5	1

6.7.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Countryside Southeast RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Countryside Southeast RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

A short-term mitigation project in the City's FY 2020-2024 CIP would include (1) a drainage study and HEC-RAS Model of Magnolia Creek to ensure all drainage areas feeding into the creek are accounted for and to ensure the improved flows from the proposed drainage improvements can discharge into the creek without negatively impacting downstream neighborhoods along Magnolia Creek; and (2) the installation of concrete and gravel paver overflow swales at existing drainage easement sites within the subdivision. Another short to mid-term mitigation project in the City's FY 2020-2024 CIP would include the desnagging and removal of vegetation from Magnolia Creek. It is anticipated that this project would increase Magnolia Creek's capacity by approximately 53%.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Countryside Southeast RLA.

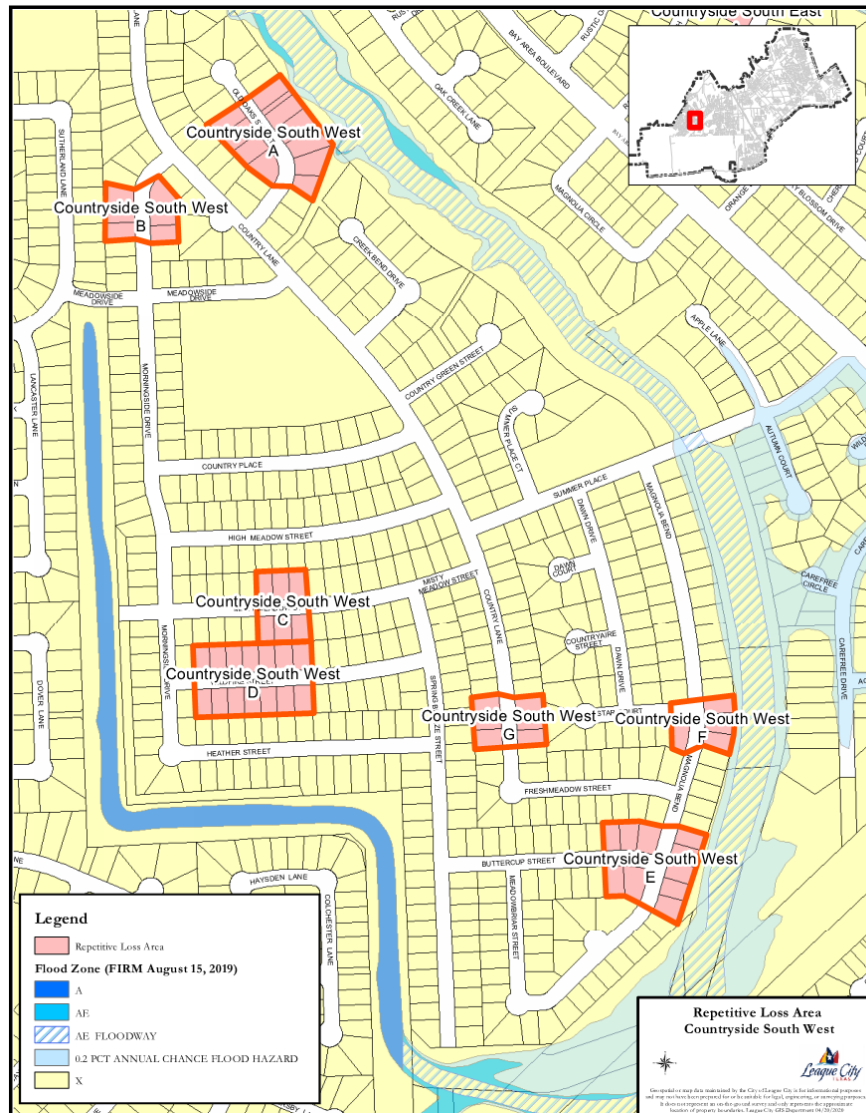
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Structural improvements included in the FY 2020-2024 CIP
- Annual outreach conducted by the Engineering Department using operating budget funds

6.8 COUNTRYSIDE SOUTHWEST

The Countryside Southwest RLA has seven sub-areas for a total of 56 properties. All of the structures are located in the X zone, and the majority of homes were built in the early 1980s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Countryside Southwest	A	10	8	3
	B	6	2	1
	C	6	1	1
	D	14	7	2
	E	10	6	2
	F	4	3	1
	G	6	2	1



6.8.1 Cause of Flooding

The Countryside Subdivision drains directly to Magnolia Creek through nine drainage outfalls to the east (two 18-inch CMPs, three 24-inch CMPs, one 30-inch CMP, one 36-inch CMP, one 42-inch CMP, and one 54-inch CMP). Based on LIDAR contours, the sheet flow pattern is from west to east toward Magnolia Creek. The existing storm sewer outfalls are located in 16 to 30-foot-wide drainage easements. The extreme event's sheet flow (100-year flow minus pipe capacity) in the streets drains to Magnolia Creek through these nine drainage easements. The existing drainage easements as currently graded do not have sufficient capacity to carry the extreme event's sheet flow from the streets to Magnolia Creek. This factor, paired with blockage of the drainage easements by fences and/or vegetation, causes excessive ponding in the street during a 1% exceedance rainfall event.

Another cause of flooding in these areas is due to the capacity and flow rate of Magnolia Creek and Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into Magnolia Creek which in turns prevents stormwater within Countryside from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

6.8.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Countryside Southwest RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Countryside Southwest RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

A short-term mitigation project in the City's FY 2020-2024 CIP would include (1) a drainage study and HEC-RAS Model of Magnolia Creek to ensure all drainage areas feeding into the creek are accounted for and to ensure the improved flows from the proposed drainage improvements can discharge into the creek without negatively impacting downstream neighborhoods along Magnolia Creek; and (2) the installation of concrete and gravel paver overflow swales at existing drainage easement sites within the subdivision. Another short to mid-term mitigation project in the City's FY 2020-2024 CIP would include the desnagging and removal of vegetation from Magnolia Creek. It is anticipated that this project would increase Magnolia Creek's capacity by approximately 53%.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Countryside Southwest RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Structural improvements included in the FY 2020-2024 CIP
- Annual outreach conducted by the Engineering Department using operating budget funds

6.9 DOVE MEADOWS

The Dove Meadows RLA has two sub-areas for a total of 15 properties. All of the structures in both sub-areas are located in the floodplain, and the majority of homes were built in the mid to late 1980s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Dove Meadows	A	10	0	2
	B	5	1	1



6.9.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Borden's Gully and Dickinson Bayou. Once Dickinson Bayou reaches capacity, it pushes stormwater back into Borden's Gully which in turns prevents stormwater within Dove Meadows from properly draining during 1% exceedance events which causes excessive ponding in the street and, in extreme events, can lead to structural inundation.

6.9.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Dove Meadows RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Dove Meadows RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Dickinson Bayou drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Structural Projects

A short-term mitigation project in the City’s FY 2020-2024 CIP would include (1) a drainage study and HEC-RAS Model of Landing Ditch to ensure all drainage areas feeding into Borden’s Gully is accounted for and to ensure the improved flows from the proposed drainage improvements can discharge into it without negatively impacting downstream neighborhoods along Borden’s Gully and Dickinson Bayou; and (2) design, purchase land, and construct an approximate 115 acre-foot detention pond adjacent to Borden’s Gully.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Dove Meadows RLA.

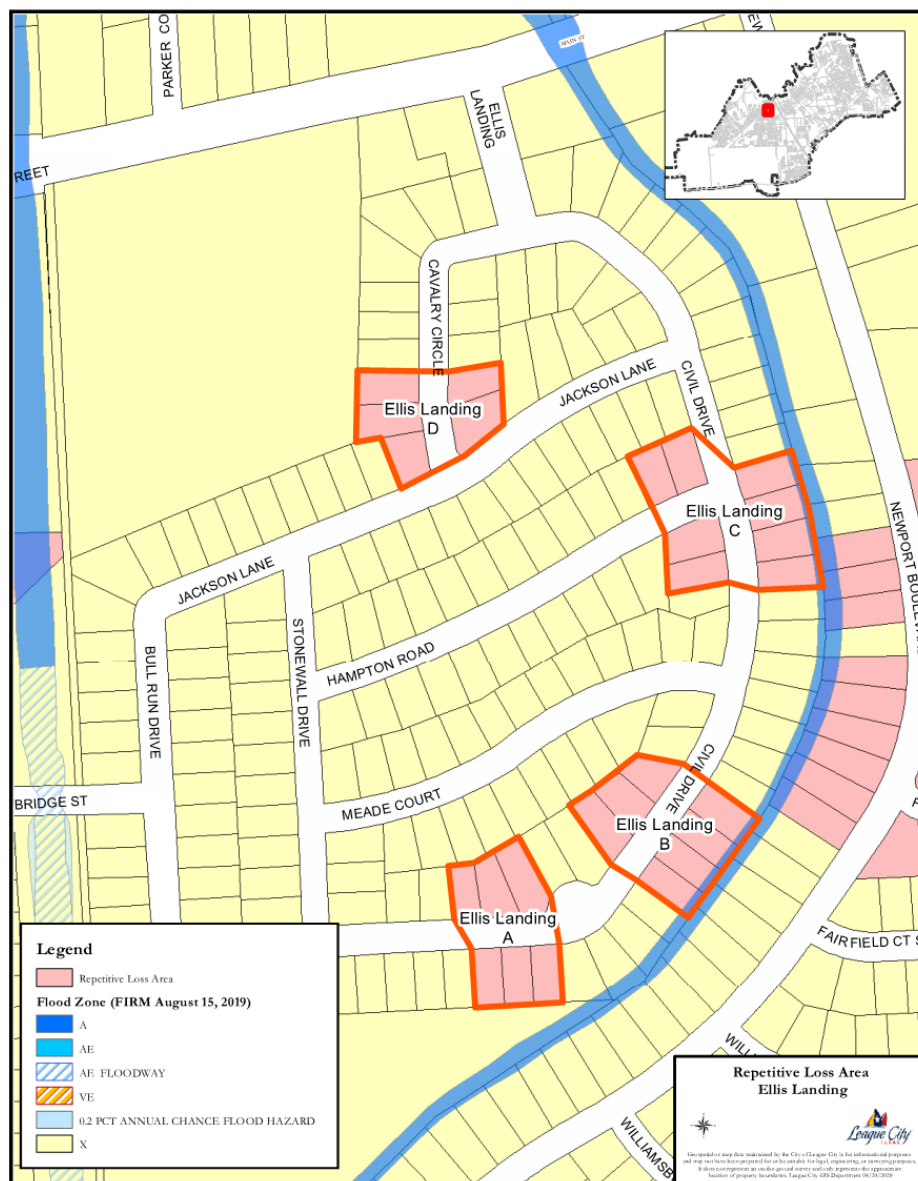
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Structural improvements included in the FY 2020-2024 CIP
- Annual outreach conducted by the Engineering Department using operating budget funds

6.10 ELLIS LANDING

The Ellis Landing RLA has four sub-areas for a total of 26 properties. All of the structures are located in the X zone, and the majority of homes were built in the early 1970s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Ellis Landing	A	6	2	1
	B	7	4	1
	C	8	6	2
	D	5	4	1



6.10.1 Cause of Flooding

Ellis Landing subdivision drains directly to the concrete lined Newport Ditch through four drainage outfalls to the east (three 24-inch CMPs and one 36-inch CMP). Based on LIDAR contours, the sheet flow pattern is from west to east toward Newport Ditch. The existing storm sewer outfalls are located in 10-foot wide drainage easements. The extreme event's sheet flow (100-year flow minus pipe capacity) in the streets drains to Newport Ditch through these four drainage easements. The existing drainage easements, as currently graded, do not have sufficient capacity to carry the extreme event's sheet flow from the streets to Newport Ditch. This factor, combined with blockage of the drainage easements by fences and/or vegetation, causes excessive ponding in the street during a 1% exceedance rainfall event.

Another cause of flooding in these areas is due to the capacity and flow rate of Newport Ditch and Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into Newport Ditch which in turns prevents stormwater within Ellis Landing from properly draining during 1% exceedance events which causes excessive ponding in the street and, in extreme events, can lead to structural inundation.

6.10.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Ellis Landing RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Ellis Landing RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

A short-term mitigation project in the City's FY 2020-2024 CIP would include (1) a drainage study and HEC-RAS Model of Newport Ditch to ensure all drainage areas feeding into the creek are accounted for and to ensure the improved flows from the proposed drainage improvements can discharge into the creek without negatively impacting downstream neighborhoods along Newport Ditch; and (2) the installation of concrete and gravel paver overflow swales at existing drainage easement sites within the subdivision. A short to mid-term mitigation project in the City's FY 2020-2024 CIP would include the desnagging and removal of vegetation from Newport Ditch. It is anticipated that this project would increase Newport Ditch's capacity by approximately 56%.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public

which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Ellis Landing RLA.

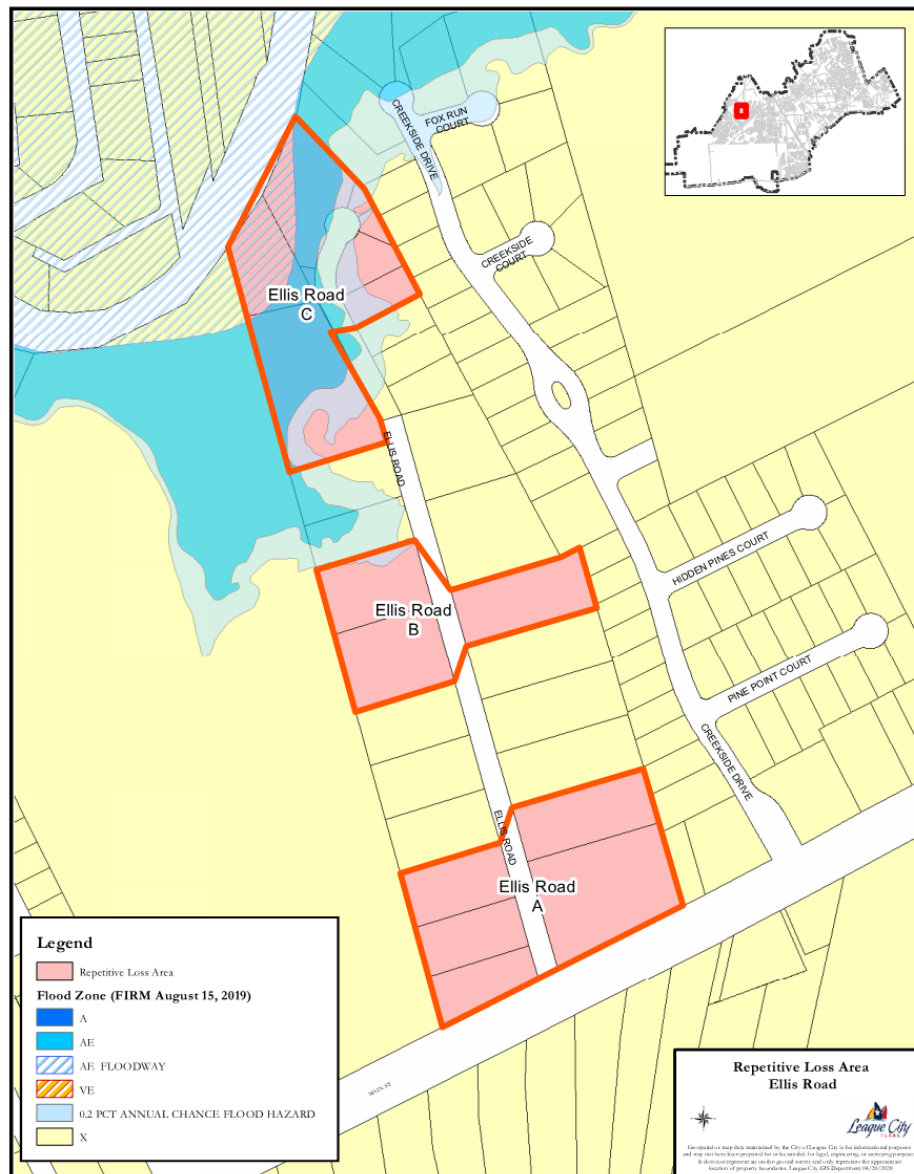
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Structural improvements included in the FY 2020-2024 CIP
- Annual outreach conducted by the Engineering Department using operating budget funds

6.11 ELLIS ROAD

The Ellis Road RLA has three sub-areas with a total of 11 properties. Sub-area A and sub-area B are located in the X zone. Sub-area C is partially in the floodplain and floodway. The majority of the homes in this RLA were built in the mid-1970s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Ellis Road	A	5	3	1
	B	3	2	1
	C	3	1	1



6.11.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Clear Creek. Once Clear Creek reaches capacity, it prevents stormwater along Ellis Road from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

6.11.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Ellis Road RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Ellis Road RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Ellis Road RLA.

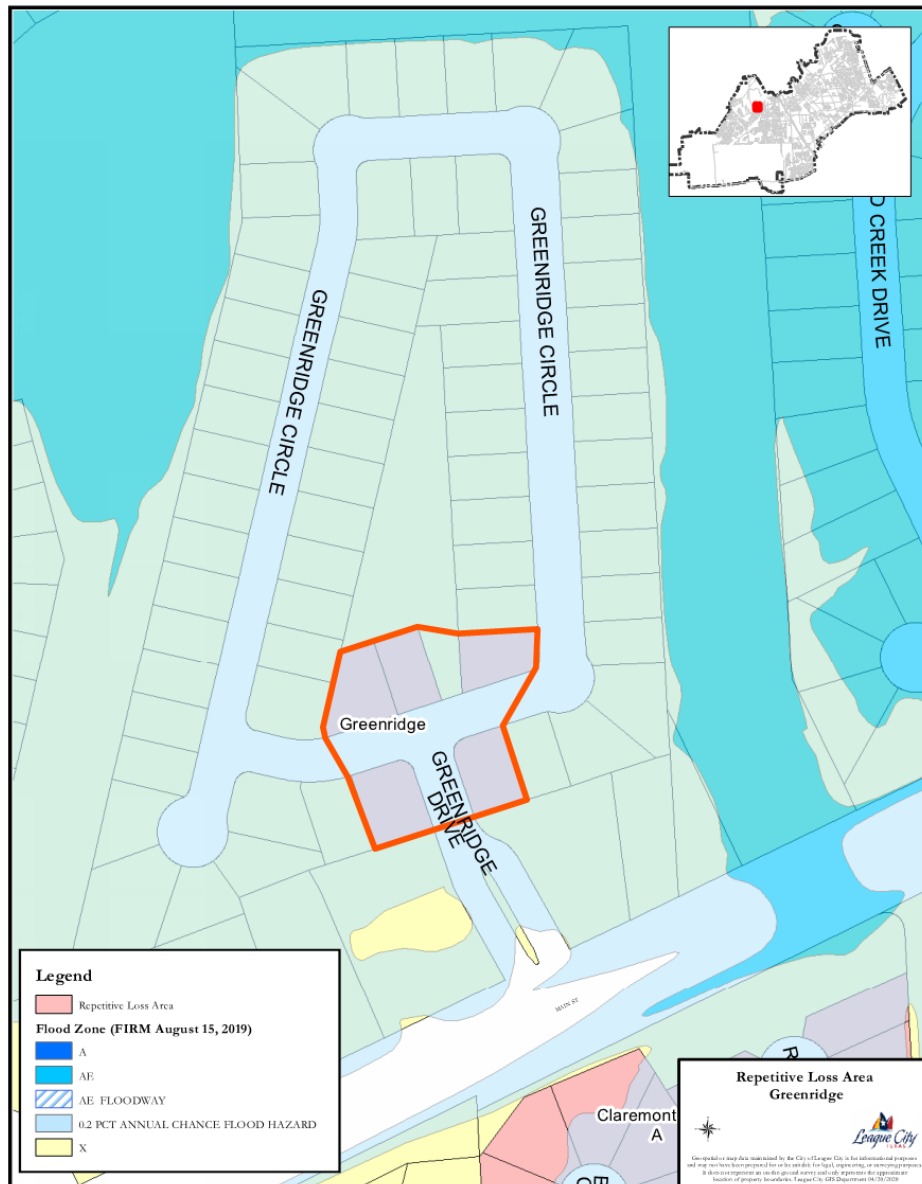
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

6.12 GREENRIDGE

The Greenridge RLA has a total of five properties that are located in the 0.2% flood zone. The homes in this area were built in 2001.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Greenridge	(none)	5	3	1



6.12.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into the tributary which in turns prevents stormwater within this area from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

6.12.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Greenridge RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Greenridge RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Ellis Road RLA.

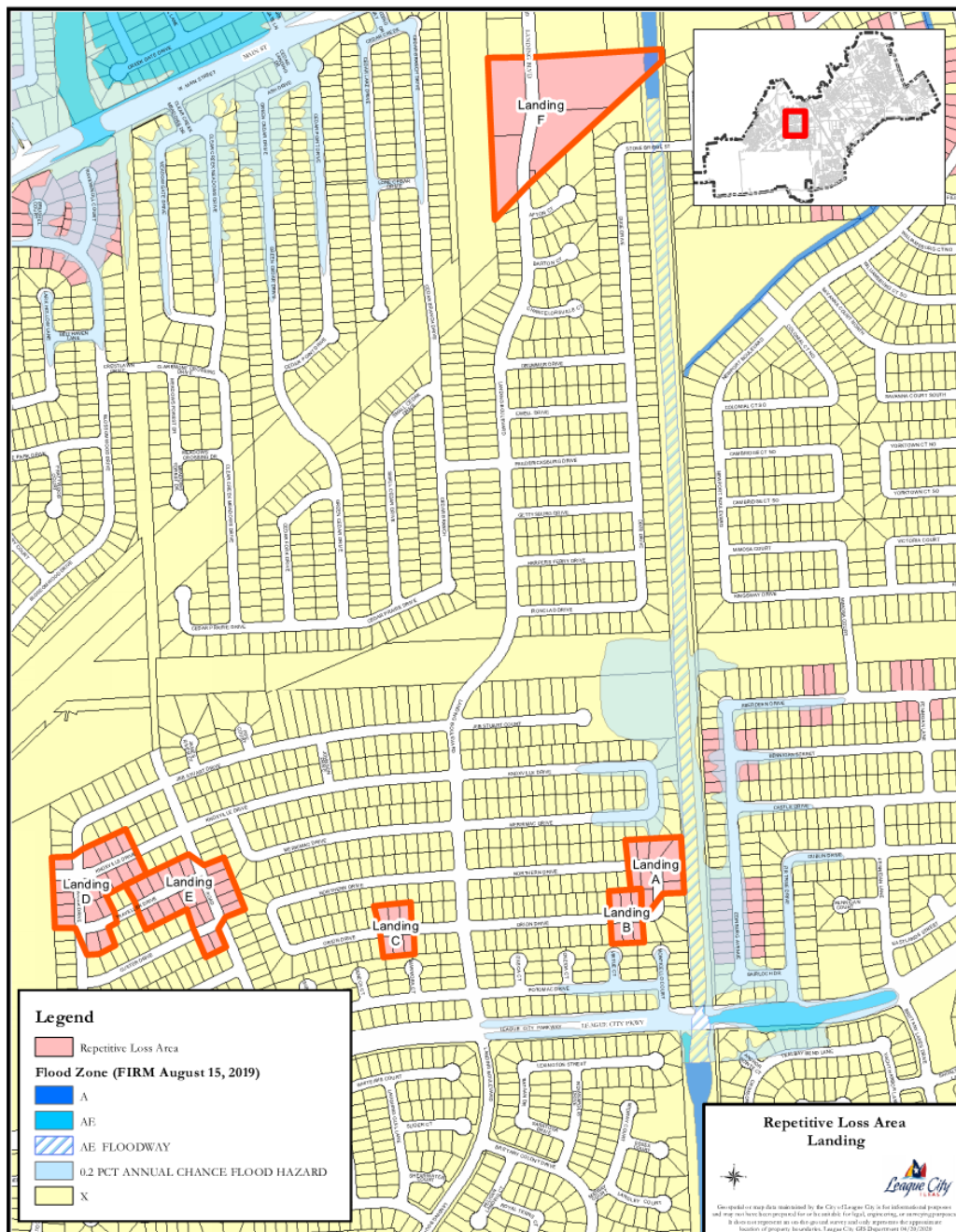
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

6.13 LANDING

The Landing RLA has six sub-areas for a total of 63 properties. Sub-areas A through E are homes that were built in the early to mid-1980s, while sub-area F is a non-residential area built in the late 1990s. All of the structures are in the X zone.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Landing	A	9	5	2
	B	6	1	1
	C	6	5	1
	D	18	15	8
	E	20	13	4
	F	4	2	1



6.13.1 Cause of Flooding

The Landing subdivision drains directly to the Landing Ditch through eight storm sewer lines to the east (one 18-inch CMP, one 24-inch CMP, one 30-inch CMP, three 42-inch CMPs, one 48-inch CMP, and one 72-inch CMP). Four additional storm sewer lines are located within the ROW of Tuscarora Court, Floyd Road, Landing Boulevard, and Monticello Drive that convey runoff to Landing Ditch from a storm sewer system in Brittany Bay. Based on LIDAR contours, the sheet flow pattern is from west to east toward Landing Ditch. The existing storm sewer lines are located in eight 10-foot wide drainage easements. The extreme event's sheet flow (100-year flow minus pipe capacity) in the streets drains to Landing Ditch through these eight drainage easements. As currently graded, the existing drainage easements do not have sufficient capacity to carry the extreme event's sheet flow from the streets to Landing Ditch. This factor, paired with blockage of the drainage easements by fences and/or vegetation, causes excessive ponding in the street during a 1% exceedance rainfall event.

Another cause of flooding in these areas is due to the capacity and flow rate of Landing Ditch and Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into Landing Ditch which, in turn, prevents stormwater within The Landing from properly draining during 1% exceedance events which causes excessive ponding in the street and, in extreme events, can lead to structural inundation.

6.13.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Landing RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Landing RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

A short-term mitigation project in the City's 2020-2024 CIP would include (1) a drainage study and HEC-RAS Model of Landing Ditch to ensure all drainage areas feeding into the creek are accounted for and to ensure the improved flows from the proposed drainage improvements can discharge into the creek without negatively impacting downstream neighborhoods along Landing Ditch; and (2) the installation of concrete and gravel paver overflow swales at existing drainage easement sites within the subdivision. Another short to mid-term mitigation project in the City's FY 2020-2024 CIP would include the desnagging and removal of vegetation from Landing Ditch. It is anticipated that this project would increase Landing Ditch's capacity by approximately 34%.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Landing RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Structural improvements included in the FY 2020-2024 CIP
- Annual outreach conducted by the Engineering Department using operating budget funds

6.14 MAGNOLIA ESTATES

The Magnolia Estates RLA consists of five properties, all of which are homes that were built in 2003 or 2004. The area is predominantly in the 0.2% flood zone with a sliver of the floodplain touching the property at the corner of Magnolia Way and Old South Way.

Repetitive Loss Area	Sub- Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Magnolia Estates	(none)	5	5	1

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Magnolia Estates RLA.

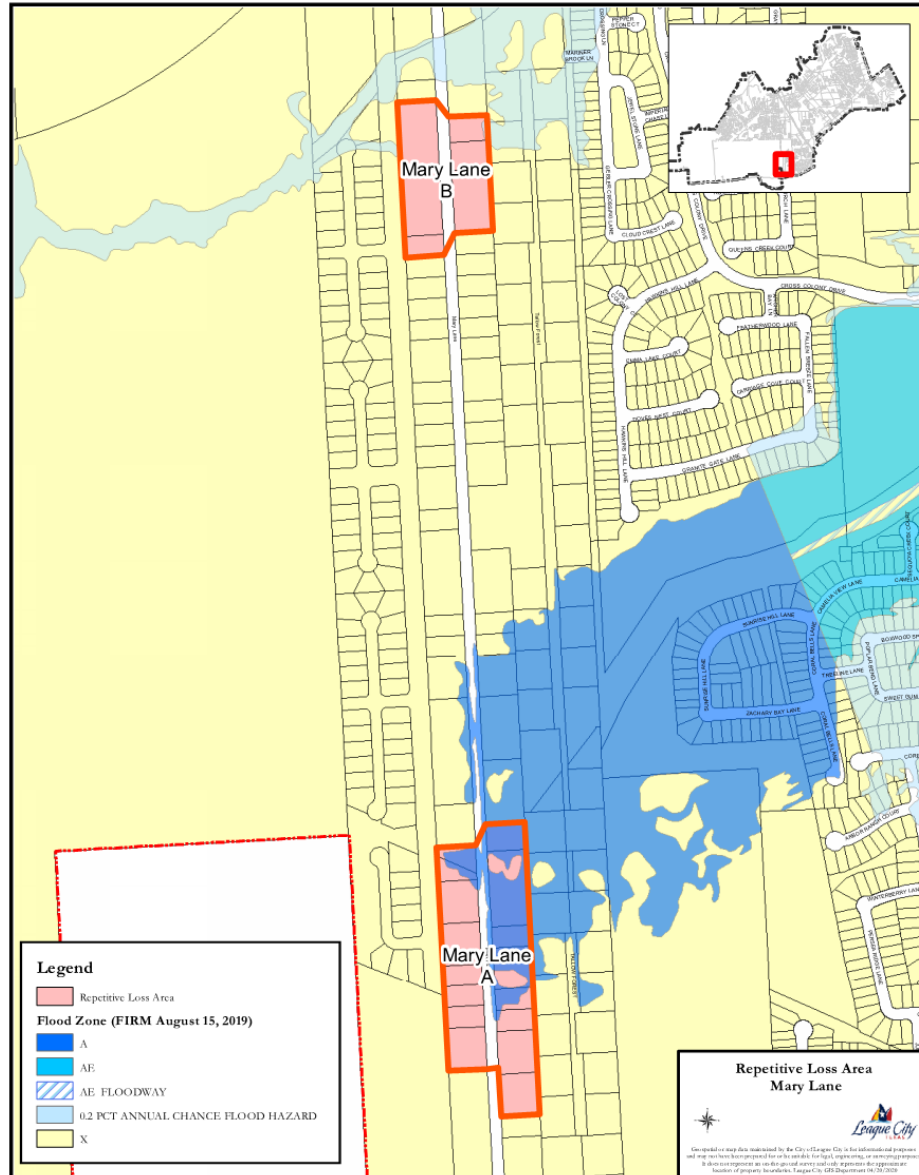
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

6.15 MARY LANE

The Mary Lane RLA has two-sub-areas with 18 properties total. Half of sub-area A is in the floodplain, and the remaining properties are in the X zone. Sub-area A is a mix of older and newer homes with a range of construction in the mid-1970s through the mid-1990s. Homes in sub-area B were built in the mid-1970s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Mary Lane	A	13	1	4
	B	5	1	2



6.15.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Borden's Gully, Magnolia Bayou and Dickinson Bayou. Once Dickinson Bayou reaches capacity, it pushes stormwater back into Borden's Gully and Magnolia Bayou which in turns prevents stormwater in these areas from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

6.15.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Mary Lane RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Mary Lane RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Dickinson Bayou drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Mary Lane RLA.

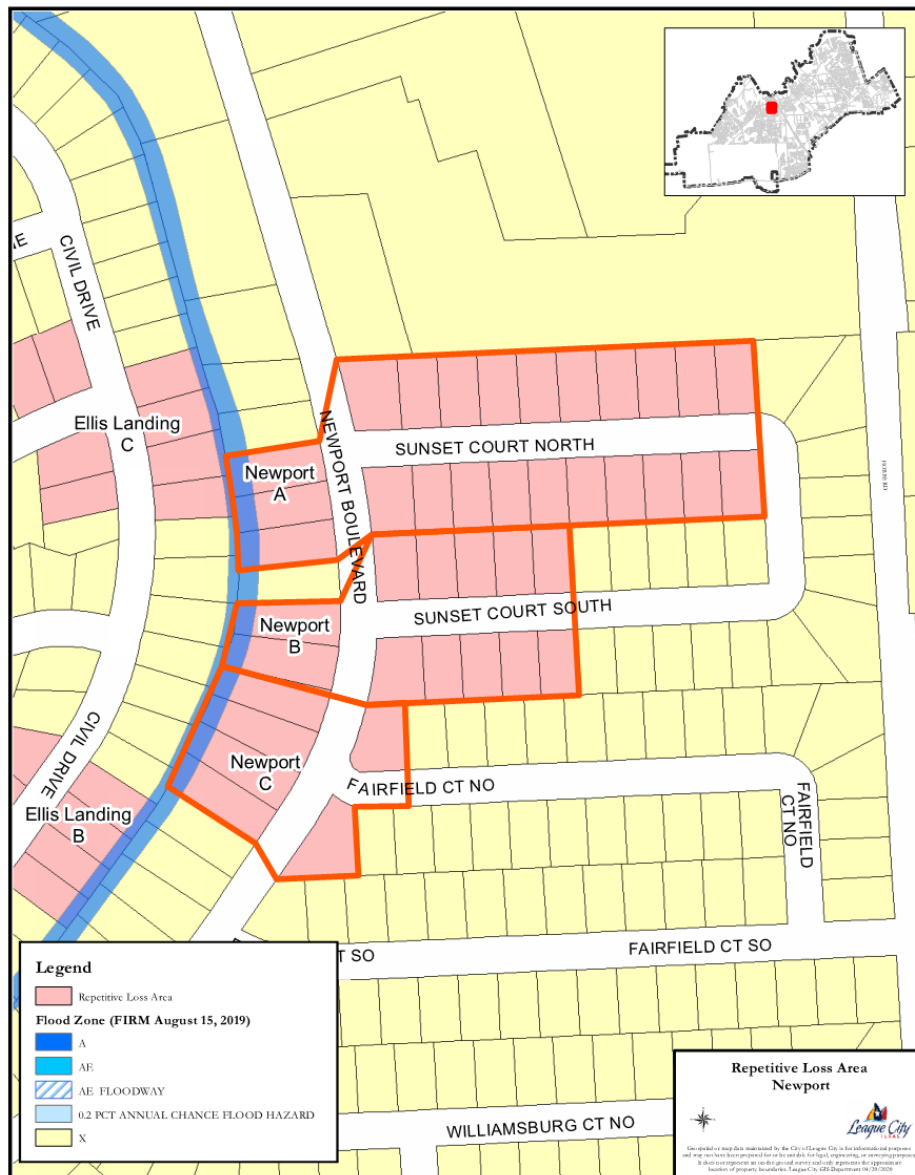
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

6.16 NEWPORT

The Newport RLA consists of three sub-areas of 41 properties total. All of the homes are in the X zone with the exception of the back end of the properties furthest west that touch the floodplain. The homes were built in the early 1960s and 1970s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Newport	A	23	6	6
	B	12	7	4
	C	6	3	3



6.16.1 Cause of Flooding

Newport subdivision drains directly to the concrete lined Newport Ditch through fourteen drainage outfalls to the west and south (twelve 24-inch RCPs, one 42-inch RCP, and one 48-inch RCP). Two storm lines are located within the Mimosa Court and Hervey Lane ROWs. Based on LIDAR contours, and due to a higher elevation within the middle of the subdivision, the sheet flow pattern is from east to west and from north to south toward Newport Ditch. The extreme event's sheet flow (100-year flow minus pipe capacity) in the streets drains to Newport Ditch through 12 assumed drainage easements. As currently graded, the existing assumed drainage easements do not have sufficient capacity to carry the extreme event's sheet flow from the streets to Newport. This factor, combined with blockage of the drainage easements by fences and/or vegetation, causes excessive ponding in the street during a 1% exceedance rainfall event.

Another cause of flooding in these areas is due to the capacity and flow rate of Newport Ditch and Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into Newport Ditch which in turns prevents stormwater within these areas from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

6.16.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Newport RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Newport RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

A short-term mitigation project in the City's FY 2020-2024 CIP would include (1) a drainage study and HEC-RAS Model of Newport Ditch to ensure all drainage areas feeding into the Newport Ditch are accounted for and to ensure the improved flows from the proposed drainage improvements can discharge into the ditch without negatively impacting downstream neighborhoods along Newport Ditch and (2) the installation of concrete and gravel paver overflow swales at existing drainage easement sites within the subdivision. A short to mid-term mitigation project in the City's FY 2020-2024 CIP would include the Desnagging and removal of vegetation from Newport Ditch. It is anticipated that this project would increase Newport Ditch's capacity by approximately 56%.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Newport RLA.

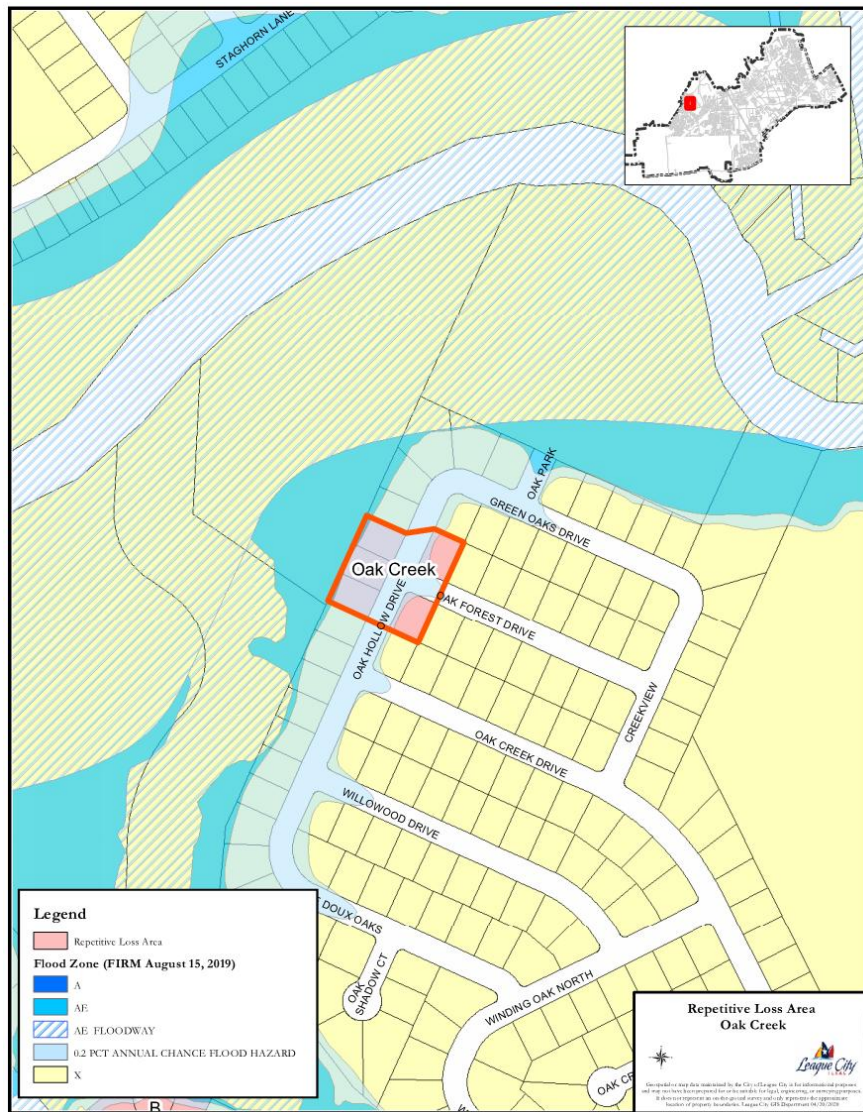
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Structural improvements included in the FY 2020-2024 CIP
- Annual outreach conducted by the Engineering Department using operating budget funds

6.17 OAK CREEK

The Oak Creek RLA consists of five properties located partially in the 0.2% flood zone and X zone. The homes were built in the late 1990s.

Repetitive Loss Area	Sub- Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Oak Creek	(none)	5	4	1



6.17.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into this area which prevents the area from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

6.17.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Oak Creek RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Oak Creek RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Oak Creek RLA.

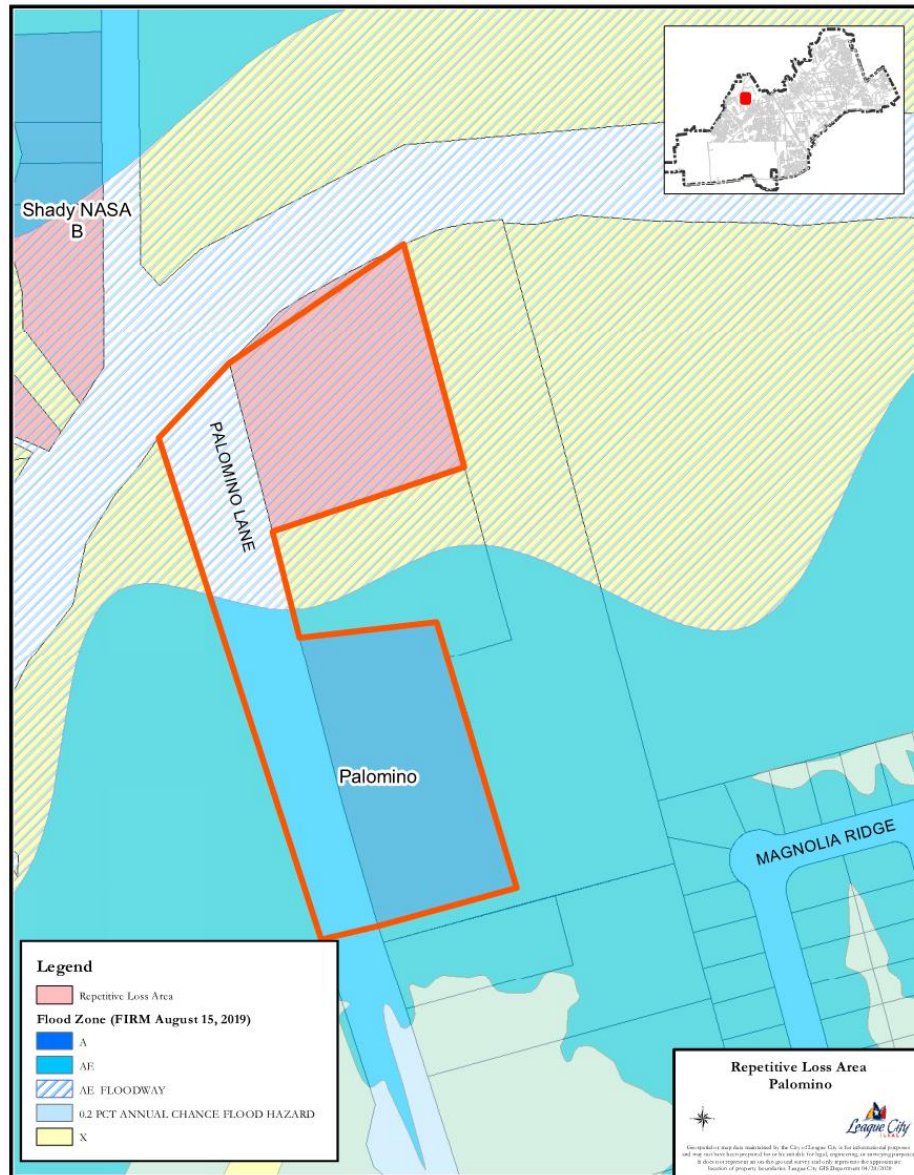
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

6.18 PALOMINO

The Palomino RLA is one of the smallest areas identified in this RLAA with only two properties total. One property is located in the floodway of Clear Creek, and the other is in the floodplain. The structures were built in 1984 and 2018.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Palomino	(none)	2	1	1



6.18.1 Cause of Flooding

A large portion of this area lies within the floodway for Clear Creek; therefore, flooding in this area is due to the capacity and flow rate of Clear Creek.

6.18.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Palomino RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Palomino RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of the area, implement stringent development requirements for this area, and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Palomino RLA.

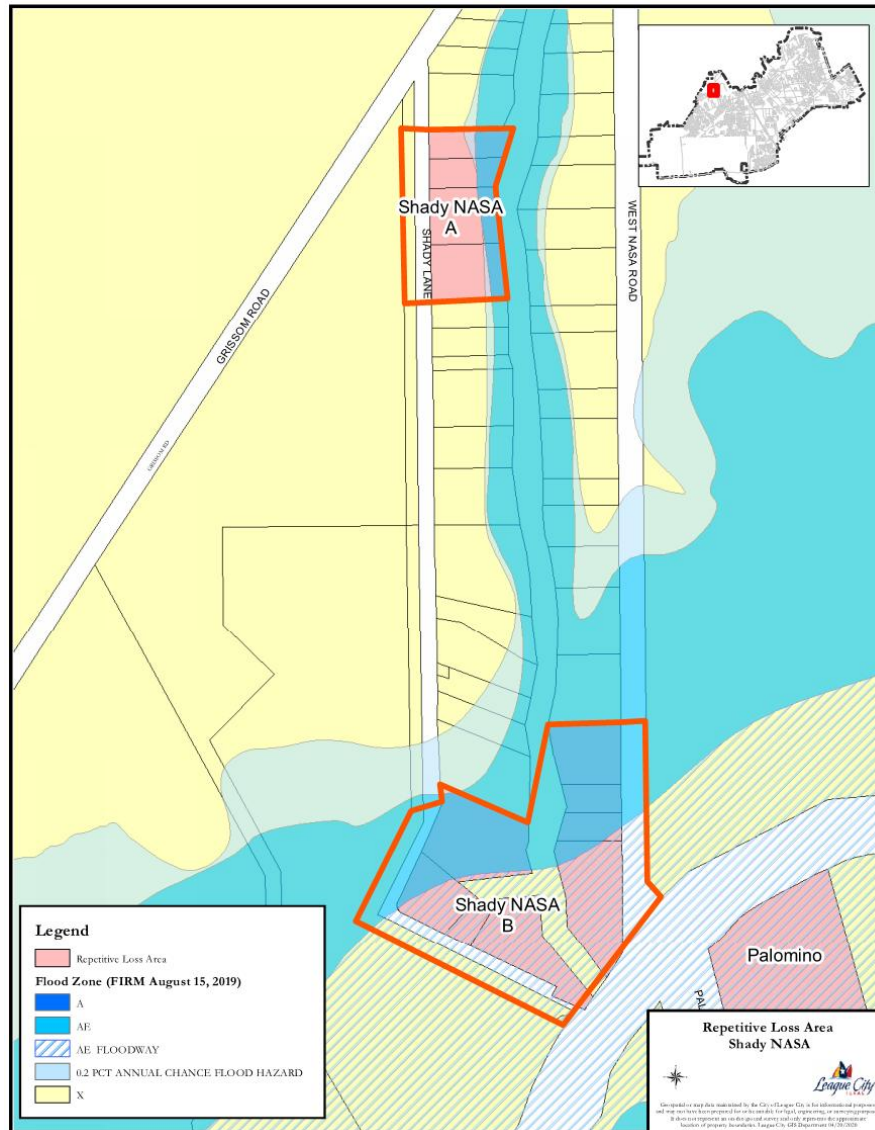
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

6.19 SHADY NASA

The Shady NASA RLA has two sub-areas with nine properties total. This RLA belongs to the part of League City that is in Harris County. The homes are in the floodway, floodplain, and X zone, and the majority of them were built in the 1970s, along with homes built in the 1960s and 1980s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Shady NASA	A	3	0	1
	B	6	1	4



6.19.1 Cause of Flooding

A portion of this area lies within the floodway for Clear Creek; therefore, flooding in this area is due to the capacity and flow rate of Clear Creek.

6.19.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Shady NASA RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Shady NASA RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of the area, implement stringent development requirements for this area, and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Shady NASA RLA.

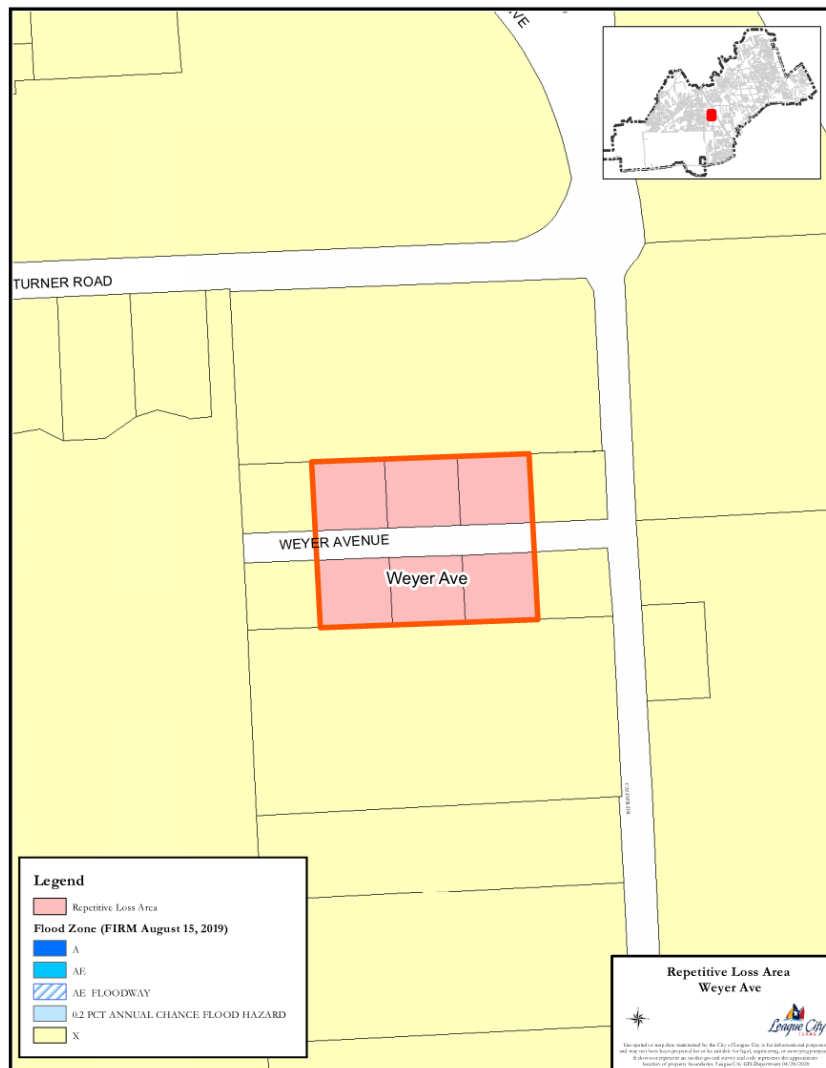
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

6.20 WEYER

The Weyer RLA consists of five properties all in the X zone. Dates of construction range from 1950 through 1960, and into the 1980s and 2000s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Weyer	(none)	5	1	1



6.20.1 Cause of Flooding

This area was constructed prior to League City's detention requirements. Stormwater drains west to east into the ditches of Calder Road. Flooding in this area appears to be due to the capacity and flow rate of the open ditch system along Weyer Avenue and Calder Drive. Once the ditches reach capacity, it pushes stormwater back into the area preventing stormwater from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

6.20.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Weyer RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Weyer RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Newport RLA.

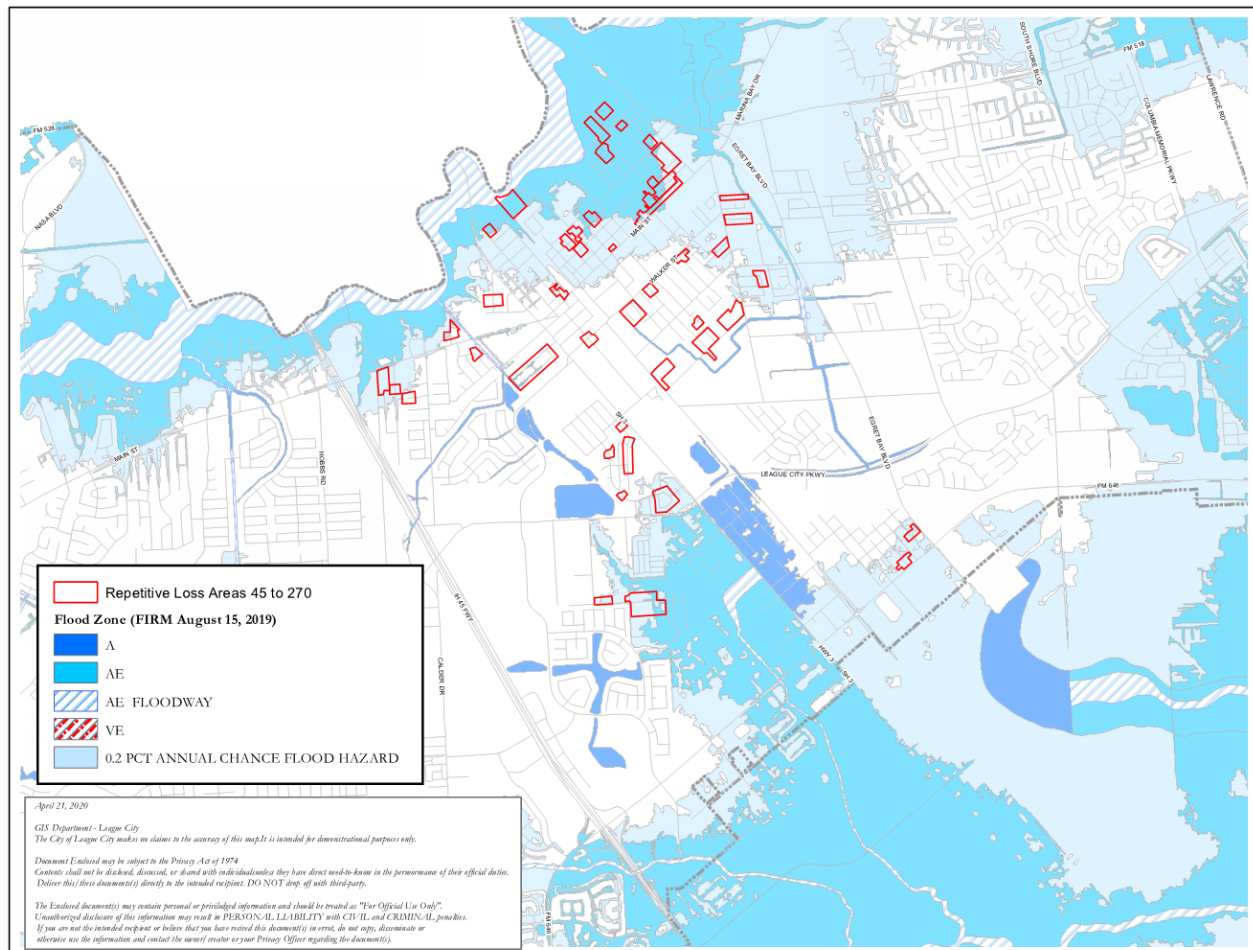
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.0 REPETITIVE LOSS AREAS – I-45 TO FM 270 DIVISION

The division between I-45 and FM 270 includes 24 RLAs (listed below) containing 490 properties total. Most of the RLAs are in the northern part of the city closer to Clear Creek. (Section 7 continues in the same format as Section 6.)

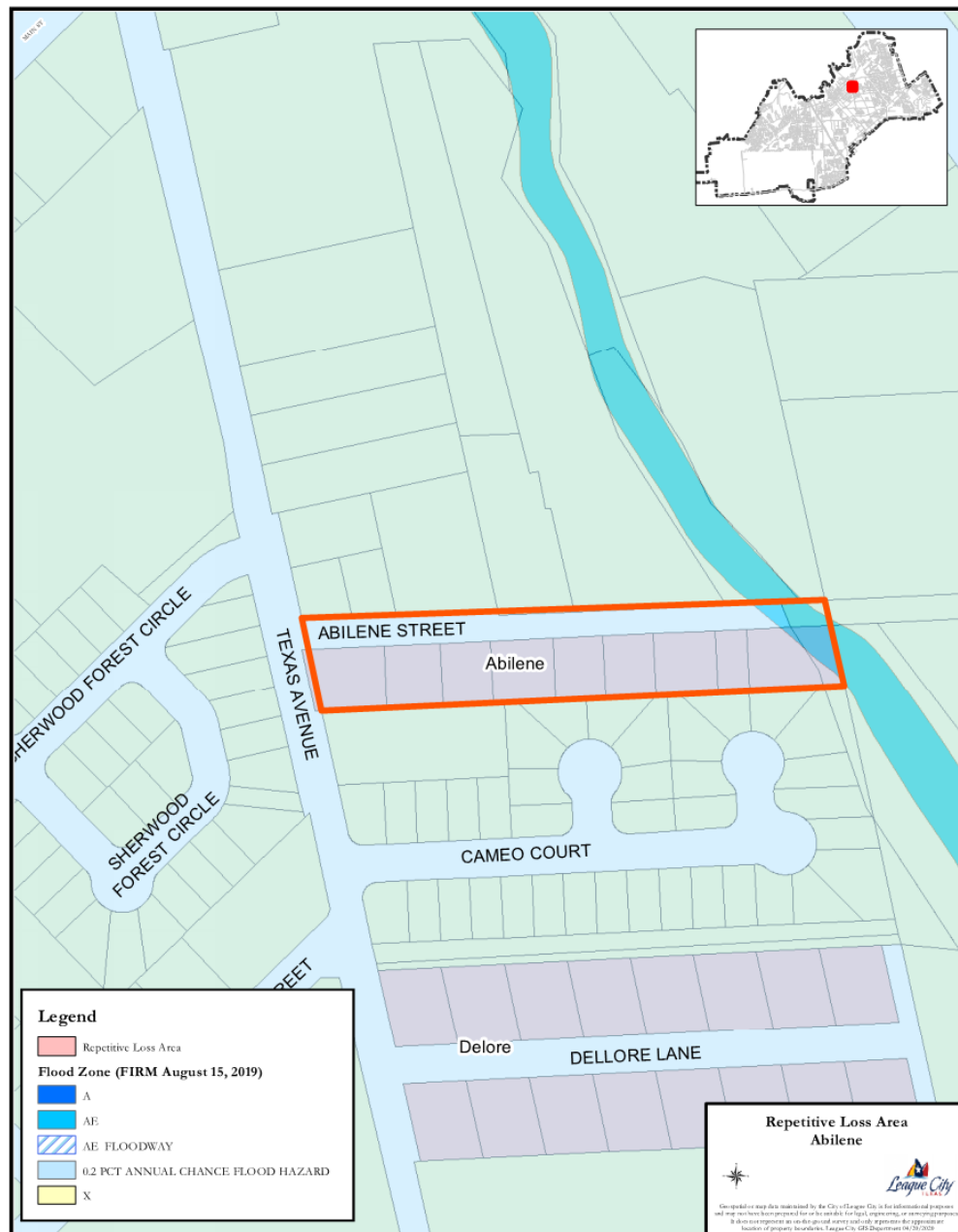
- Abilene
- Breckenridge
- Crestwood
- Crystal Street
- Delloro Lane
- Dickinson Avenue
- Effie Illinois
- Golden Acres
- Highland Terrace
- McKibben
- Oakcrest Manor
- Oaks of Clear Creek
- Old Town North
- Orange Grove
- Patton Sub
- Pecan Forest
- Perkins
- Shellside
- Texas at Power
- Trinity
- Wakefield
- Walker at Clear Creek
- Walker at David
- Walker at Iowa



7.1 ABILENE

The Abilene RLA consists of nine properties all located in the 0.2% flood zone. Most of the homes were built in the 1970s and 1980s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Abilene	(none)	9	5	4



7.1.1 Cause of Flooding

A cause of flooding in this area is due to the capacity and flow rate of the open ditches in the area, Robinson Bayou and Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into Robinson Bayou which in turns prevents stormwater within this area from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

7.1.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Abilene RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Abilene RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

The drainage system was altered when Robinson Bayou was widened and extended. This appears to have corrected the flooding issues for rainfall events up to 1% in size.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Abilene RLA.

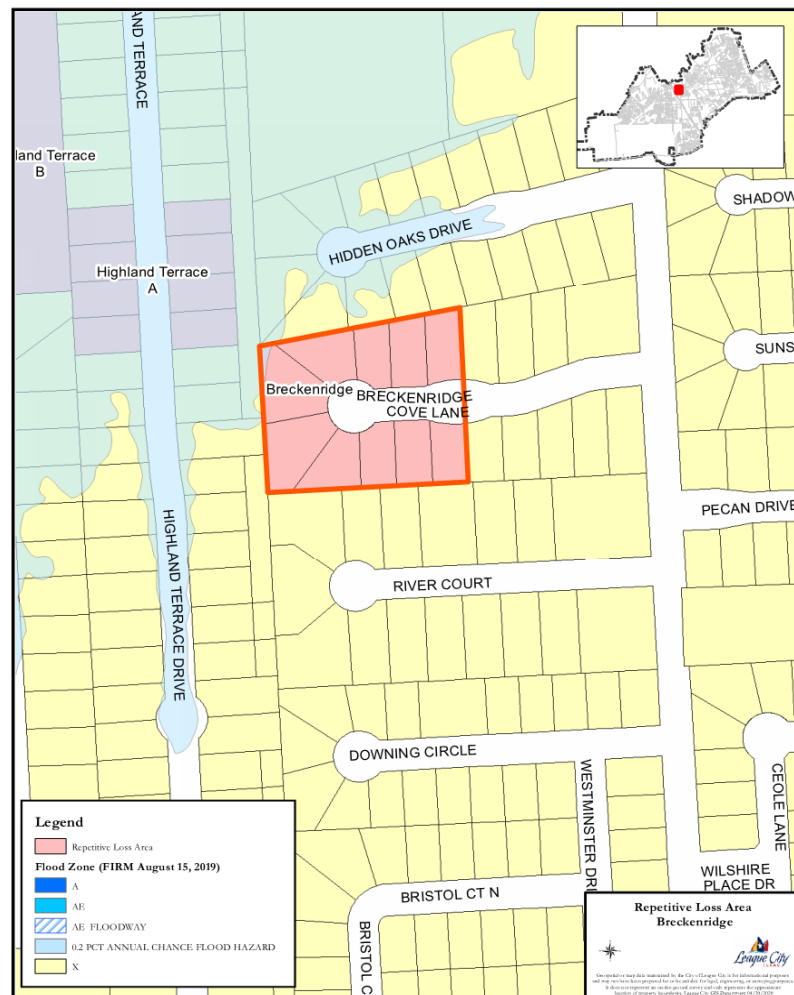
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.2 BRECKENRIDGE

The Breckenridge RLA consists of 10 properties all located in the X zone. The homes were built in 1999/2000.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Breckenridge	(none)	10	7	5



7.2.1 Cause of Flooding

Existing drainage system discharging into Kelly Ditch was undersized leading to street ponding and, during extreme events, structural inundation.

7.2.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Breckenridge RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Breckenridge RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

The undersized sections of the drainage system have been corrected, and the City has not seen excessive street ponding or structural inundation during 1% rainfall events.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Breckenridge RLA.

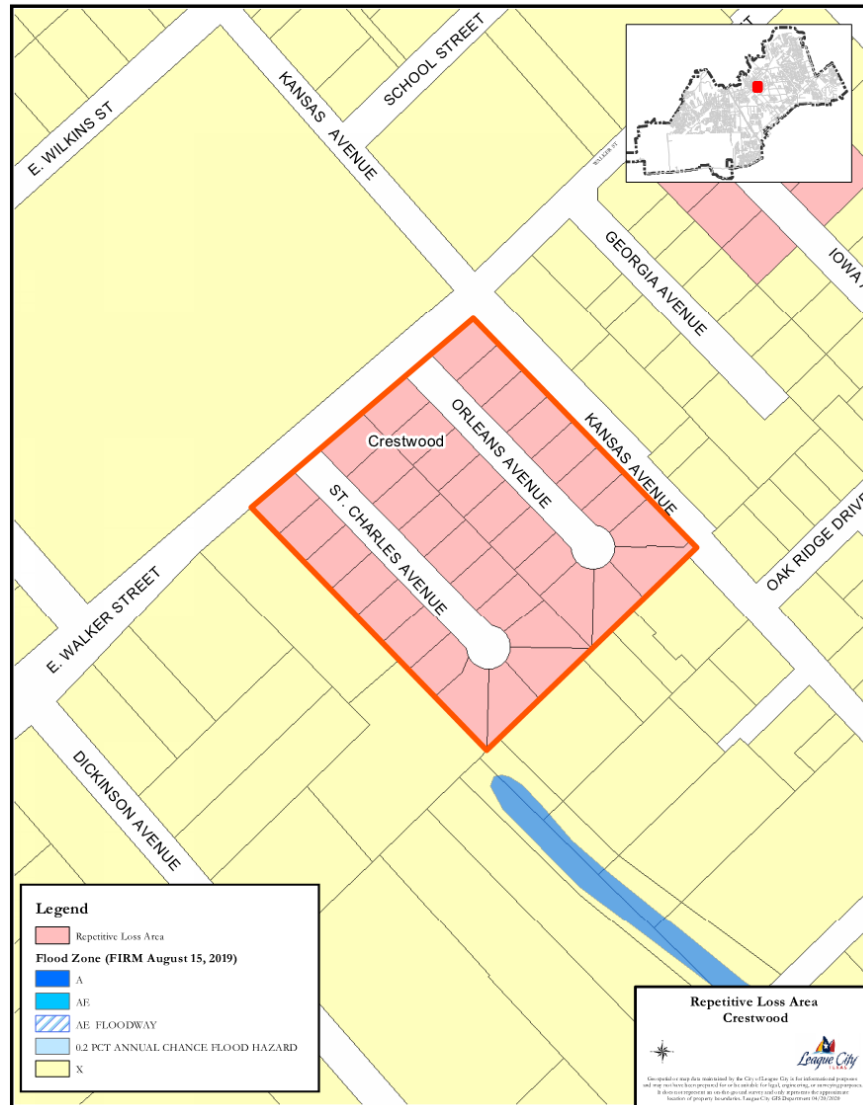
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.3 CRESTWOOD

The Crestwood RLA consists of 36 properties that are all located in the X zone. Most of the homes were built in the 1970s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Crestwood	(none)	36	15	7



7.3.1 Cause of Flooding

In the past, this area along Walker Street was open ditch and the RLA actually drained into the Power Street Ditch. An inefficient system coupled with open ditches led to excessive street ponding and, during extreme events, structural inundation.

7.3.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Crestwood RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Crestwood RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

Walker Street was reconstructed and the drainage system was altered when Robinson Bayou was widened. This appears to have corrected the flooding issues for rainfall events up to 1% in size.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Crestwood RLA.

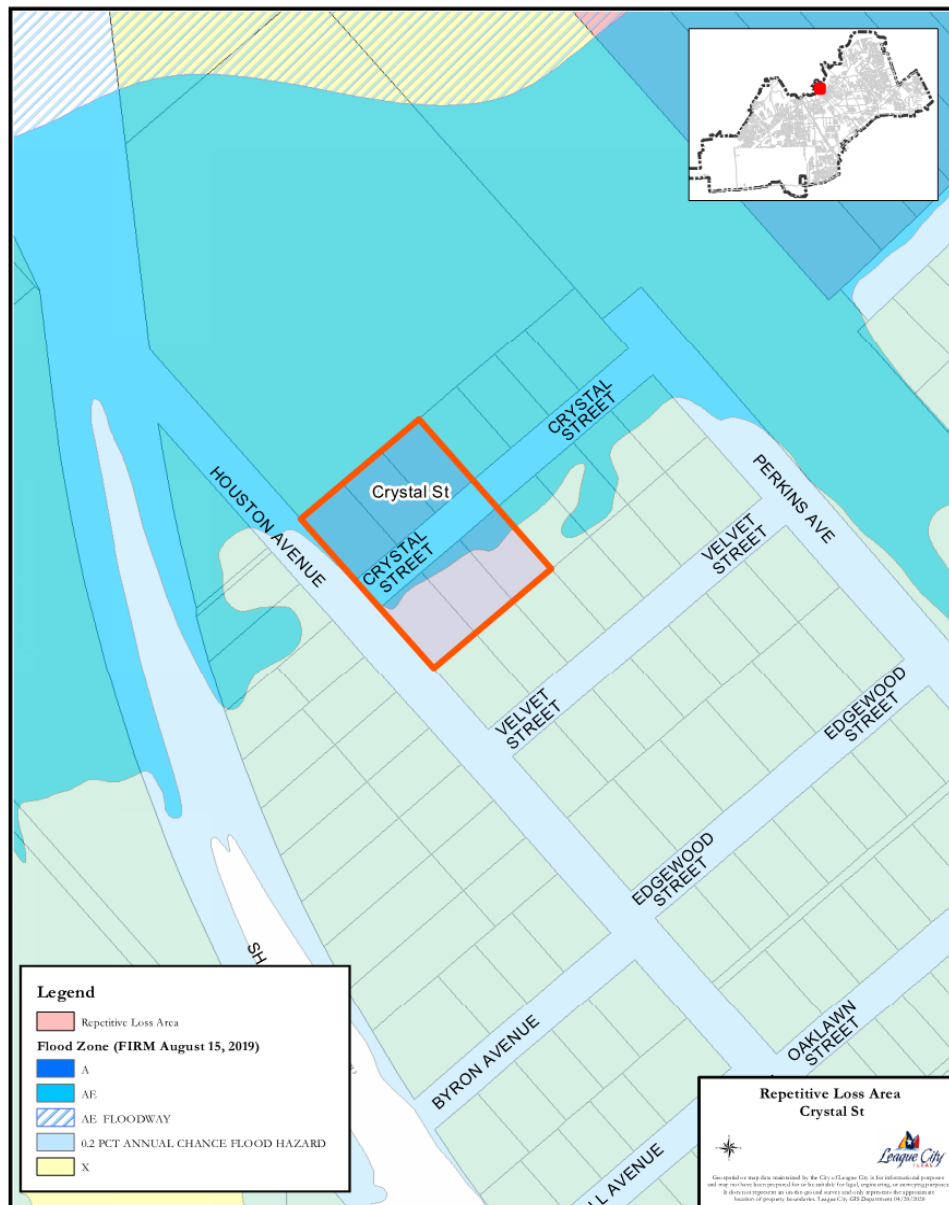
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.4 CRYSTAL STREET

The Crystal Street RLA is made up of six properties with half of them in the floodplain. The homes were built in the early 1960s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Crystal Street	(none)	6	3	1



7.4.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into this area which prevents the area from properly draining during 1% exceedance events which causes excessive ponding in the street and, in extreme events, can lead to structural inundation.

7.4.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Crystal Street RLA. Considerations were given to the location of the nearest channel, the flood zone,

age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Crystal Street RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with our neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Crystal Street RLA.

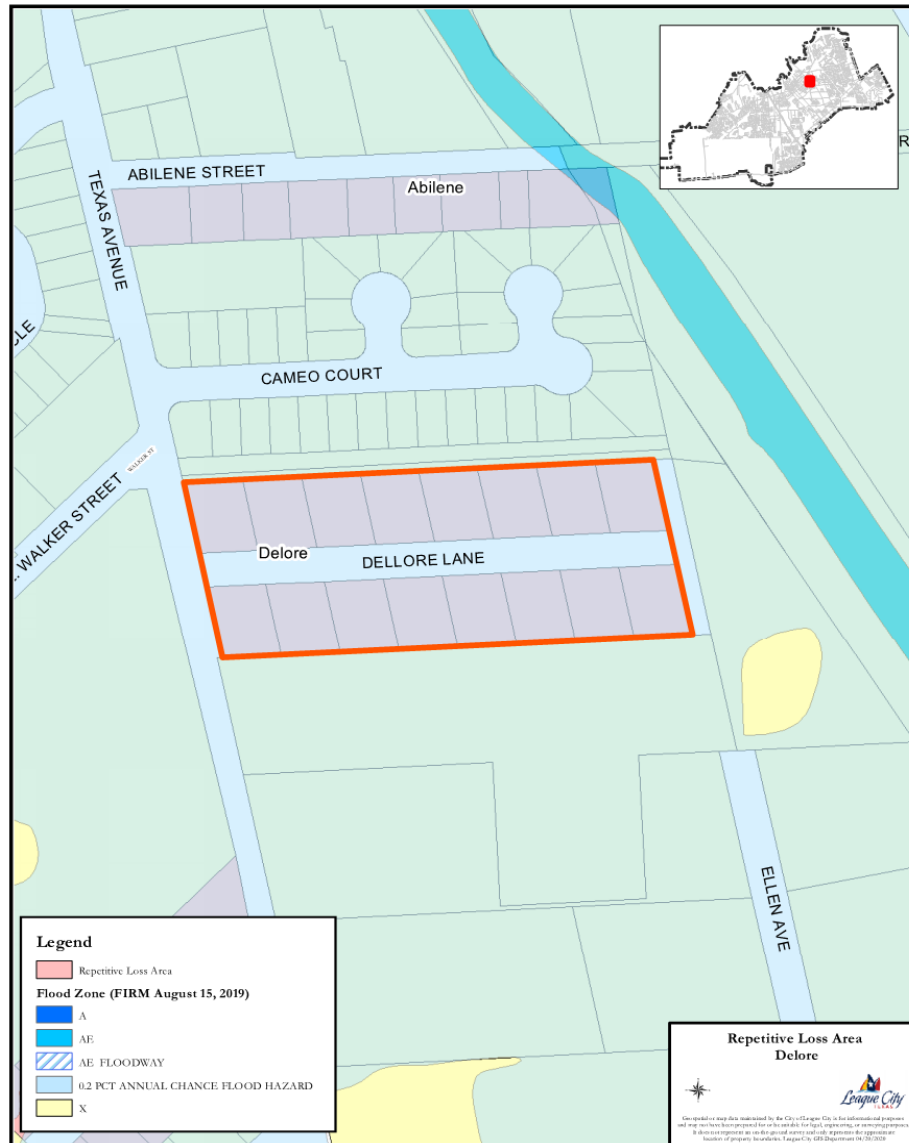
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.5 DELLORE LANE

The Dellore Lane RLA consists of 16 properties that are located within the 0.2% flood zone. The homes were built in the 1960s and 1970s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Dellore Lane	(none)	16	12	3



7.5.1 Cause of Flooding

A cause of flooding in this area is due to the capacity and flow rate of the open ditches in the area, Robinson Bayou and Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into Robinson Bayou which in turns prevents stormwater within this area from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

7.5.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Dellore Lane RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Dellore Lane RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

The drainage system was altered when Robinson Bayou was widened and extended. This appears to have corrected the flooding issues for rainfall events up to 1% in size.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Dellore Lane RLA.

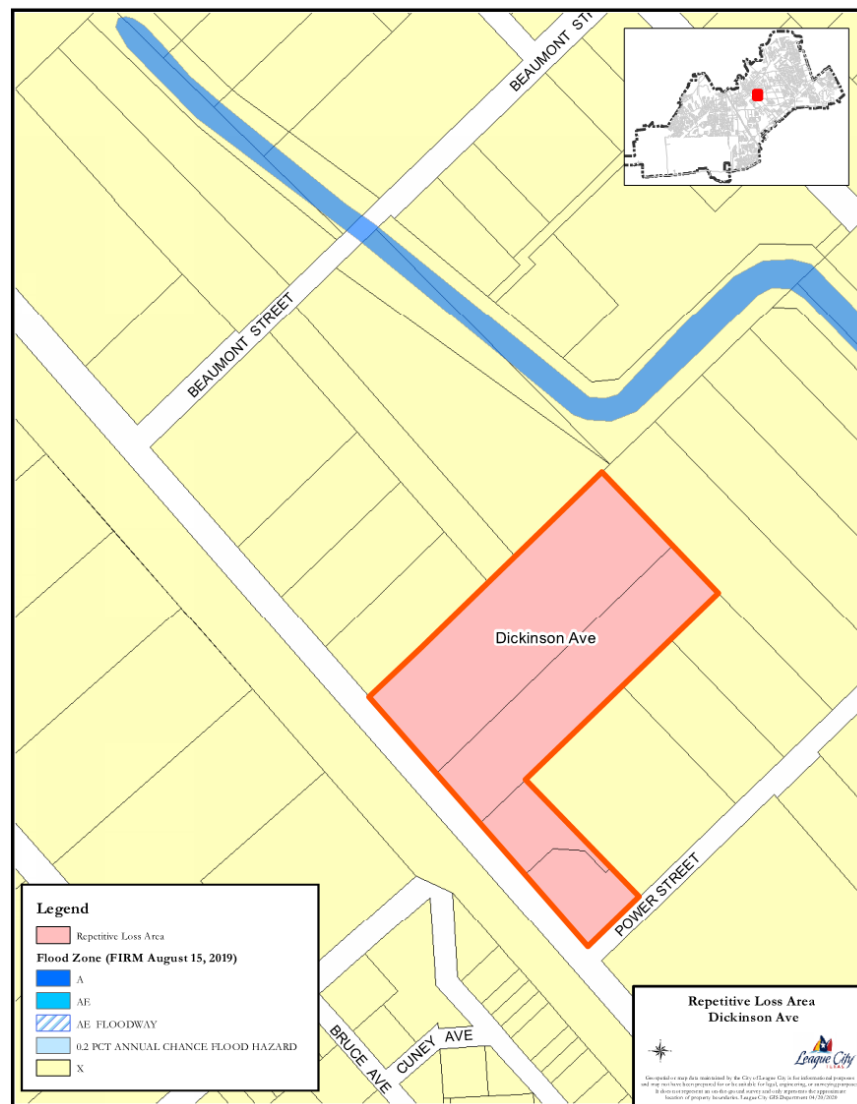
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.6 DICKINSON AVENUE

The Dickinson Avenue RLA consists of four properties located in the X zone. Two of the homes were built in the mid-1970s, and two were built after the year 2000.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Dickinson Avenue	(none)	4	3	1



7.6.1 Cause of Flooding

Flooding in this area appears to be the result of undersized culverts and open ditches.

7.6.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Dickinson Avenue RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Dickinson Avenue RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

In 2019, the City began construction to re-build Dickinson Avenue between Walker Street and FM 646. Drainage in this area will be corrected with this project.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Dickinson Avenue RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.7 EFFIE ILLINOIS

The Effie Illinois RLA consists of 28 properties located in the X zone. Most homes were built in the 1970s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Effie Illinois	(none)	28	11	2

age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Effie Illinois RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

The drainage system was altered when Robinson Bayou was widened and extended. This appears to have corrected the flooding issues for rainfall events up to 1% in size.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Effie Illinois RLA.

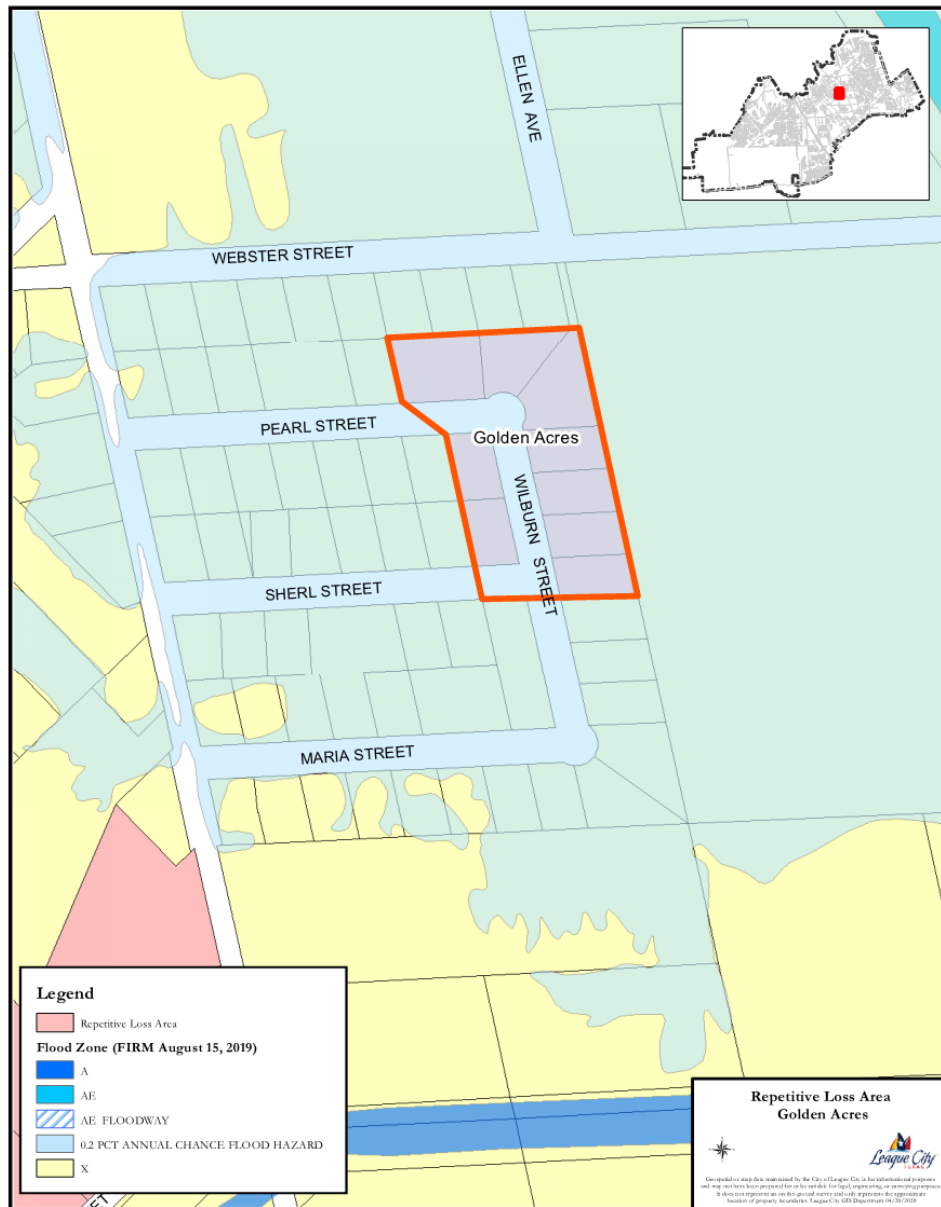
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.8 GOLDEN ACRES

The Golden Acres RLA consists of six properties located in the 0.2% flood zone. (The map shows more than six parcels, but two of those are vacant land.) The homes were built in the mid to late 1960s and early 1970s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Golden Acres	(none)	6	1	2



7.8.1 Cause of Flooding

This area was constructed prior to League City’s detention requirements. Stormwater drains east to west through an open ditch system into the ditches of Texas Avenue. Flooding in this area appears to be due to the capacity and flow rate of the open ditch system. Once the ditches reach capacity, it pushes stormwater back into the area preventing stormwater from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

7.8.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Golden Acres RLA. Considerations were given to the location of the nearest channel, the flood zone,

age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Golden Acres RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Golden Acres RLA.

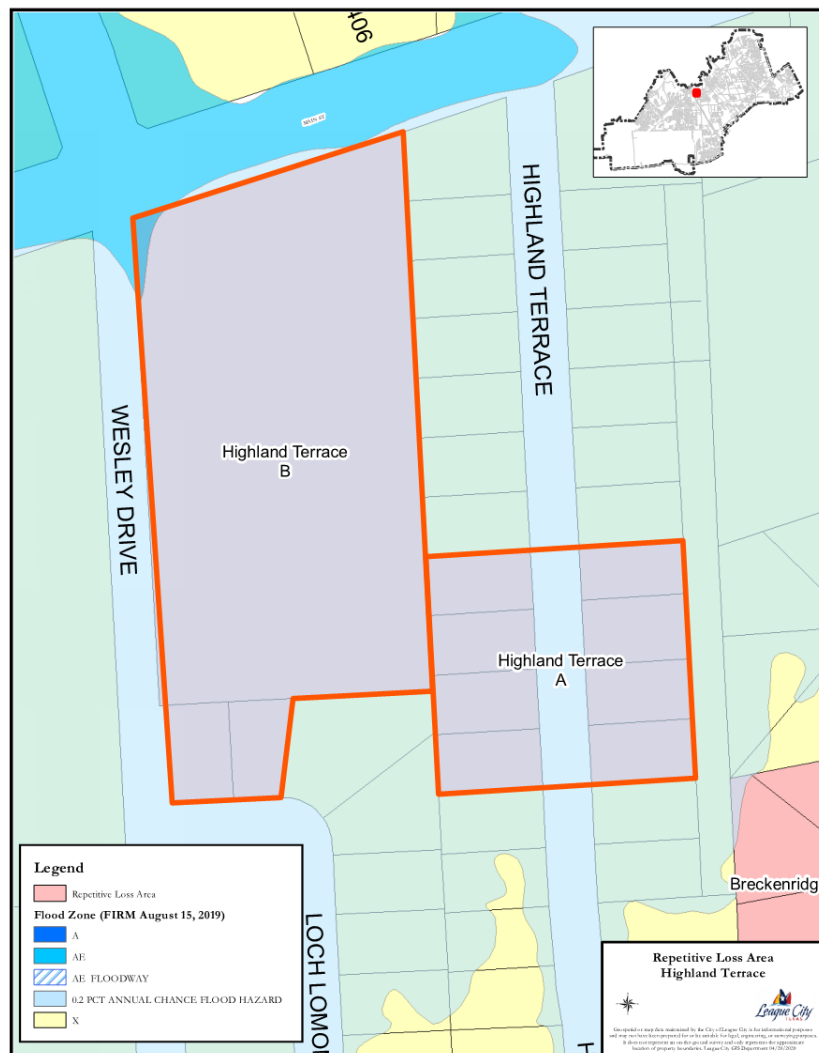
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.9 HIGHLAND TERRACE

The Highland Terrace RLA consists of two sub-areas of 11 properties total. The homes are located in the 0.2% flood zone and were built in the mid to late 1960s and early 1970s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Highland Terrace	A	8	2	1
	B	3	1	1



7.9.1 Cause of Flooding

Highland Terrace is a significant sheet flow path for the neighborhood to the south. Using neighborhood streets to convey excess flows during significant rainfall events is appropriate; however, the Highland Terrace sheet flow path is blocked by a local high point near its intersection with FM 518. The vertical profile of FM 518 shows that it generally slopes downhill east to west from a high point of approximately 20 feet near Englewood Drive to a low point of approximately 12 feet near Wesley Drive. The road rises again to cross Corum Ditch, creating a bowl between Wesley Drive and Highland Terrace. The storm sewer network surcharges above the ground elevation in several locations.

There is a tendency for the drainage from the Highland Terrace neighborhood to sheet flow to the south and west towards FM 518 and Corum Ditch. The bowl-like topography of FM 518 in the vicinity of Wesley Drive results in an area of impassible flooding. A primary cause of the deficiency in this area is a combination of the existing vertical profile of FM518 and the lack of an appropriate overland flow path for the excess flows in the neighborhood to the south.

7.9.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Highland Terrace RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Highland Terrace RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

A short to mid-term mitigation project in the City’s FY 2020-2024 CIP would include (1) the re-grading of Wesley Drive in the vicinity of Main Street to promote conveyance in the south and west directions; (2) establishing an overland flow path from Wesley Drive to Corum Ditch; (3) installation of a parallel sub-surface system with large inlets to remove the drainage “sag” along Main Street; and (4) construct a detention pond will be constructed to mitigate impacts caused by the conveyance of additional flows from the new system.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Highland Terrace RLA.

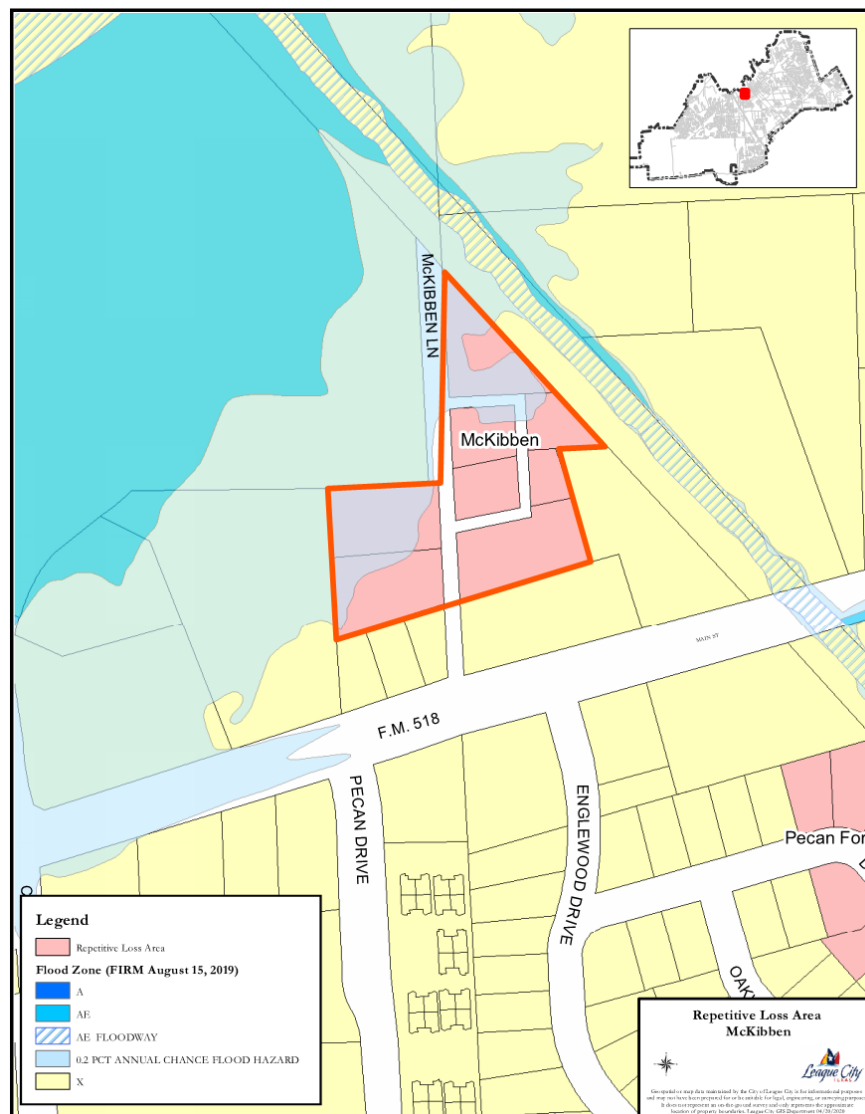
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Structural improvements included in the FY 2020-2024 CIP
- Annual outreach conducted by the Engineering Department using operating budget funds

7.10 MCKIBBEN

The McKibben RLA consists of six properties, located in the 0.2% flood zone and X zone, and built in the mid-1960s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
McKibben	(none)	6	2	1



7.10.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Clear Creek. Once Clear Creek reaches capacity, it prevents stormwater along McKibben Lane from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

7.10.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the McKibben RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the McKibben RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the McKibben RLA.

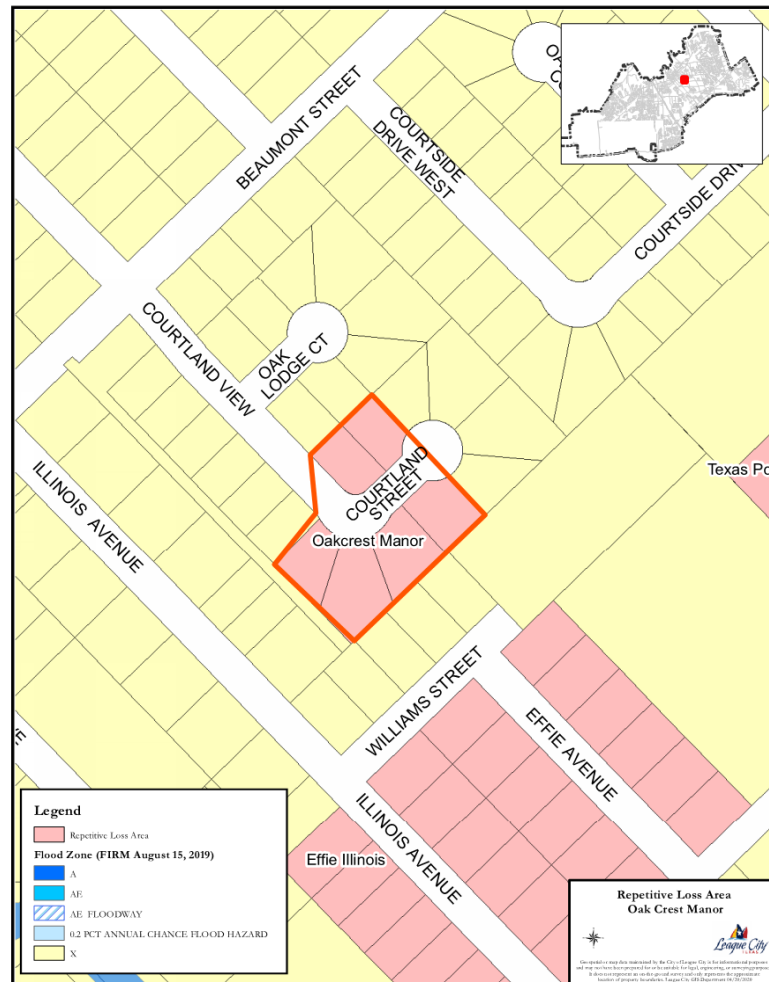
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.11 OAKCREST MANOR

The Oakcrest Manor RLA has six properties that are all located in the X zone and were built in 1998.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Oakcrest Manor	(none)	6	4	1



7.11.1 Cause of Flooding

In the past, this area was problematic due to the inefficiencies in the adjacent drainage system which led to excessive street ponding and, during extreme events, structural inundation.

7.11.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Oakcrest Manor RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Oakcrest Manor RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of the area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

The drainage system was improved when Robinson Bayou was widened and extended. This appears to have corrected the flooding issues for rainfall events up to 1% in size.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Oakcrest Manor RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.12 OAKS OF CLEAR CREEK

The Oaks of Clear Creek RLA has five sub-areas with a total of 81 properties. All properties but those in sub-area B are located in the X zone. All of the homes were built in the early to mid-1990s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Oaks of Clear Creek	A	27	16	6
	B	37	31	4
	C	6	6	1
	D	6	2	1
	E	5	4	1



7.12.1 Cause of Flooding

In general, the region is subject to widespread roadway inundation and structural flooding during the 100-year, 24-hour event. Many of the roadways within the region are impassible during lesser events and subject to excessively long time-to-drain durations. Limited outfall capacities and topographic low regions across the neighborhood yield high ponding depths in low points during the 100-year, 10-year, and 2-year 24-hour event. Additionally, the 2-year 24-hour storm event produces ponding that exceeds the City design standards. This is an indication of system capacity deficiencies.

7.12.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Oaks of Clear Creek RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Oaks of Clear Creek RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

A short-term mitigation project in the City’s FY 2020-2024 CIP would include (1) purchasing and removing one to two homes on Deer Ridge Drive to reduce long-term repetitive losses within the Oaks of Clear Creek Subdivision; and (2) analyze and design drainage system improvements to provide proper drainage of Deer Ridge Drive into Bradshaw Ditch while reducing excessive flooding in the street during extreme events. Another short to mid-term mitigation project in the City’s FY 2020-2024 CIP would include (1) the design of an 8 acre-foot pond adjacent to Bradshaw Ditch along the southwest side of the Subdivision and a 60 acre-foot pond along the northwest side of the subdivision; and (2) internal drainage re-routing design will be needed along with up-sizing of portions of the existing storm sewer system.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Oaks of Clear Creek RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Structural improvements included in the FY 2020-2024 CIP
- Annual outreach conducted by the Engineering Department using operating budget funds

7.13 OLD TOWN NORTH

The Old Town North RLA is made up of 15 sub-areas and 120 properties. Most of the sub-areas are in the floodplain, and some are in the 0.2% flood zone. Construction dates for the homes range from as far back as the early 1900s to as recently as 2016.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Old Town North	A	6	1	2
	B	9	4	1
	C	5	3	2
	D	6	4	1
	E	6	5	1
	F	6	3	1
	G	6	4	2
	H	4	3	1
	I	5	3	1
	J	10	7	2
	K	4	1	1
	L	14	7	5
	M	21	13	6
	N	16	4	2
	O	2	0	1

7.13.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Old Town North RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Old Town North RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Old Town North RLA.

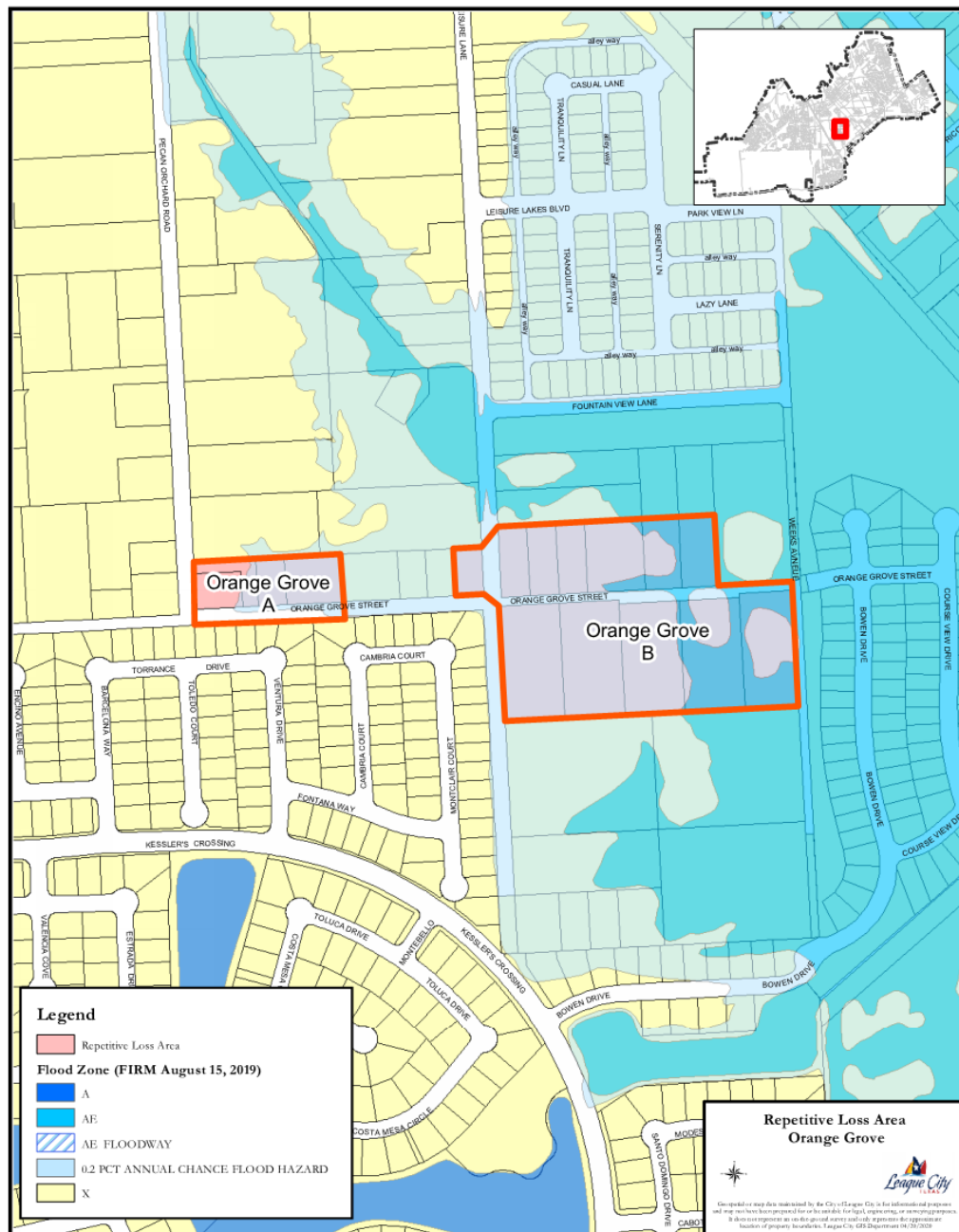
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.14 ORANGE GROVE

The Orange Grove RLA has two sub-areas for a total of 16 properties. Some of the properties are in the floodplain, and some are in the 0.2% flood zone. The majority of homes were built in the 1980s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Orange Grove	A	3	2	1
	B	13	11	5



7.14.1 Cause of Flooding

This area was constructed prior to League City's detention requirements. Stormwater drains west to east in open ditches to Benson's Bayou. Flooding in this area appears to be due to the capacity and flow rate of the open ditch system and can be exacerbated by the water surface elevation of Benson's Bayou in 1% exceedance events. Once the ditches reach capacity, it pushes stormwater back into the area preventing stormwater from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

7.14.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Orange Grove RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Orange Grove RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to "a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation." Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City's long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City's two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Structural Projects

In 2017, City forces reworked the outfall from Orange Grove and Leisure Lane into Benson's Bayou which led to a reduction in anticipated structural inundation related to the flooding associated with Hurricane Harvey. A mid- to long-term mitigation project in the City's FY 2020-2024 CIP would include (1) re-grading Benson Bayou and related tributaries from the HL&P culverts (located in the Bayou north of the FM 646 intersection) all the way through to SH 3 (approximately 2,750 LF) including the reconstruction of one or both of the Bayou crossings at LCP and SH 3; and (2) the construction of an approximate 110 acre-foot mitigation pond and related pond outfall structures.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Orange Grove RLA.

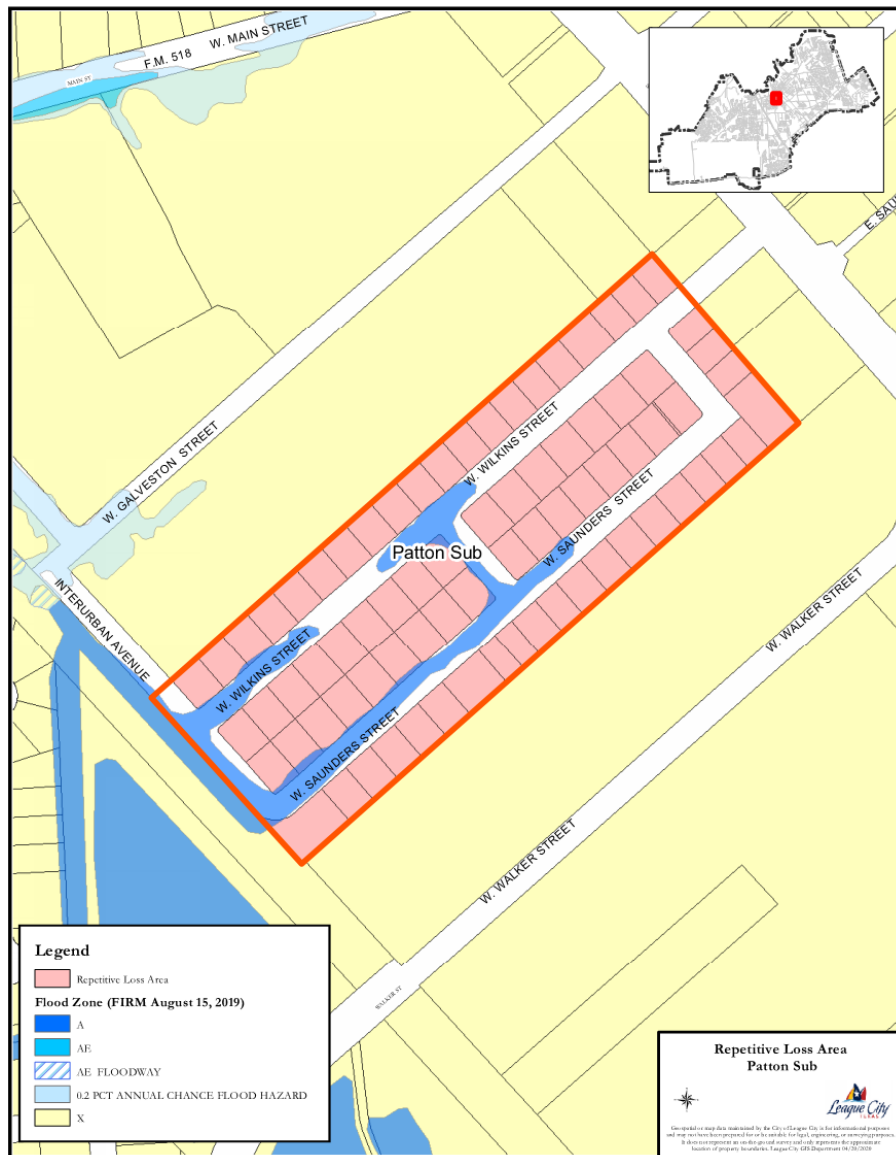
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Structural improvements included in the FY 2020-2024 CIP
- Annual outreach conducted by the Engineering Department using operating budget funds

7.15 PATTON SUB

The Patton Sub RLA has 76 properties that are all in the X zone with only streets in the floodplain. Most of the homes were built in the 1950s and 1960s.

Repetitive Loss Area	Sub- Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Patton Sub	(none)	76	31	8



7.15.1 Cause of Flooding

This area was constructed prior to League City's detention requirements. Stormwater drains west to east through a combination culvert/open ditch system into the Interurban Ditch. Flooding in this area appears to be due to the capacity and flow rate of the existing system along with the restrictive Interurban Ditch. Once the systems reach capacity, it pushes stormwater back into the area preventing stormwater from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

7.15.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Patton Sub RLA. Considerations were given to the location of the nearest channel, the flood zone,

age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Patton Sub RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

A mid- to long-term mitigation project would include (1) re-grading Interurban Ditch; and (2) the construction of a mitigation pond and related pond outfall structures along W. Galveston Street.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Patton Sub RLA.

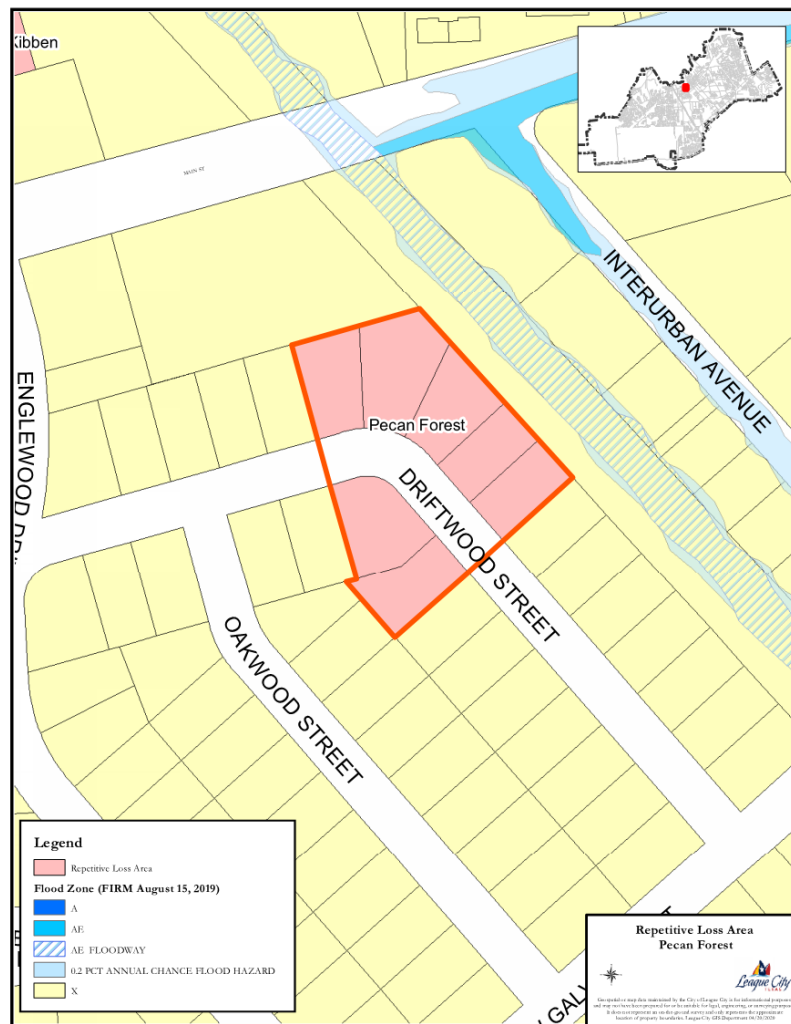
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.16 PECAN FOREST

The Pecan Forest RLA consists of seven properties that are all located in the X zone. Homes were built in the early 1970s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Pecan Forest	(none)	7	4	1



7.16.1 Cause of Flooding

Flooding in this area appears to be due to the capacity and flow rate of the Clear Creek along with the restrictive Interurban Ditch. Once the systems reach capacity, it pushes stormwater back into the area preventing stormwater from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

7.16.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Pecan Forest RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Pecan Forest RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Pecan Forest RLA.

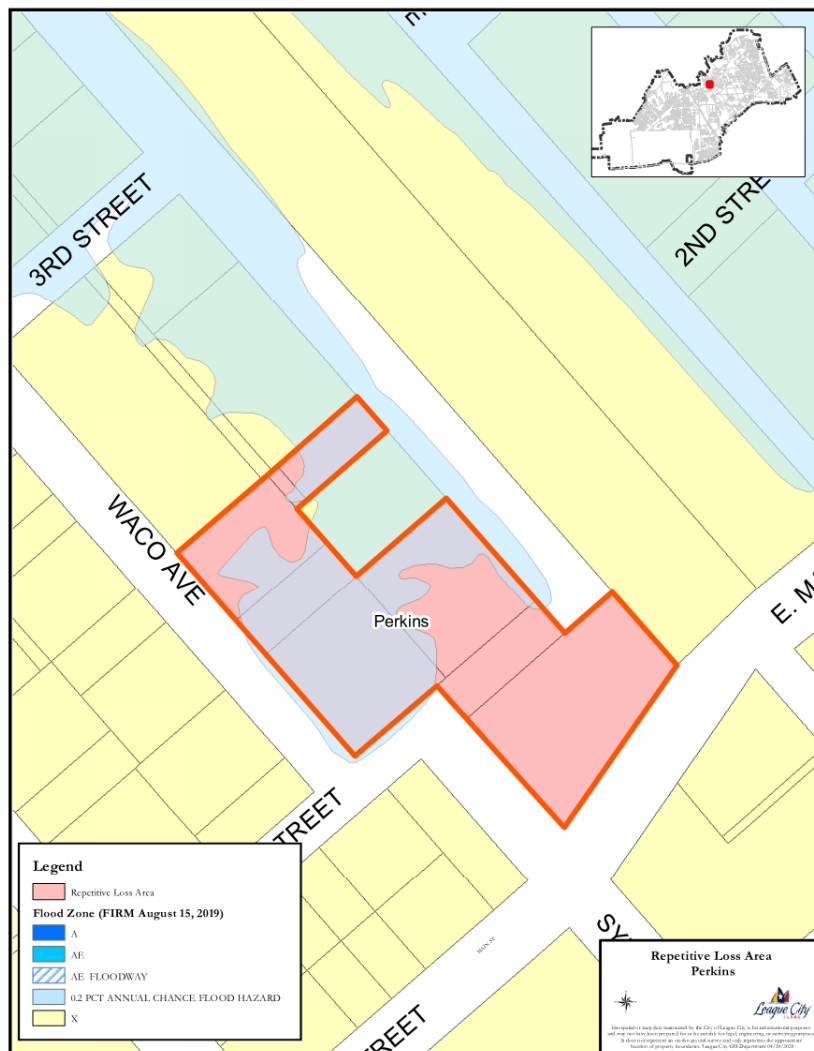
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.17 PERKINS

The Perkins RLA consists of four properties located in the 0.2% flood zone. Construction dates range from 1950 to 1990.

Repetitive Loss Area	Sub- Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Perkins	(none)	4	4	2



7.17.1 Cause of Flooding

Flooding in this area appears to be due to the capacity and flow rate of Clear Creek and a lack of detention ponds in the area. Once Clear Creek reaches capacity, it pushes stormwater back into this area which prevents the area from properly draining during 1% exceedance events which causes excessive ponding in the street and, in extreme events, can lead to structural inundation.

7.17.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Perkins RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Perkins RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures

built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Perkins RLA.

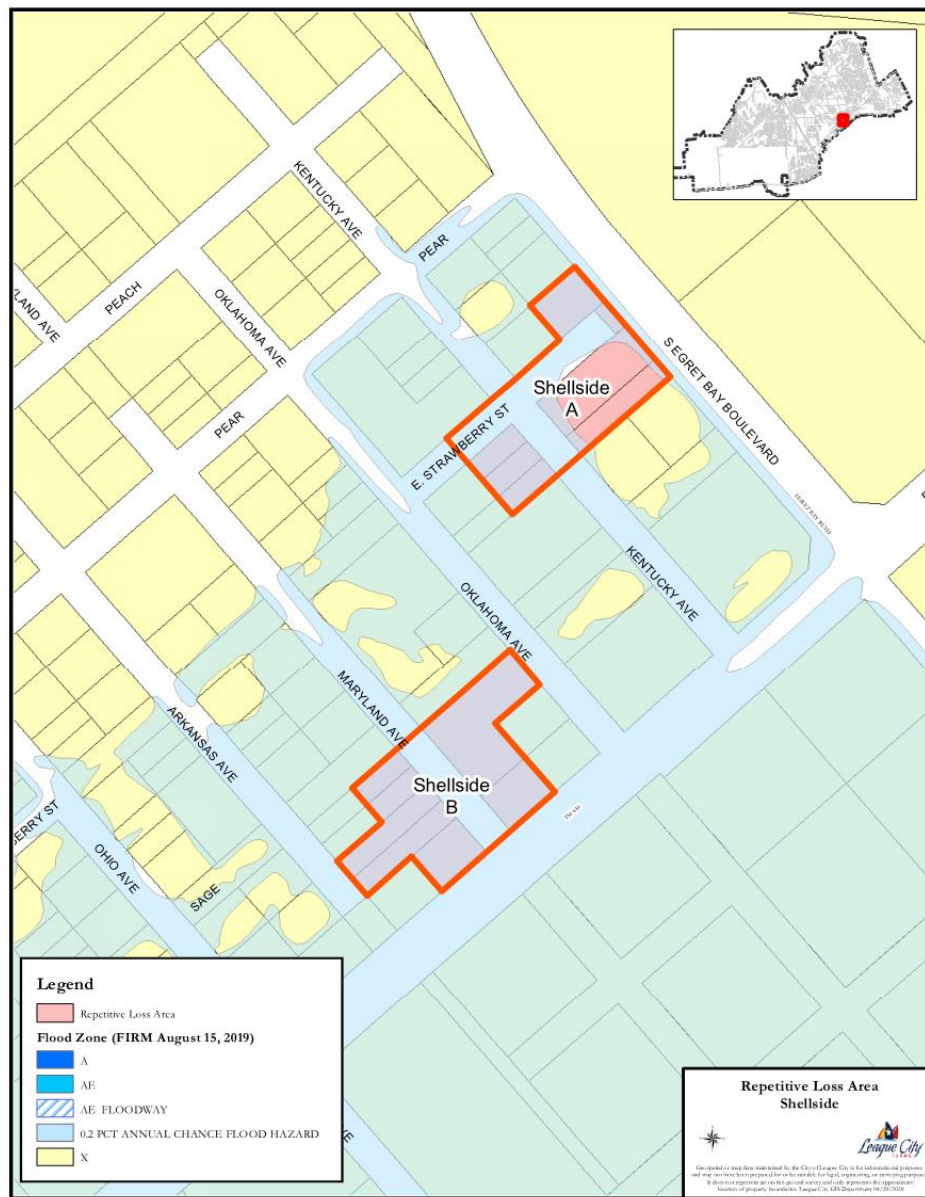
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.18 SHELLSIDE

The Shellside RLA has 12 properties located in the 0.2% flood zone. The majority of homes were built after the year 2004.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Shellside	A	5	2	1
	B	7	3	1



7.18.1 Cause of Flooding

An inefficient system coupled with open ditches led to excessive street ponding and, during extreme events, structural inundation.

7.18.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Shellside RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Shellside RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

The drainage system has been altered by the Tuscan Lakes Development, Robinson Bayou extension, and the City’s Shellside Drainage Improvements Project. This appears to have corrected the flooding issues for rainfall events up to 1% in size.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Shellside RLA.

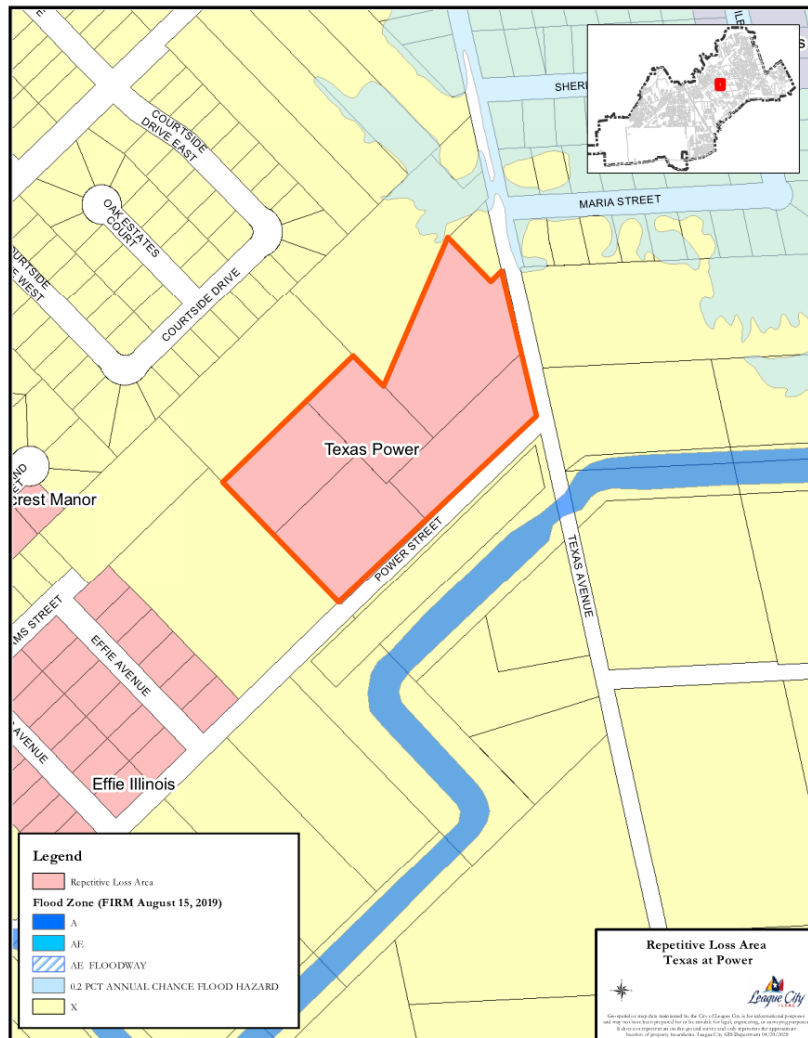
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.19 TEXAS AT POWER

The Texas at Power RLA has two properties located in the X zone that were built in 1960 and 1982.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Texas at Power	(none)	2	1	1



7.19.1 Cause of Flooding

This area has inefficiencies in the adjacent drainage system which leads to excessive street ponding.

7.19.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Texas at Power RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Texas at Power RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Texas at Power RLA.

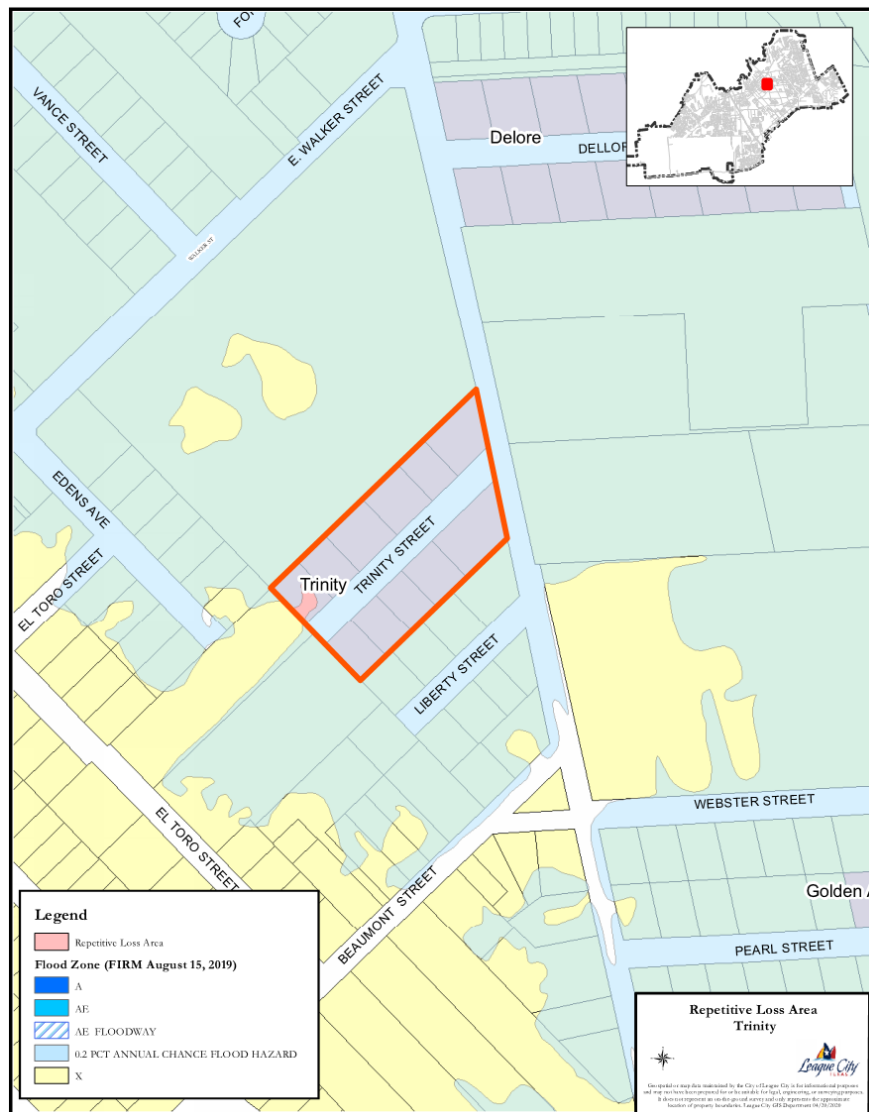
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.20 TRINITY STREET

The Trinity Street RLA consists of 11 properties located in the 0.2% flood zone. Most of the homes in this area were built in the 1960s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Trinity Street	(none)	11	4	2



7.20.1 Cause of Flooding

A cause of flooding in this area is due to the capacity and flow rate of the open ditches in the area, Robinson Bayou and Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into Robinson Bayou which in turns prevents stormwater within this area from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

7.20.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Trinity Street RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Trinity Street RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage

Structural Projects

Recent work along Robinson Bayou has helped mitigate this area.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Trinity Street RLA.

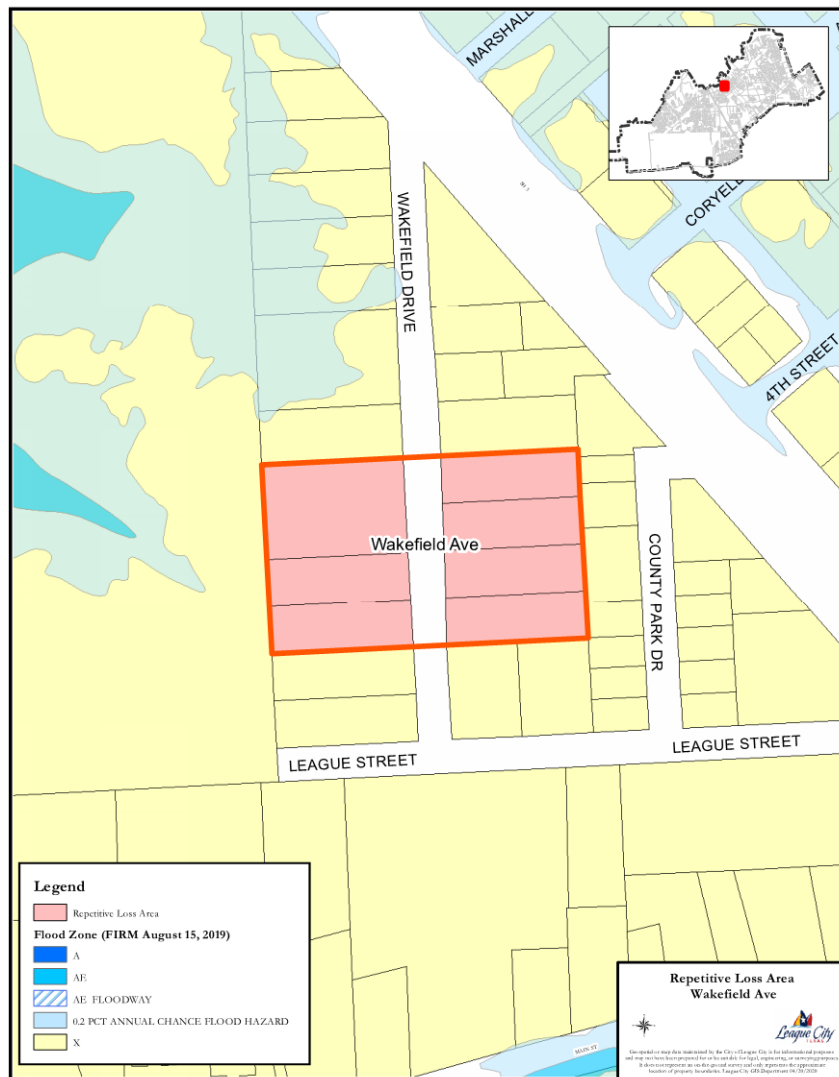
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.21 WAKEFIELD AVENUE

The Wakefield Avenue RLA includes seven properties located in the X zone. Homes were built in the 1940s and 1950s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Wakefield Avenue	(none)	7	4	1



7.21.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into this area which prevents the area from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

7.21.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Wakefield Avenue RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Wakefield Avenue RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Wakefield Avenue RLA.

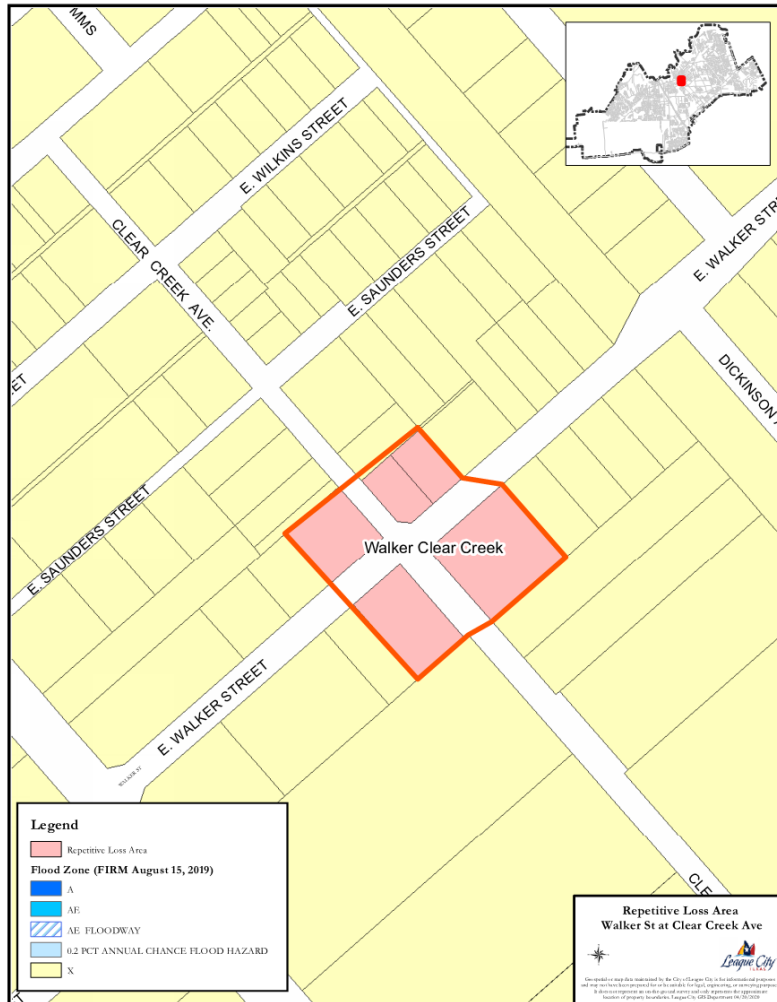
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.22 WALKER AT CLEAR CREEK AVENUE

The Walker at Clear Creek Avenue RLA consists of five properties located in the X zone. Homes were built in the 1950s and 1960s.

Repetitive Loss Area	Sub- Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Walker at Clear Creek Avenue	(none)	5	2	1



7.22.1 Cause of Flooding

In the past, this area along Walker Street was open ditch with flooding in the area due to an inefficient system which led to excessive street ponding and during extreme events, structural inundation.

7.22.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Walker at Clear Creek Avenue RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Walker at Clear Creek Avenue RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

Walker Street has been reconstructed. This appears to have corrected the flooding issues for rainfall events up to 1% in size.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Walker at Clear Creek Avenue RLA.

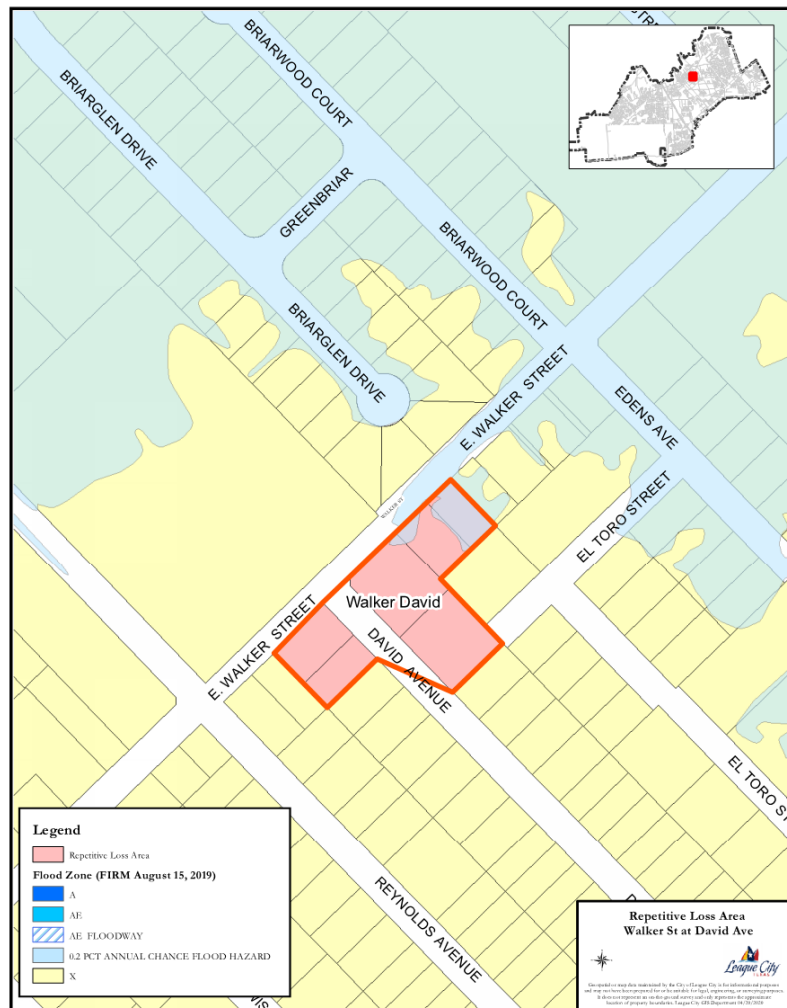
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.23 WALKER AT DAVID

The Walker at David RLA consists of five properties located mostly in the X zone. Homes were built in the 1950s, 1970, and 2008.

Repetitive Loss Area	Sub- Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Walker at David	(none)	5	1	1



7.23.1 Cause of Flooding

In the past, this area along Walker Street was open ditch with flooding in the area due to an inefficient system which led to excessive street ponding and during extreme events, structural inundation.

7.23.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Walker at David RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Walker at David RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures

built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

Walker Street has been reconstructed. This appears to have corrected the flooding issues for rainfall events up to 1% in size.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Walker at David RLA.

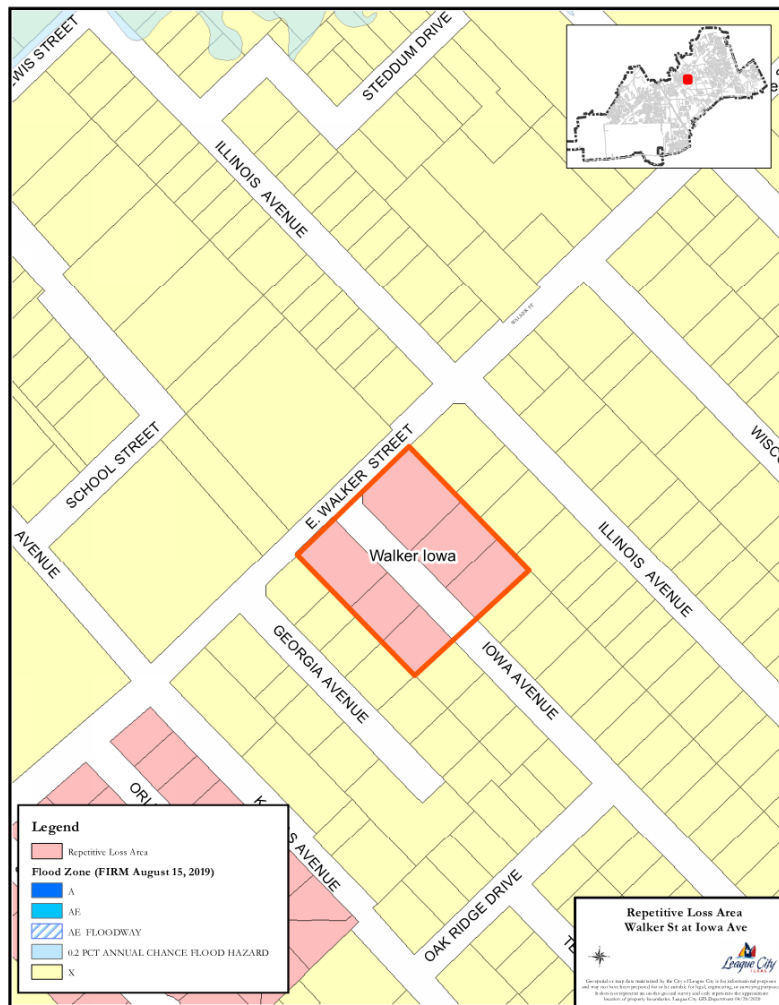
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

7.24 WALKER AT IOWA

The Walker at Iowa RLA includes six properties located in the X zone. Most of the homes were built in the early 1950s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Walker at Iowa	(none)	6	3	1



7.24.1 Cause of Flooding

In the past, this area along Walker Street was open ditch with flooding in the area due to an inefficient system which led to excessive street ponding and during extreme events, structural inundation.

7.24.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Walker at Iowa RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Walker at Iowa RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

Walker Street was reconstructed, and the drainage system was altered when Robinson Bayou was widened. This appears to have corrected the flooding issues for rainfall events up to 1% in size.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Walker at Iowa RLA.

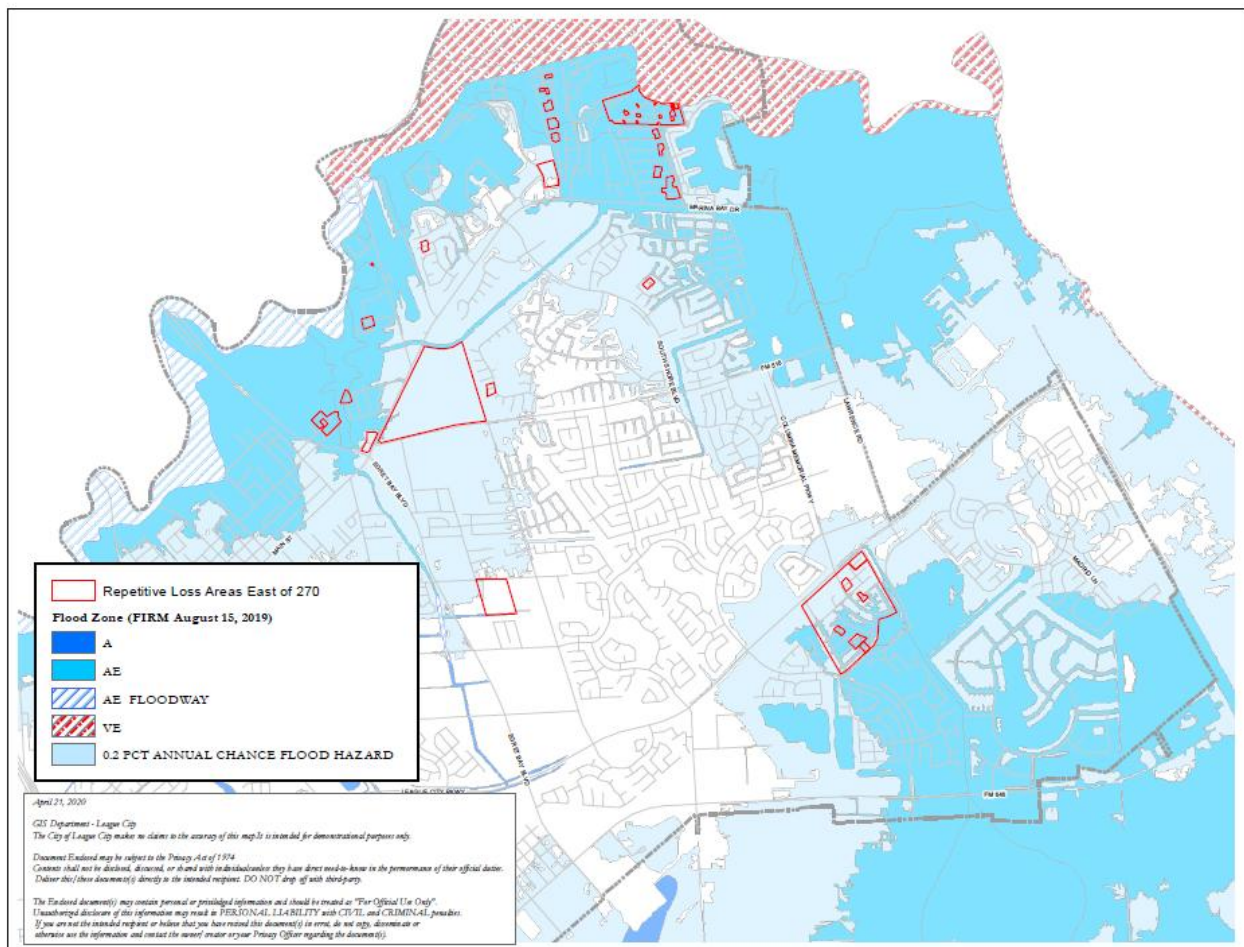
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

8.0 REPETITIVE LOSS AREAS – EAST OF FM 270 DIVISION

The division located east of FM 270 includes 14 RLAs (listed below) and contain a total of 267 properties. Most of the RLAs are in the northern part of the city closer to the VE zone. Almost all of the RLAs in this division are in the floodplain. (Section 8 continues in the same format as Sections 6 and 7.)

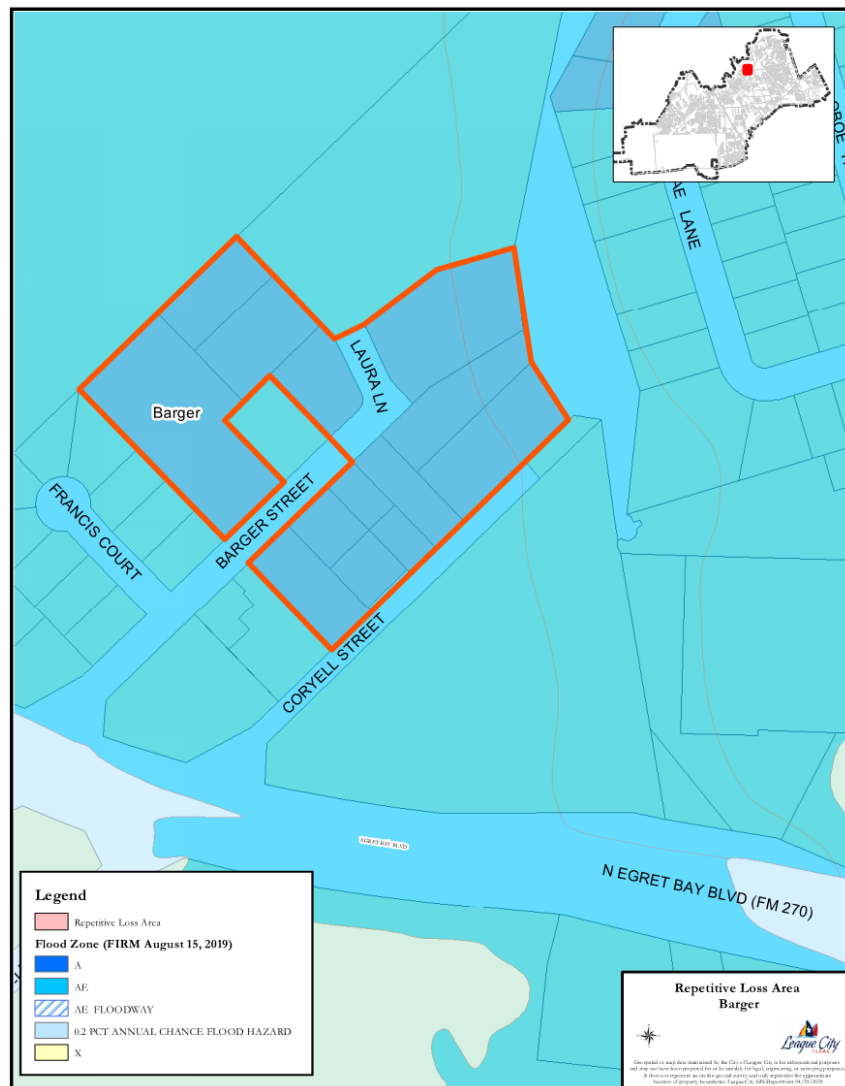
- | | |
|--------------------|----------------------------|
| • Barger | • Harbour Pointe |
| • Bay Ridge | • Kemper Drive |
| • Bayou Brae | • Lakefront |
| • Clear Creek High | • Lakeside |
| • Enterprise | • League City Intermediate |
| • Five Corners | • The Wharf |
| • Glen Cove | • Triple Mast |



8.1 BARGER

The Barger RLA consists of 12 properties located in the floodplain. Most of the homes were built in the 1960s and 1970s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Barger	(none)	12	8	2



8.1.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Robinson Bayou and Clear Creek. Once Clear Creek reaches capacity, it pushes stormwater back into this area which prevents the area from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

8.1.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Barger RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Barger RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Structural Projects

In recent years the City has made improvements to Robinson Bayou which has helped this area, but not solved all of the flooding issues.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Barger RLA.

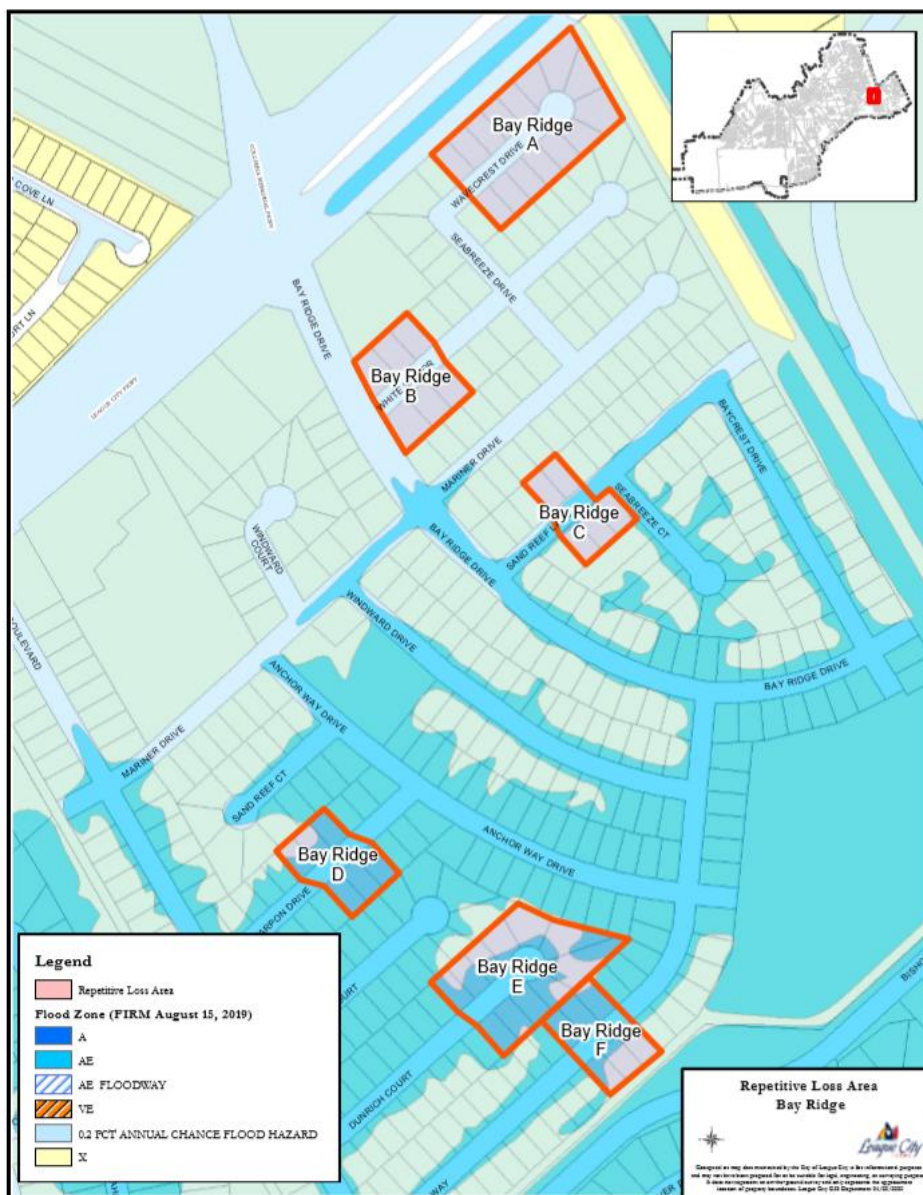
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

8.2 BAY RIDGE

The Bay Ridge RLA consists of six sub-areas for a total of 49 properties. Half of the sub-areas are located in the 0.2% flood zone, and the other half are in the floodplain. The majority of homes were built in the 1970s and 1980s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Bay Ridge	A	15	11	3
	B	6	2	1
	C	5	1	1
	D	6	5	1
	E	11	6	1
	F	6	6	1



8.2.1 Cause of Flooding

Current flooding events are related to the amount of rainfall for a given event over capacitating the existing storm sewer system, the capacity of the detention pond and height of water in Gum Bayou.

8.2.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Bay Ridge RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Bay Ridge RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Dickinson Bayou drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Structural Projects

A short-term mitigation project in the City’s FY 2020-2024 CIP would be the upgrade of the existing storm sewer system on Seacrest Blvd, Anchor Way, Windward, Baycrest Drive, Wave Crest, White Sail, and Mariner. Another short to mid-term mitigation project in the City’s FY 2020-2024 CIP would include (1) expansion of the existing detention pond; and (2) inclusion of a stormwater pump station.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Bay Ridge RLA.

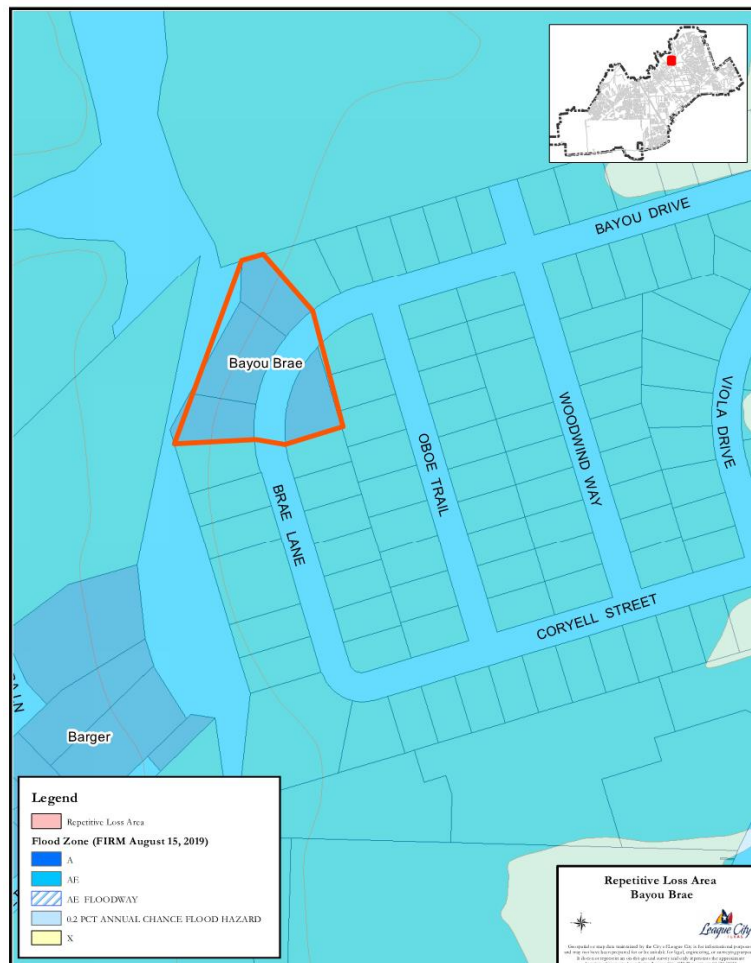
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Structural improvements included in the FY 2020-2024 CIP
- Annual outreach conducted by the Engineering Department using operating budget funds

8.3 BAYOU BRAE

The Bayou Brae RLA has four properties that are located in the floodplain. The majority of homes were built in the 1970s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Bayou Brae	(none)	4	4	1



8.3.1 Cause of Flooding

The area has chronic flooding due to existing flow restrictions with the storm sewer system along Bayou Drive which can lead to 1% or more rainfall events to inundate properties along Bayou Drive and Brae Lane.

8.3.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Bayou Brae RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Bayou Brae RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Structural Projects

A short to mid-term mitigation project in the City’s 2020-2024 CIP would include (1) upgrade the existing storm sewer mains along Bayou Drive and Woodward Way; and (2) design/construct 1% exceedance overflow swales for Bayou Drive and Brae Lane.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Bayou Brae RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Structural improvements included in the FY 2020-2024 CIP
- Annual outreach conducted by the Engineering Department using operating budget funds

8.4 CLEAR CREEK HIGH

The Clear Creek High RLA consists of two properties located in the 0.2% flood zone. (Although the map shows only one parcel, there are multiple buildings with different addresses on the site.) Structures in this area were built in 1985.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Clear Creek High	(none)	2	1	1



8.4.1 Cause of Flooding

The area has chronic flooding due to existing flow restrictions with the storm sewer systems along FM 518 and FM 2094 which can lead 1% or more rainfall events to inundate the streets, parking lots and, in extreme cases, the Clear Creek ISD buildings.

8.4.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Clear Creek High RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Clear Creek High RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

Clear Creek ISD is working on a project to adjust drainage flow to direct more flow into the Genco Canal instead of the FM 518/2094 systems. This project has a property to be dedicated to the City for future detention needs along the Genco Canal.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Clear Creek High RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Coordination with CCISD on the Genco Canal project
- Annual outreach conducted by the Engineering Department using operating budget funds

8.5 ENTERPRISE

The Enterprise RLA has two properties that are located in the 0.2% flood zone. (Although the map shows only one parcel, there are multiple buildings with different addresses on the site.) The structures on the properties were built in 1989 and 1999.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Enterprise	(none)	2	1	1



8.5.1 Cause of Flooding

The area has flooding due to the site being developed under older standards and floodplain maps and potentially to some flow restrictions with the storm sewer system.

8.5.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Enterprise RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Enterprise RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Enterprise RLA.

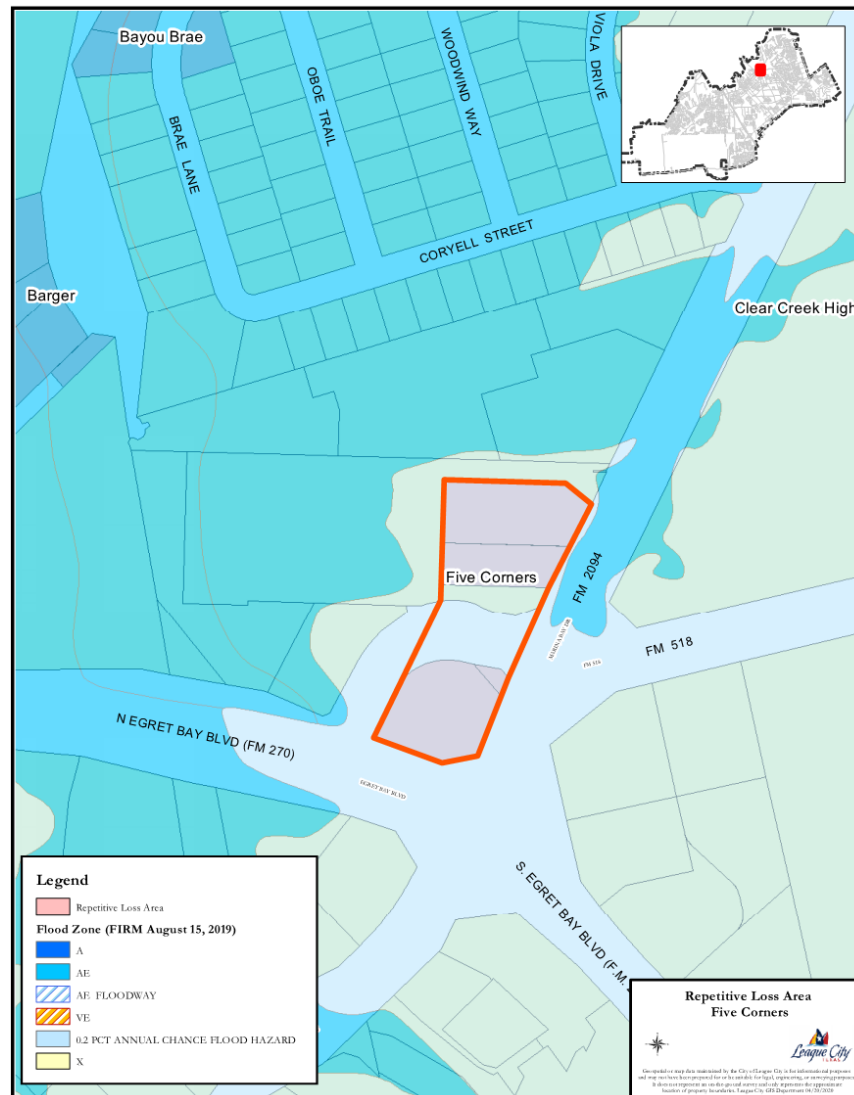
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

8.6 FIVE CORNERS

The Five Corners RLA includes four properties located in the 0.2% flood zone. Structures were built in the mid-1980s and 1990s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Five Corners	(none)	4	0	1



8.6.1 Cause of Flooding

The area has chronic flooding due to existing flow restrictions with the storm sewer systems along FM 518 and FM 2094.

8.6.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Five Corners RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Five Corners RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Structural Projects

A recent project coordinated between the City of League City and the Texas Department of Transportation to rework the intersection at Five Corners was recently completed. The project added a new road system and rerouted the drainage due to the new road. The project appears to have addressed the drainage issues typically seen in events up to a 1% event in this area.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services

Possible activities under these mitigation categories were considered, but were not applicable for the Five Corners RLA.

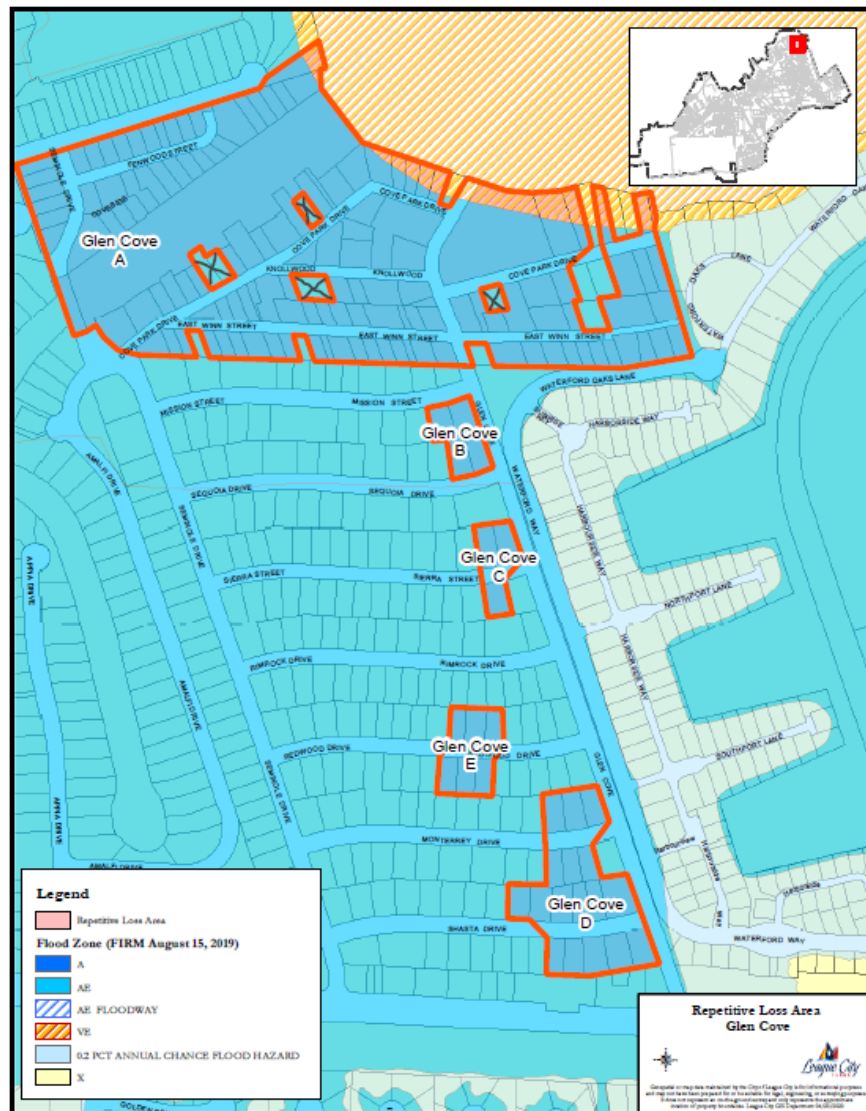
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

8.7 GLEN COVE

The Glen Cove RLA consists of five sub-areas for a total of 138 properties located in the floodplain. (The properties with the “X” were not included in the Glen Cove RLA.) Construction dates range from the mid-1950s through to the 2010s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Glen Cove	A	107	57	34
	B	3	3	1
	C	17	8	4
	D	7	3	1
	E	4	3	1



8.7.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Clear Lake. Once Clear Lake reaches capacity, it prevents stormwater in this area from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

8.7.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Glen Cove RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Glen Cove RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Glen Cove RLA.

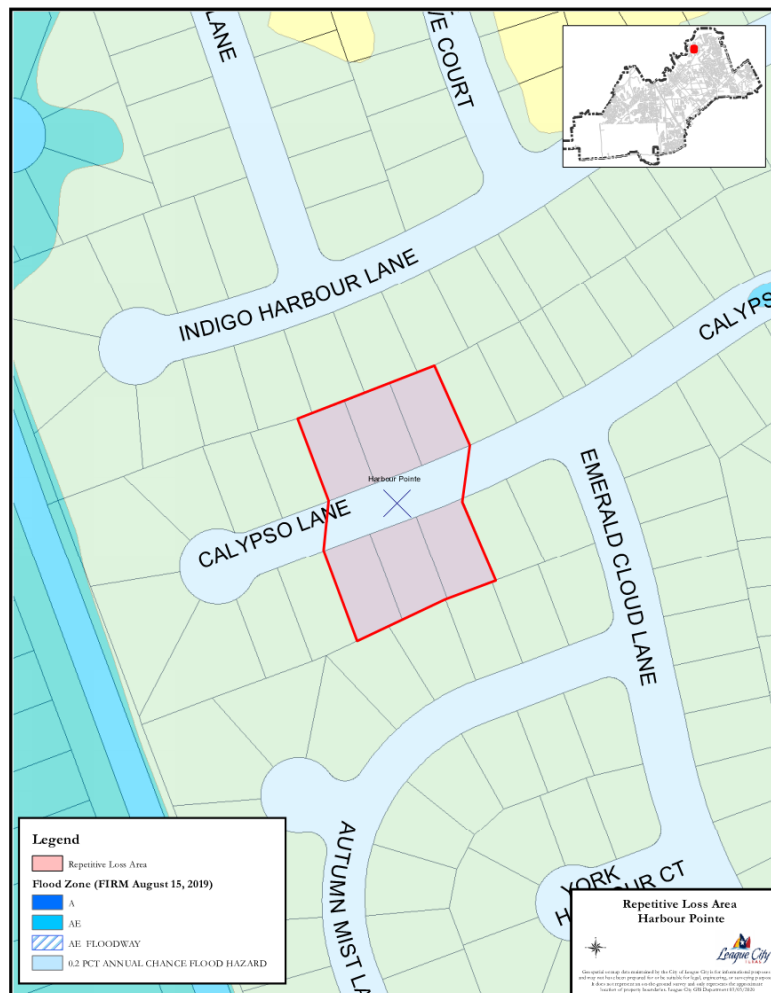
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

8.8 HARBOUR POINTE

The Harbour Pointe RLA includes six properties located in the 0.2% flood zone. The homes were built in 1999.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Harbour Pointe	(none)	6	4	1



8.8.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Clear Lake. Once Clear Lake reaches capacity, it prevents stormwater in this area from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

8.8.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Harbour Pointe RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Harbour Pointe RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Harbour Pointe RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

8.9 KEMPER

The Kemper RLA consists of six properties located in the 0.2% flood zone. Homes were built in 1988.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Kemper	(none)	6	6	1



8.9.1 Cause of Flooding

The area appears to see flooding due to the area being a little lower than the neighboring properties.

8.9.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Kemper RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Kemper RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection

Clear Creek ISD has a property to be dedicated to the City for future detention needs that may be able to help this area, but further analysis is needed to confirm.

Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Kemper RLA.

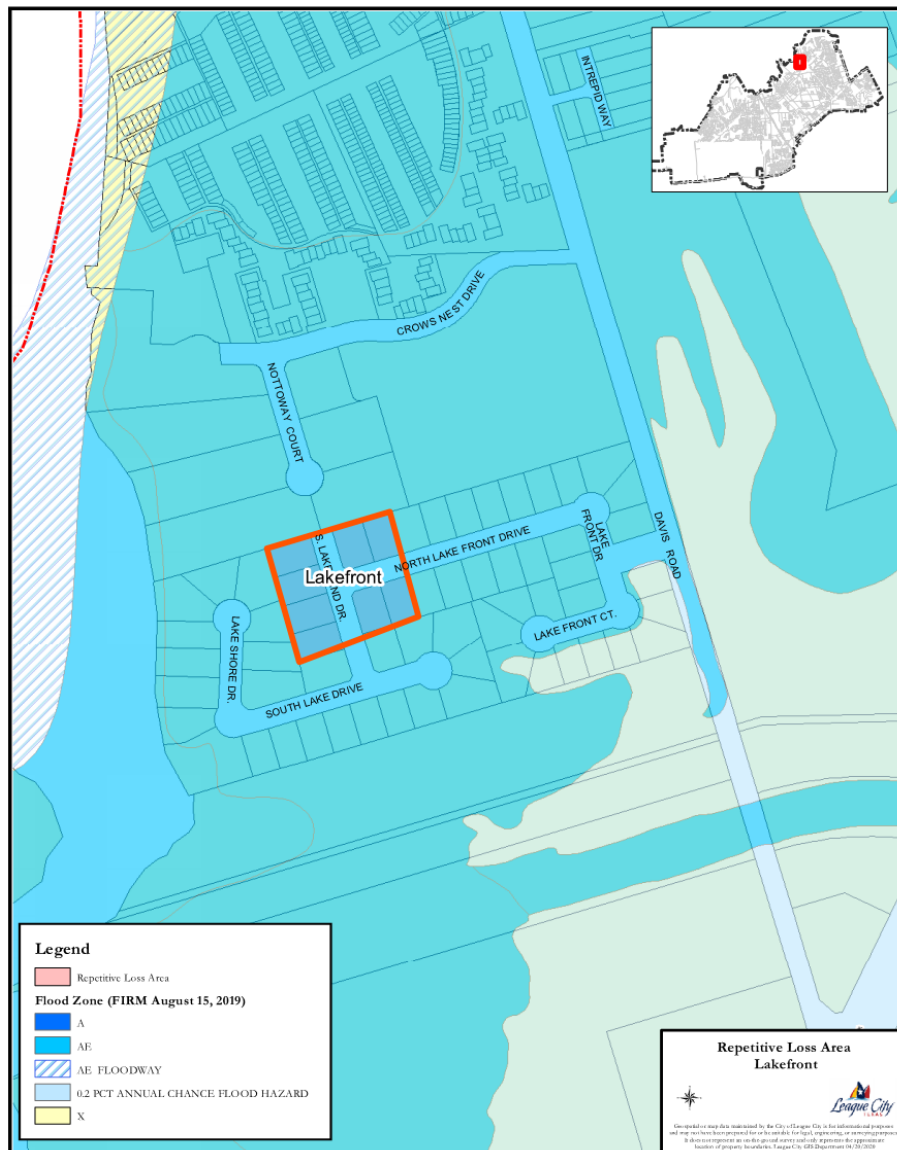
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

8.10 LAKEFRONT

The Lakefront RLA consists of eight properties located in the floodplain. Homes were built in the late 1990s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Lakefront	(none)	8	4	1



8.10.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Clear Creek. Once Clear Creek reaches capacity, it prevents stormwater in this area from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

8.10.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Lakefront RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Lakefront RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Lakefront RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

8.11 LAKESIDE

The Lakeside RLA consists of five sub-areas for a total of 24 properties. All of the homes are in the floodplain, and were constructed as far back as 1935 until the late 2010s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Lakeside	A	5	1	1
	B	4	2	1
	C	5	4	2
	D	6	5	2
	E	4	3	1



8.11.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Clear Lake. Once Clear Lake reaches capacity, it prevents stormwater in this area from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

8.11.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the Lakeside RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the Lakeside RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Lakeside RLA.

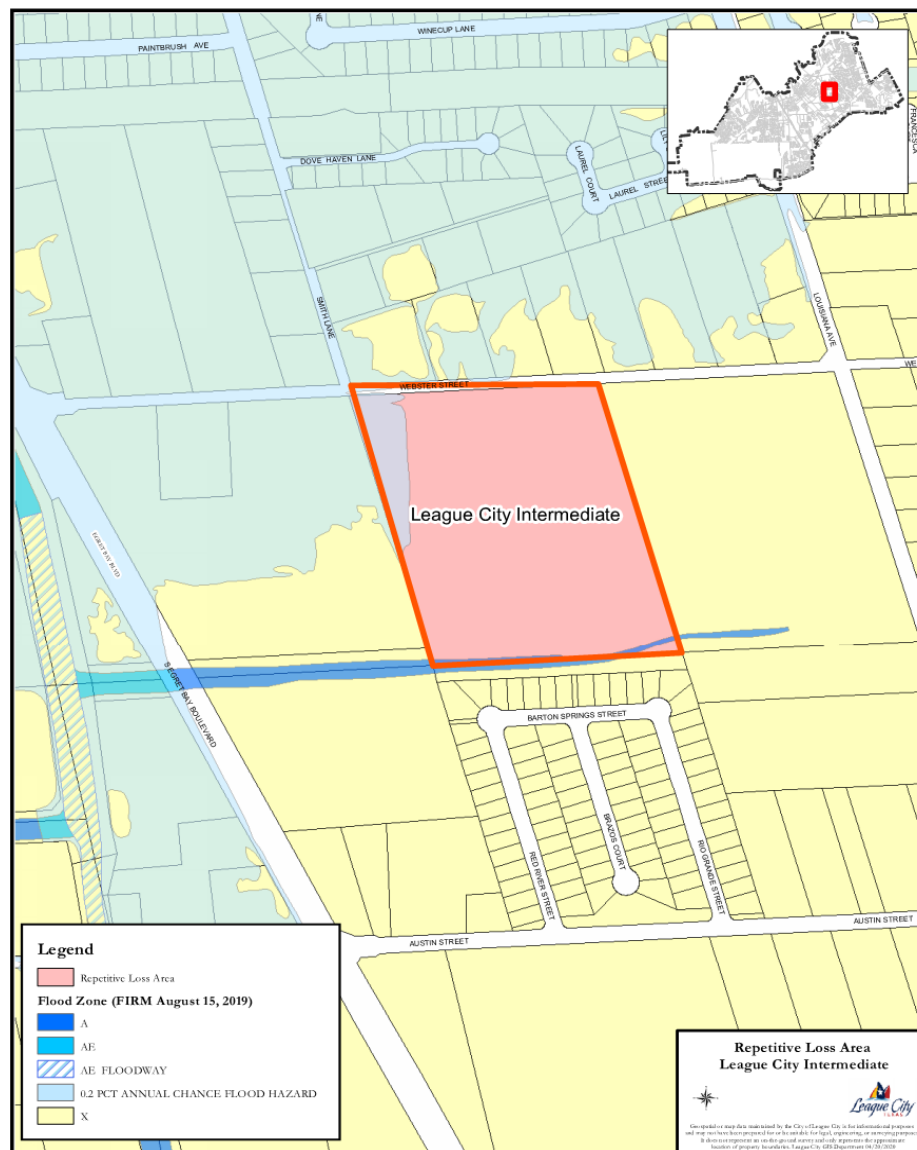
Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

8.12 LEAGUE CITY INTERMEDIATE

The League City Intermediate RLA includes two properties located in the X zone. (Although the map shows only one parcel, there are multiple buildings with different addresses on the site.) The structures were built in the early 1990s and 2000s.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
League City Intermediate	(none)	2	2	1



8.12.1 Cause of Flooding

Flooding in this area appears to be the result of undersized culverts and open ditches.

8.12.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on the League City Intermediate RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for the League City Intermediate RLA.

Preventative

The City's long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City's extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Walker at Iowa RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

8.13 THE WHARF

The Wharf has four properties located in the floodplain. Homes were built in 1979.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
The Wharf	(none)	4	3	2



8.13.1 Cause of Flooding

Flooding in this area is due to the capacity and flow rate of Clear Lake. Once Clear Lake reaches capacity, it prevents stormwater in this area from properly draining during 1% exceedance events which causes excessive ponding in the street and in extreme events can lead to structural inundation.

8.13.2 Mitigation Alternatives

City staff evaluated several mitigation options with regards to what would have the greatest impact on The Wharf RLA. Considerations were given to the location of the nearest channel, the flood zone, age and condition of the homes, cost effectiveness, feasibility, and potential to reduce future flood risk. Below is a summary of mitigation alternatives considered and recommended for The Wharf RLA.

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and

all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage. The City’s two-foot freeboard and CRS discount also encourage citizens in the floodplain to pursue flood insurance at a more affordable rate.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for The Wharf RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

8.14 TRIPLE MAST

The Triple Mast RLA has six properties located in the 0.2% flood zone. All the homes were built in 1992.

Repetitive Loss Area	Sub-Area	# of RLA Properties	# of Flood Ins. Policies	# of FEMA Rep. Loss Properties
Triple Mast	(none)	6	5	1

Preventative

City Council adopted a revised Flood Damage Prevention Ordinance in July 2019 that included higher standards for new and substantially improved structures in the floodplain, as well as new structures built in the 0.2% flood zone (aka 500-year floodplain). The ordinance requires that the lowest floor and all servicing equipment must be elevated (residential) or floodproofed (non-residential) to “a minimum of 24 inches above the larger of the base flood elevation (BFE), the crown of the nearest street or the highest grade adjacent to the building and be a minimum of three inches above the nearest 500-year flood elevation.” Previously, the standard had been 18 inches. The increase in elevation applies to both new construction and substantially improved/damaged structures. Another aspect of preventative activities is drainage system maintenance. The City’s long-term strategy is to continue to perform normal, routine maintenance of area and to commission a Master Drainage Plan for the City and joint studies with neighboring municipalities related to Clear Creek drainage improvements.

Property Protection

The City promotes the purchase and maintenance of flood insurance by way of an annual targeted outreach project (explained further in *Public Information*). Given the increased frequency of major flooding events, flood insurance remains a paramount way to mitigate the effects of future flood damage.

Public Information

Part of the City’s extensive public outreach involves a targeted, annual mailing in May/June to each of the 1,183 properties in the 58 RLAs. The RLA mailing is similar to outreach slated for the general public which includes information on flood insurance, development regulations, and drainage system maintenance. However, the RLA outreach also includes information on property protection and sources of financial assistance such as mitigation grants. The City also maintains a comprehensive Flood Protection Information page on its website (www.leaguecity.com) that includes the topics listed above as well as information on flood protection assistance and flood safety.

Natural Resource Protection, Emergency Services, Structural Projects

Possible activities under these mitigation categories were considered, but were not applicable for the Triple Mast RLA.

Recommended mitigation measures:

- Drainage system maintenance conducted on a routine schedule and following a flooding event
- Annual outreach conducted by the Engineering Department using operating budget funds

9.0 CONCLUSION

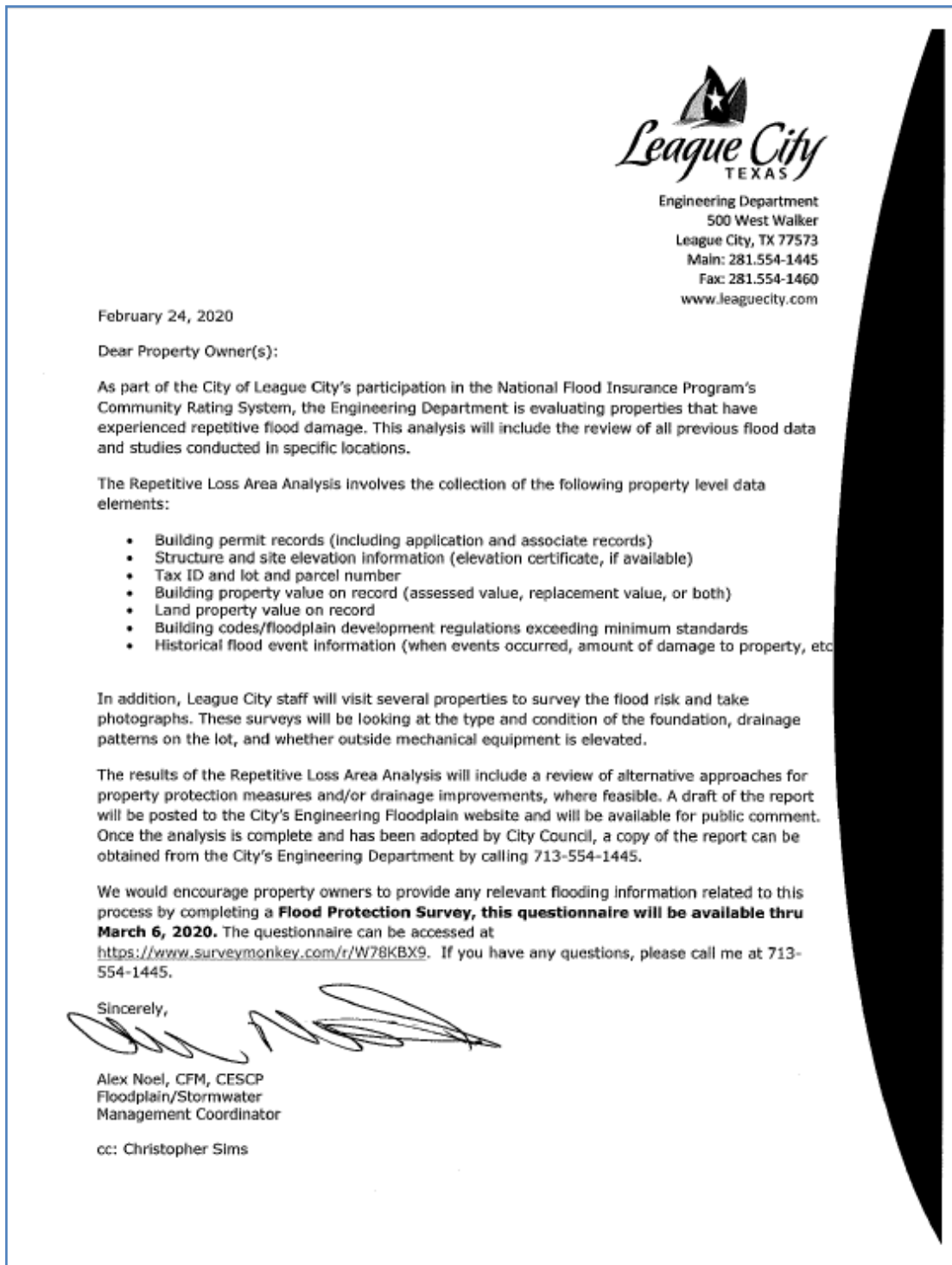
The problem of repetitive flooding is one that the City of League City takes very seriously. The City has chosen to be proactive in several ways in an attempt to head off flooding before the storms even happen. The City’s approach to the new FIRMs is one example. FEMA started developing new countywide FIRMs in 2012, but the release of the maps was met with many delays. In the meantime, the City used the preliminary FIRMs as best available data, and strongly encouraged developers to meet or exceed the BFE shown on the preliminary maps. As the preliminary maps were modified over the years, the City kept up with the changes and relayed them to developers so that the data stayed current.

In addition, the City's FY 2020-2024 CIP (referenced several times as a mitigation alternative) came as a result of the City's hard look at Hurricane Harvey and the areas flooding more frequently. Citizens have historically encouraged and endorsed the City's proposed projects to improve drainage, as the frequency of storm events has heightened their sense of awareness to the flooding possibility. The decision to increase the freeboard for new development and substantial improvements/damage from 18 inches to 24 inches in the Flood Damage Prevention Ordinance is another example of the City's proactive measures to mitigate future flood damage.

Due to storm events like the Tax Day flood in April and the Memorial Day flood in May, the public no longer considers flooding to be a risk only during hurricane season. The devastation of events such as Hurricane Ike and Hurricane Harvey has kept the issue of flooding on the minds of citizens, and the City does its part in keeping it there through its comprehensive outreach programs such as annual mailings, content included in quarterly newsletters mailed to every resident, half-sheet flyers given to the public during 19 planned events, annual Hurricane Awareness events at a local hardware store, and FEMA brochures in municipal buildings. As a result, more citizens are doing their part to protect themselves and their properties such as purchasing and maintaining flood insurance, keeping storm drains clear of debris, and other forms of property protection. Through its outreach and mitigation measures, the City remains confident it can reduce future flood damage for the benefit of their citizens.

APPENDIX A

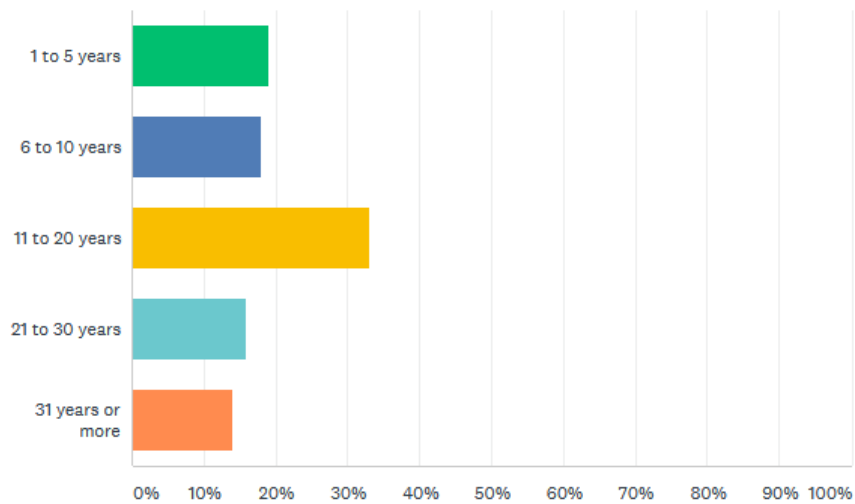
Below is the letter that the City of League City mailed to 1,196 property owners beginning on February 24, 2020 through February 26, 2020. Following the letter is screenshots from the online Flood Protection Survey that was linked within the letter.



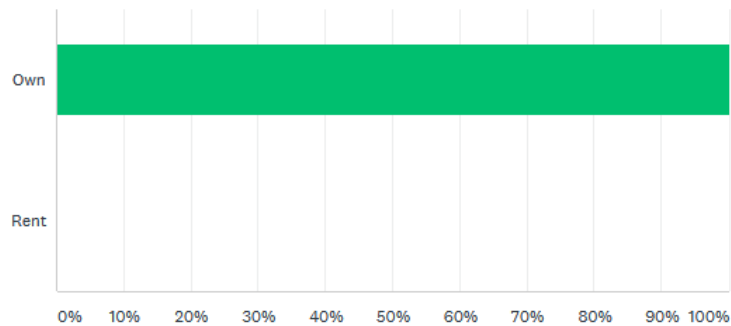
Questions from the League City Flood Protection Survey

1. What is your street address?

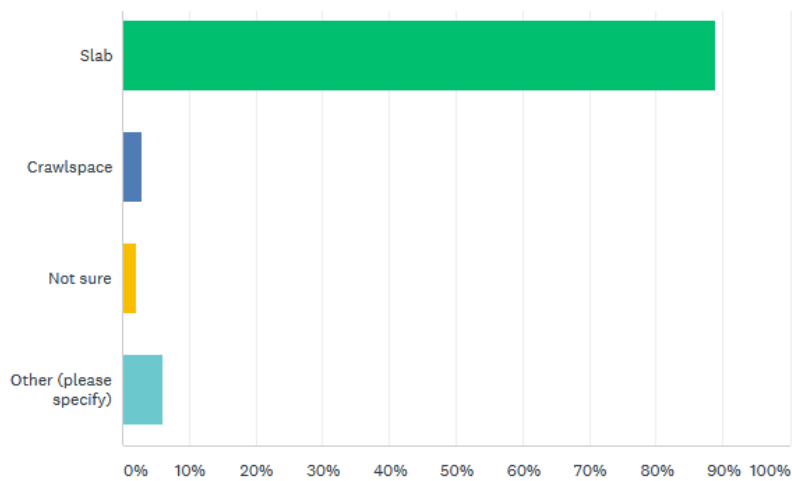
2. How many years have you lived in the home/building at this address?



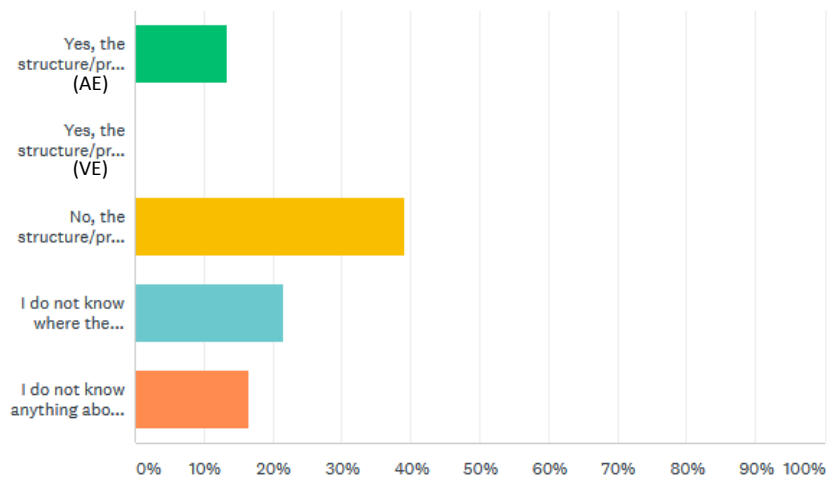
3. Do you rent or own this home/building?



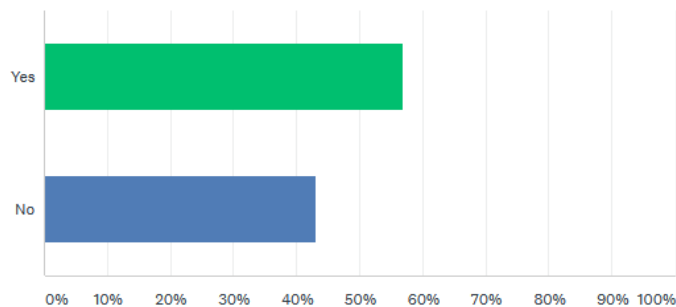
4. What type of foundation does the home/building have?



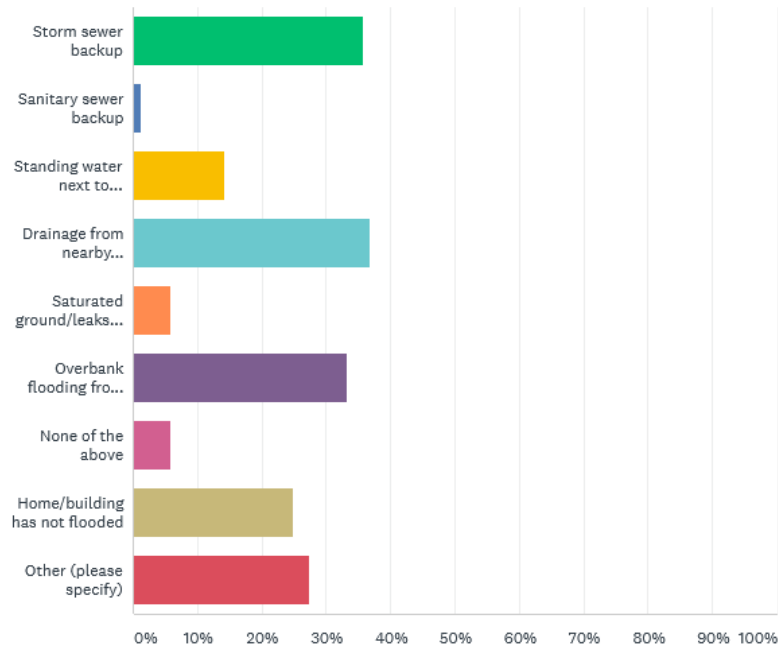
5. Do you know if your home/building or property is within the FEMA-defined 100-year floodplain?



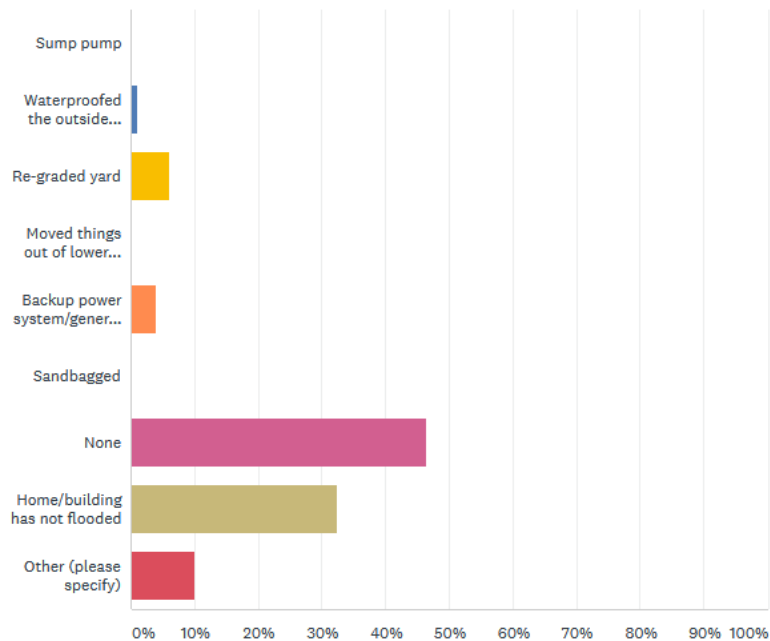
6. Has this home/building or property ever been flooded or had a water/drainage problem?



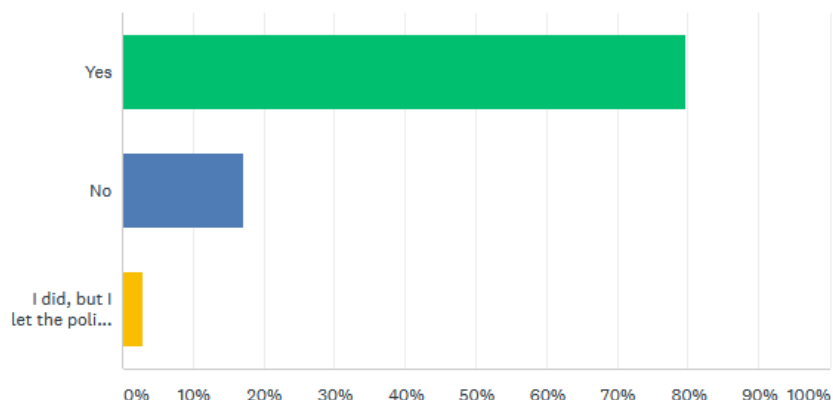
7. What do you feel was the cause of your flooding? Check all that affect your home/building.



8. Have you installed any flood protection measures on the property?



9. Do you have a flood insurance policy on your home/building?



10. What actions do you think the City, State, or Federal Government should take to reduce the effects of flooding?

Below is a sampling of respondents' comments.

- "Keep drains clean and clear of debris. Add additional drainage routes to the creek."
- "Improve storm drainage."
- "If a new subdivision is built, detention ponds should be added and not continue to drain into the existing drainage, as the current drainage system is not big enough for the overflow."
- "Deepen retention areas."
- "Raise houses near creeks to allow water to flow better for larger storms."
- "In this instance with the exceeding large volume of rain, I do not believe anything could have been done to eliminate flooding."
- "League City is currently fixing and evening out our roads, which will help."
- "Being on the Gulf Coast, there is little that can be done to protect against natural disasters such as hurricanes."

Of the 133 respondents, 86 provided comments to question #10. The most common answer was for the City to ensure that drains were kept clear of debris.

APPENDIX B

In accordance with the Privacy Act of 1974, Appendix B containing sensitive and site-specific data per address will not be shared with the public.